EUROPEAN
COMMISSION

Brussels, 16.2.2022
SWD(2022) 33 final

PART 1/4

COMMISSION STAFF WORKING DOCUMENT

Updated Detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure Implementation of Art 10 (3) of Directive 2014/94/EU

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1 INTRODUCTION

The present Commission Staff Working Document (SWD) “Updated Detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regard alternative fuels in the transport sector and the deployment of the relevant infrastructure. Implementation of Art 10 (3) of Directive 2014/94/EU”, updates the SWD/2021/49 final[1], which accompanied the “Report from the Commission to the European Parliament and the Council on the application of Directive 2014/94/EU on the deployment of alternative fuels infrastructure”[2]. The Commission Report and the SWD/2021/49 final were adopted by the Commission on 8 March 2021. The SWD/2021/49 final did not include the assessment of the National Implementation Reports (NIRs) of Italy, Portugal and the United Kingdom (UK) due to their late submission to the Commission.
The updated SWD includes the assessment of the NIRs of the above-mentioned Member States and the UK, and presents the revised common assessment at EU level to reflect the impact of all NIRs. Finally, the updated SWD corrects some minor errors that were found in the previous SWD/2021/49 final.
The UK had the obligation to submit its NIR to the Commission since it was still a Member State of the European Union at the date of submission established in the Directive 2014/94/EU. Therefore, the Commission was obliged to assess also the UK NIR. For this reason, in the updated SWD, the UK is referenced to as one of the 28 EU Member States. The updated results are consistent with the conclusions drawn in the “Report from the Commission to the European Parliament and Council on the application of Directive 2014/94/EU on the deployment of alternative fuels infrastructure”.

To minimise transport dependence on oil and to reduce the environmental impact of transport, Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure (hereinafter the "Directive”), of 22 October 2014, provides a common approach for the development of alternative fuels infrastructure as well as common technical specifications.

The Directive requires Member States to set up long-term National Policy Frameworks (NPFs) for the development of the alternative fuels market and the planning of the deployment of relevant alternative fuels infrastructure. The Directive also sets requirements for rollout of alternative fuels infrastructure along the core network of the Trans-European Transport Network (TEN-T) and its urban areas - with different milestones for 2020, 2025 and 2030 for different alternative fuels. Finally, the Directive prescribes common technical specifications for recharging and refuelling points and for consumer information.
In accordance with the requirements of the Directive, Member States shall:

[1] Referenced to in this updated SWD as “European Commission, 2021a”.

[2] Referenced to in this updated SWD as “European Commission, 2021b”.

- by 31 December 2020, establish an adequate number of publicly accessible recharging points to ensure that electric vehicles (hereinafter “EV”) can circulate at least in urban/suburban agglomerations and other densely populated areas;
- by 31 December 2025, establish additional EV recharging points at least on the TEN-T Core Network, urban/suburban agglomerations and other densely populated areas;
- assess shore power supplies for inland waterway vessels and seagoing vessels in sea and inland ports;
- by 31 December 2020, establish an adequate number of publicly accessible refuelling points to ensure that CNG vehicles can circulate in urban/suburban agglomerations and other densely populated areas and, where appropriate, on networks designated by Member States;
- by 31 December 2025, establish an adequate number of publicly accessible CNG fuelling points at least in the existing TEN-T Core Network in order to ensure that CNG vehicles can circulate throughout the European Union (hereinafter "EU”);
- by 31 December 2025, establish an adequate number of LNG refuelling points in ports to ensure the circulation of LNG inland waterway vessels or seagoing vessels throughout the TEN-T Core Network;
- By 31 December 2025, establish an adequate number of publicly accessible LNG refuelling points in the existing TEN-T Core Network at least to ensure that LNG-powered heavy-duty vehicles can circulate throughout the EU on demand unless costs are disproportionate in relation to the benefits, including environmental benefits.

Under Article 10 of the Directive, Member States have to submit a report on the implementation of their national policy framework to the Commission by 18 November 2019, and every three years thereafter. The national implementation report (hereinafter “NIR”) has to cover the information listed in Annex I of the Directive and, where appropriate, to include a relevant justification regarding the level of attainment of the national targets and objectives referred to in Article (3)(1).

Point 3 of Article 10 of the Directive prescribes also that “*The Commission shall submit a report on the application of this Directive to the European Parliament and to the Council every three years with effect from 18 November 2020*”.
The SWD/2021/0049 final (European Commission, 2021a), adopted on 8 March 2021, was part of the Report from the Commission to the European Parliament and the Council on the application of Directive 2014/94/EU on the deployment of alternative fuels infrastructure (European Commission, 2021b), but it was incomplete. The present Commission Staff Working Document (hereinafter “SWD”) has to be published as it is complete and conclusive.

The SWD is structured as follows: after the introduction, Chapter 2 describes the methodology adopted for the assessment of the NIRs and presents the new parameters and calculations carried out in this SWD, which were not present in the Commission SWD on the National Policy Frameworks (European Commission, 2019).
Chapter 3 provides for all the MSs a tabularised synthesis of the most relevant assessment results, both concerning the numerical values provided in the NIRs in relation to alternative

fuels vehicles and related infrastructure, and concerning the outcome of the analysis and assessment of the measures.

Chapter 4 is divided in two sections. The first section provides some considerations and additional information on the results shown in Chapter 3, but from an EU-wide perspective. Where possible, the results from the individual NIRs and MSs are combined to provide EU averages that, although with some limitations related to the availability of data and the number of Member States assessed, give an indication of the EU-wide state of play in 2018 and of the outlook until 2030.

The second section of Chapter 4 presents an update of the simplified analysis regarding the economic and social impact of the Directive, based on the NIRs[3].

Chapter 5 contains the detailed assessment reports of the individual NIR of the 28 Member States[4]. These 28 assessment reports are preceded by a section that explains the structure and content of each part of the assessment.

When considering the individual assessment reports and the EU-wide analysis it is important to keep in mind that the information provided in the NIRs and assessed by the Commission constitutes a snapshot of the situation in 2018. More than three years have passed since then and in several cases the position and strategies of the MSs concerning alternative fuels might have changed quite considerably. Nevertheless, this SWD provides an impressive amount of data, information and analysis on the level of implementation of the Directive three years after the submission of the NPFs by the MSs.

[3] The previous simplified analysis and modeling of the economic and social impact of the Directive was carried out on the basis of the inputs provided by the MS in their NPFs.

[4] These National Implementation Reports refer to the situation up to 2018, when the United Kingdom was still a Member State of the European Union. Therefore, this Commission Staff Working Document includes references to the data reported by the UK.

2 METHODOLOGY FOR THE ASSESSMENT OF NATIONAL IMPLEMENTATION REPORTS

The analysis of the national implementation reports (NIR) has been carried out in two stages: first, an assessment at Member State level according to the methodology described in the following sections. After that, an analysis at EU level has been performed, which also includes some considerations on the economic and social impact of the implementation of the Directive.

2.1 Member state level assessment methodology

The assessment of the Implementation Reports at Member State level is performed along two main directions: on the one hand, it evaluates the AFV estimates and AFI targets, on the other hand, the support measures. Concerning the former, the assessment analyses the MSs situation in 2018 towards reaching the AFV-estimates / AFI-targets and characterises the modifications reported in the NIR versus the NPF. As for the latter, by applying the assessment methodology, it examines whether the existing or planned support actions or measures from the NIR are coherent with the AFV-estimates / AFI-targets set in the NIR, and provides an evaluation of the possible impact of such measures to achieve the objectives[5].

2.1.1 *AFV-estimates / AFI-targets assessment*

The flowchart in Figure 2.1.1-1 gives an overview of the AFV estimates and AFI targets assessment by presenting the main activities (rectangles) that are performed and their different inputs and outputs (parallelograms). The following sections present in detail the methodology employed to perform the listed activities:

- level of change assessment - see subsection 2.1.2
- progress assessment (including annual growth rate determination in the case of electricity/road and CNG/road pairs) - see subsection 2.1.3
- determination of the AFV-estimates / AFI-targets attainment - see subsection 2.1.4
- analysis of the adequacy between alternative fuels vehicles and infrastructure - see subsection 2.1.5

[3] Disclaimer: the evaluation of the impact is related only to the objectives set by the MS in the NIR/NPF, not to the absolute values of these objectives, nor to a comparison among member states.

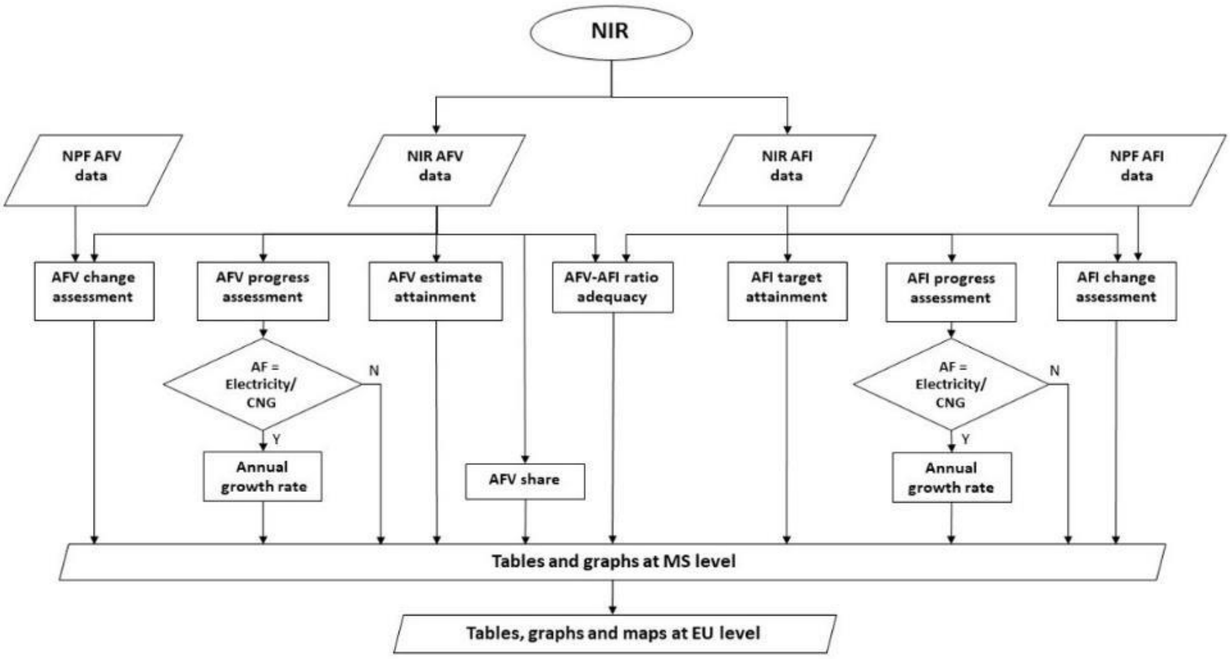


Figure 2.1.1-1 Overview of the AFV estimates and AFI targets assessment

2.1.2 *Assessment of AFV-estimates / AFI-targets changes*

The changes presented in the NIR in comparison with the NPF concerning AFV-estimates / AFI-targets are computed for a given year according to this formula:

$$change[\%] = \frac{NIR\ value - NPF\ value}{NPF\ value} * 100$$

They are characterized as follows:

- Increased ambition (change > 15%)
- Similar ambition (-15% ≤ change ≤ 15%)
- Decreased ambition (change < -15%)

In the assessment of each MS' NIR, these changes are computed for all the pairs alternative fuel/transport mode for which data are available and are displayed under tabular format using the colour coding described above. Table 2.1.2-1 presents an example from one MS' NIR.

Table 2.1.2-1 National AFV-estimates and AFI-targets established in one NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	68,728	6,700	142,211	9,000	370,617	NA	644,148	NA
	Change NIR vs NPF [%]			-10.95%	0.00%				
	Attainment [%]			48.33%	74.44%	18.54%		10.67%	
CNG / road	NIR	42,463	185	42,351	230	54,268	≥ 230	76,898	NA
	Change NIR vs NPF [%]			-10.16%	0.00%	15.12%	0.00%		
	Attainment [%]			100.26%	80.43%	78.25%		55.22%	
LNG / road	NIR	NA	6	NA	22	NA	≥ 22	NA	NA
	Change NIR vs NPF [%]				0.00%		0.00%		
	Attainment [%]				27.27%				
LNG / water (maritime)	NIR	NA	11	NA	NA	NA	17	NA	17
	Change NIR vs NPF [%]						0.00%		0.00%
	Attainment [%]						64.71%		64.71%
LNG / water (inland)	NIR	NA	0	NA	NA	NA	0	NA	0
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	42	6	≥ 36	13	≥ 36	≥ 13	≥ 36	NA
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%		
	Attainment [%]				46.15%				

Legend:		
	(grey)	Not applicable
	(blank)	The value could not be computed
	NA	No value/information provided/available in the NIR

It should be noted that the values shown in Table 2.1.2-1 are those in the NIR, however the corresponding values in the NPF can be easily calculated from the NIR values and the percentage changes versus NPF:

$$NPF\ value = \frac{NIR\ value}{\left(1 + \frac{change[\%]}{100}\right)}$$

When for a given column in Table 2.1.2-1 the NIR value is present and the corresponding cell "Change NIR vs NPF [%]" is empty, it means that the NPF did not contain the AFV estimates or AFI targets.

2.1.3 *Progress assessment method for AFV-estimates / AFI-targets deployment*

The progress assessment evaluates what has been achieved at MS level between 2016 and 2018 regarding alternative fuels transport systems and infrastructure compared to the overall planned evolution in the NPF/NIR for the period 2016-2030. Therefore, the progress is not influenced by the initial situation in 2016. Due to the different level of development of the various

AF/AFV/AFI, both at MS level and at EU level, two separate cases have been identified and are treated differently.

A) For the electricity/road and CNG/road pairs, where a clear evolution type could be identified in many MSs and at EU level, the progress is assessed following the next steps, which are described in detail in the mentioned subsections:

- Determination of the type of evolution at EU level for each of the two AFs from past available data until 2018, and 2020 foreseen situation in the NPF (see subsection 2.1.3.1);
- Determination of the areas of slow progress, adequate progress and fast progress (see subsection 2.1.3.2);
- Characterisation of the 2018 progress at MS level for AFV-estimates / AFI-targets deployment as ***fast***, ***adequate*** or ***slow*** progress (see subsection 2.1.3.2).

  For these two AF/transport mode pairs, the progress type information is complemented by an evaluation of the AFV-estimates / AFI-targets growth rate of the foreseen evolution (see subsection 2.1.3.4).

B) For all the other AF/transport mode pairs, for which a clear evolution type could not be identified, the 2018 progress of a MS for the corresponding transport systems or infrastructure deployment is obtained by dividing the achievement in the period 2016-2018 by the overall planned deployment during the period 2016-2030. Thus, the progress determination in these cases is based on the formula:

$$progress\ [\%] = \frac{NIR\ value\ (2018)\ -\ NIR\ value\ (2016)}{NIR\ value\ (2030)\ -\ NIR\ value\ (2016)} * 100$$

2.1.3.1 EU level analysis – evolution type determination

For the electricity/road and CNG/road pairs, the type of evolution at EU level was determined from available past data from the European Alternative Fuels Observatory (EAFO)[6] and future 2020 AFV-estimates / AFI-targets provided by the MSs in their NPFs. The highest coefficient of determination R^2 that described the goodness of the fit was used as criterion to establish the best fitting curve to these data (exponential, linear, logarithmic or power). This identified curve type provided the type of evolution at EU level that was then considered to perform the MS level progress assessment.

2.1.3.1.1 Electricity/road example

Using past data (2008–2018) regarding electric vehicles (EVs) from EAFO and 2020 EV estimates from the NPFs, the results depicted in Figure 2.1.3-1 are obtained at EU level:

[6] EAFO. (2020). European Alternative Fuels Observatory (EAFO). European Commission (EC). Retrieved from https://www.eafo.eu on 01/02/2020.

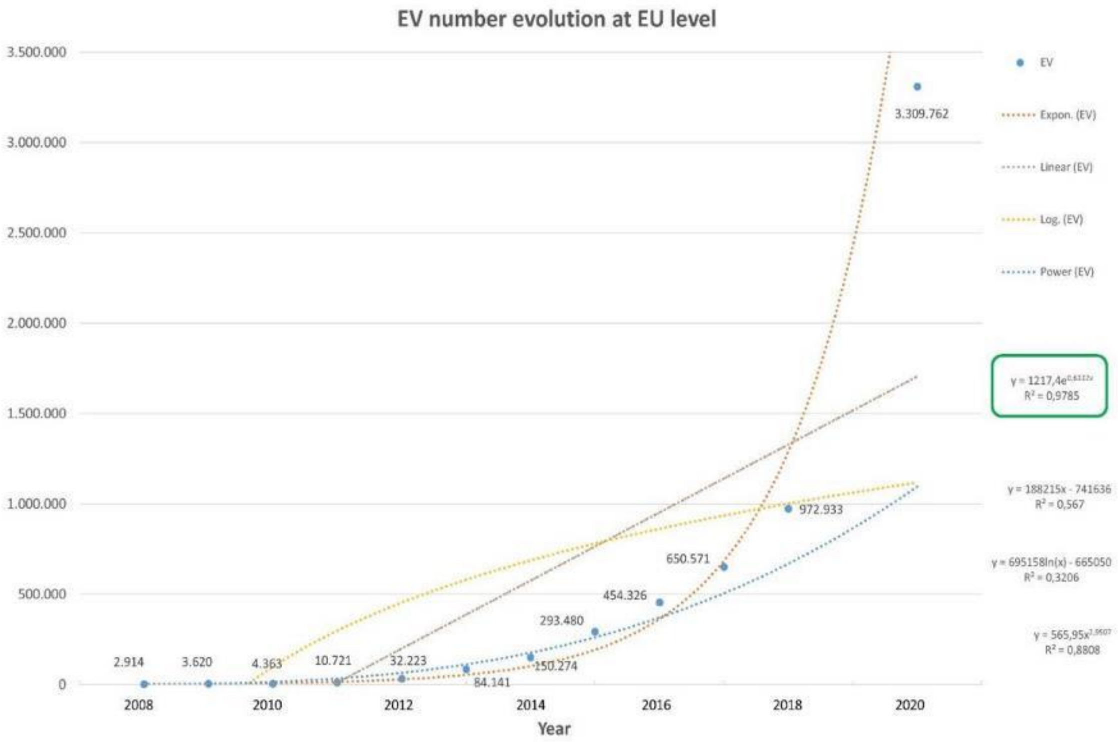


Figure 2.1.3-1 Evolution of EV number at EU level (source of data – EAFO for 2008-2018, NPFs – 2020 estimates)

Considering the highest coefficient of determination R^2 as criterion to establish the best fitting curve, the result is that **best_fit = exponential** (R^2 = 0.9785).

For recharging points, **best_fit = exponential** is also chosen for the following reasons:

- it is assumed that vehicles are the driving force for the uptake of AF transport systems and infrastructure will follow;

- the AFI Directive foresees the electric vehicles and infrastructure having a synchronised development, meaning the same evolution type as it recommends a ratio of 10 between electric vehicles and infrastructure.

2.1.3.1.2 CNG/road example

Using past CNG vehicle data (2008–2018) from EAFO and 2020 CNG vehicle estimates from the NPFs, the results depicted in Figure 2.1.3-2 are obtained at EU level:

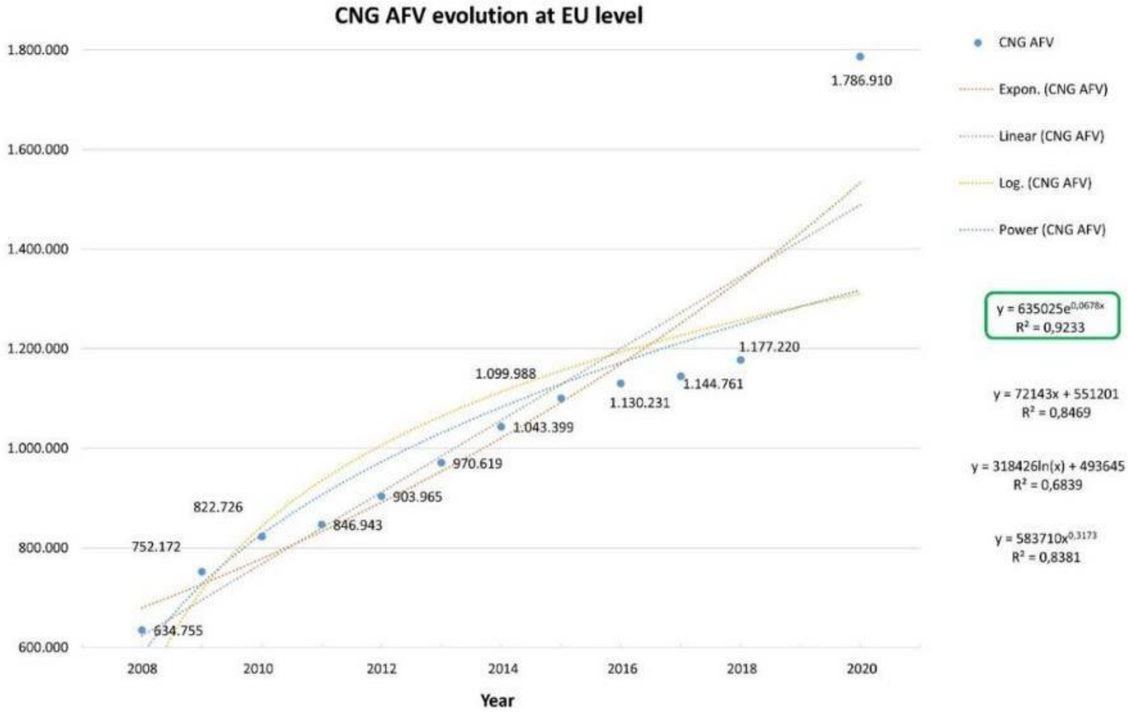


Figure 2.1.3-2 Evolution of CNG vehicle number at EU level (source of data – EAFO for 2008-2018, NPFs – 2020 estimates)

Considering the highest coefficient of determination R^2 as criterion to establish the best fit curve, also in this case the result is that **best_fit = exponential** (R^2 = 0.9233).

Following the same approach adopted for the electric vehicles and recharging infrastructure, **best_fit = exponential** is also chosen for CNG refuelling points.

2.1.3.2 Determination of the areas of slow progress, adequate progress and fast progress

Before characterising the progress of a MS, it is necessary to define the areas of slow progress, adequate progress and fast progress. This is obtained as follows:

- First, a curve of exponential type is applied to the AFV-estimates / AFI-targets values of the MS from 2016 and 2030[7]; this curve is called "best_fit_2016_2030(x)" and constitutes the lower boundary of the area of adequate progress.
- Next, a linear function connecting the AFV-estimates / AFI-targets values for 2016 and 2030[8] is added to the diagram; this straight line is called "lin_2016_2030(x)" and constitutes the upper boundary of the area of adequate progress.
- The area above the linear function is considered as area of fast progress; the area below the exponential curve is considered as area of slow progress (see Figure 2.1.3-3 and Figure 2.1.3-4)

[7] If a MS did not provide a value for 2030, the exponential curve is built using the 2016 and the farthest available value (2020/2025).
[8] If a MS did not provide a value for 2030, the straight line is built using the 2016 and the farthest available value (2020/2025).

2.1.3.3 Characterisation of AFV-estimates / AFI-targets progress at MS level in 2018

To characterise the progress in 2018 of a certain MS, the position of 2018 AFV-estimates / AFI-targets value (called "MS_situation_2018"), as reported by the MS in its implementation report, is considered with respect to the three areas described above.

Thus, it is proposed to classify the 2018 progress of the MSs for AFV-estimates / AFI-targets depending on its position with respect to one of the three areas:

- **fast progress**

  MS_situation_2018 > lin_2016_2030(2018)

- **adequate progress**

  lin_2016_2030(2018) <= MS_situation_2018 <= best_fit_2016_2030(2018)

- **slow progress**

  MS_situation_2018 < best_fit_2016_2030(2018)

In other words, when the 2018 data point of the MS is in between the exponential curve and the straight line, this is considered as an **adequate progress**. If the 2018 data point is below the exponential curve, this is considered as a **slow progress**. If the 2018 data point is above the straight line, this is considered as a **fast progress**. This is further explained in the examples in the following subsection.

2.1.3.3.1 Examples of the methodology application for the evaluation of progress for AFV-estimates / AFI-targets

In this subsection, three detailed examples of the computation of 2018 progress are provided for AFV and AFI, different pairs AF/transport mode and different Member States.

2.1.3.3.1.1 AFV CNG/road

Figure 2.1.3-3 displays the determination of the progress type for the case of CNG vehicles in one MS. The recorded EV value of fleet in 2018 is:

MS_situation_2018 = 578 (in yellow in the figure)

The best_fit is an exponential curve with the formula:

best_fit_2016_2030(x) = $319.66e^{0.1272x}$

which gives: best_fit_2016_2030(2018) = 468 (in black in the figure)

Concerning the straight line connecting the 2016 data point to the 2030 (or latest available) data point, we obtain:

lin_2016_2030(x) = 127.868x + 235.14

which gives: lin_2016_2030(2018) = 619 (in red in the figure)

In this case of CNG/road, **adequate progress** is obtained because

best_fit_2016_2030(2018) <= MS_situation_2018 <= lin_2016_2030(2018)

i.e. 468 <= 578 <= 619 (the 2018 data point is in the blue zone of adequate progress).

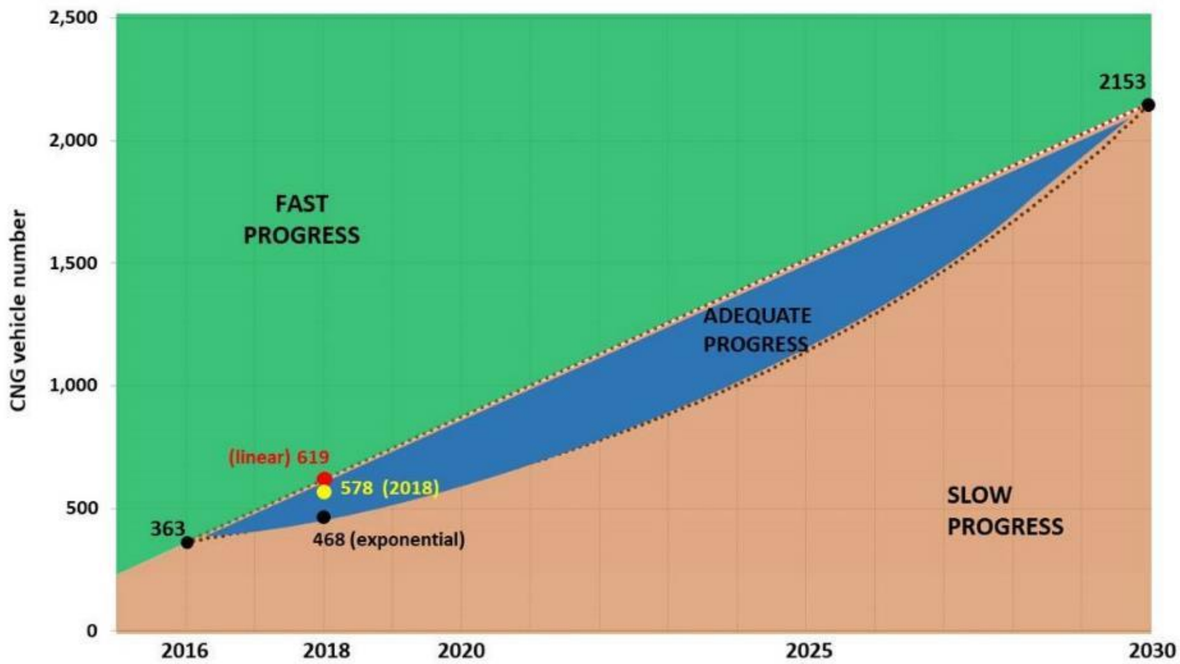


Figure 2.1.3-3 Example of 2018 progress determination for AFV CNG/road 2016 - 2030 evolution in one MS.

2.1.3.3.1.2 AFI electricity/road

Figure 2.1.3-4 displays the determination of the progress type for the case of recharging points in another MS. The recorded value of recharging points in 2018 communicated by this MS is:

MS_situation_2018 = 231 (in yellow in the figure)

The best_fit is an exponential curve with the formula:

best_fit_2016_2030(x) = $14.267e^{0.2324x}$

which gives: best_fit_2016_2030(2018) = 29 (in black in the figure)

Concerning the straight line connecting the 2016 data point to the 2030 (or latest available) data point, we obtain:

lin_2016_2030(x) = 32x - 14

which gives: lin_2016_2030(2018) = 82 (in red in the figure)

In this case, **fast progress** is obtained because

MS_situation_2018 > lin_2016_2030(2018)

i.e. 231 > 82 (the 2018 data point is in the green zone of fast progress).

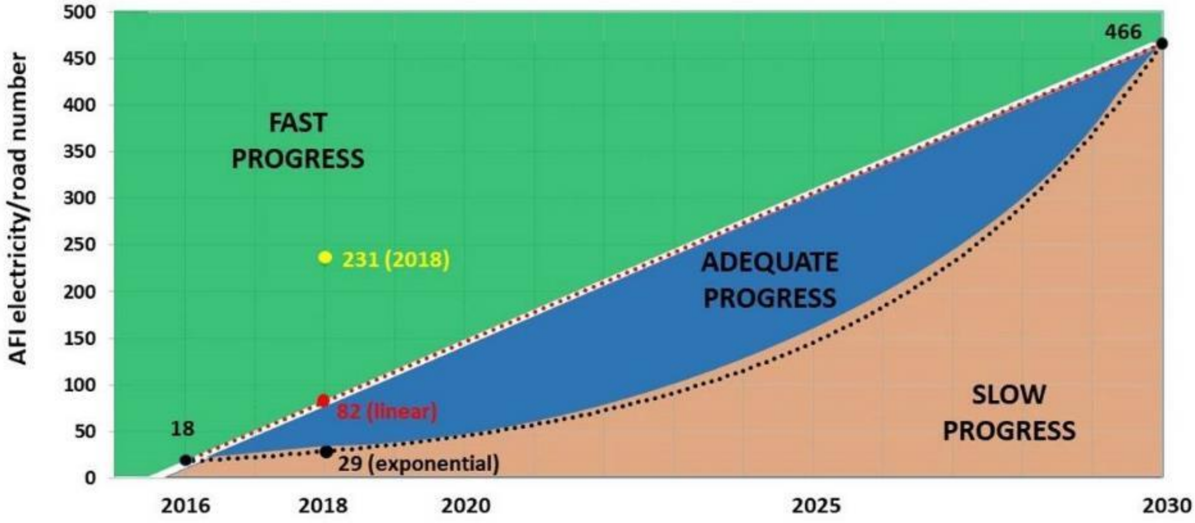


Figure 2.1.3-4 Example of 2018 progress determination for AFI electricity/road 2016 - 2030 evolution in one MS.

2.1.3.3.1.3 AFV LNG/road

As described in subsection 2.1.3 B of the assessment methodology, for all the other pairs than electricity/road and CNG road, the progress is obtained in a different way. In the following example the progress obtained from 2016 until 2018 by a MS for LNG vehicles deployment is 0.79% of the overall planned deployment during the period 2016-2030. The AFV LNG/road estimates used in the calculations are presented below:

Year	2016	2018	2020	2025	2030
LNG AFV existent/estimated value	**0**	15	100	397	1,888

and the Progress result, in this case, is obtained by the formula shown in section 2.1.3 B):

$$\text{progress [\%]} = \frac{\text{NIR value (2018) - NIR value (2016)}}{\text{NIR value (2030) - NIR value (2016)}} *100 = \frac{(15-0)}{(1{,}888-0)} * 100 = 0.79\%$$

2.1.3.4 Characterisation of the AFV-estimates / AFI-targets growth rate of the foreseen evolution at MS level

Having selected the exponential curve as best fit for the electricity and CNG AFV-estimates / AFI-targets values both at MS and at EU level, for each MS a specific exponential curve is obtained, which fits all its provided data as reported in the NIR. In order to characterise mathematically the exponential evolution for AFV-estimates / AFI-targets, a calculation of its growth rate is carried out as explained below.

Since the best fitting curve is an exponential curve, the normal exponential function under its form $\mathbf{f(x) = ae^{kx}}$ (which is employed in situations of continuous growth or decay) is used. If a quantity grows continuously by a fixed percentage (growth rate), the pattern can be depicted by this type of function.

$$f(x) = ab^x = \mathbf{ae^{kx}} = a(1+r)^x$$

where the parameters have the following meanings:
a=initial value
b=base (if b > 1 - exponential growth, if 0 < b < 1 - exponential decrease)
x=exponent (in this case, it is the year)
k=constant of proportionality (if k > 0 - the amount is increasing (growing); if k < 0 - the amount is decreasing (decaying))
r=growth rate, where $r=e^k-1$.

For each MS, the fitted exponential curve will have different parameters (a, k and r).

In order to better understand the influence of the parameters constant of proportionality (k) and growth rate (r), Figure 2.1.3-5 provides a graph containing 10 exponential functions (k=0.1, 0.2…1 and a=1) with corresponding growth rates displayed.

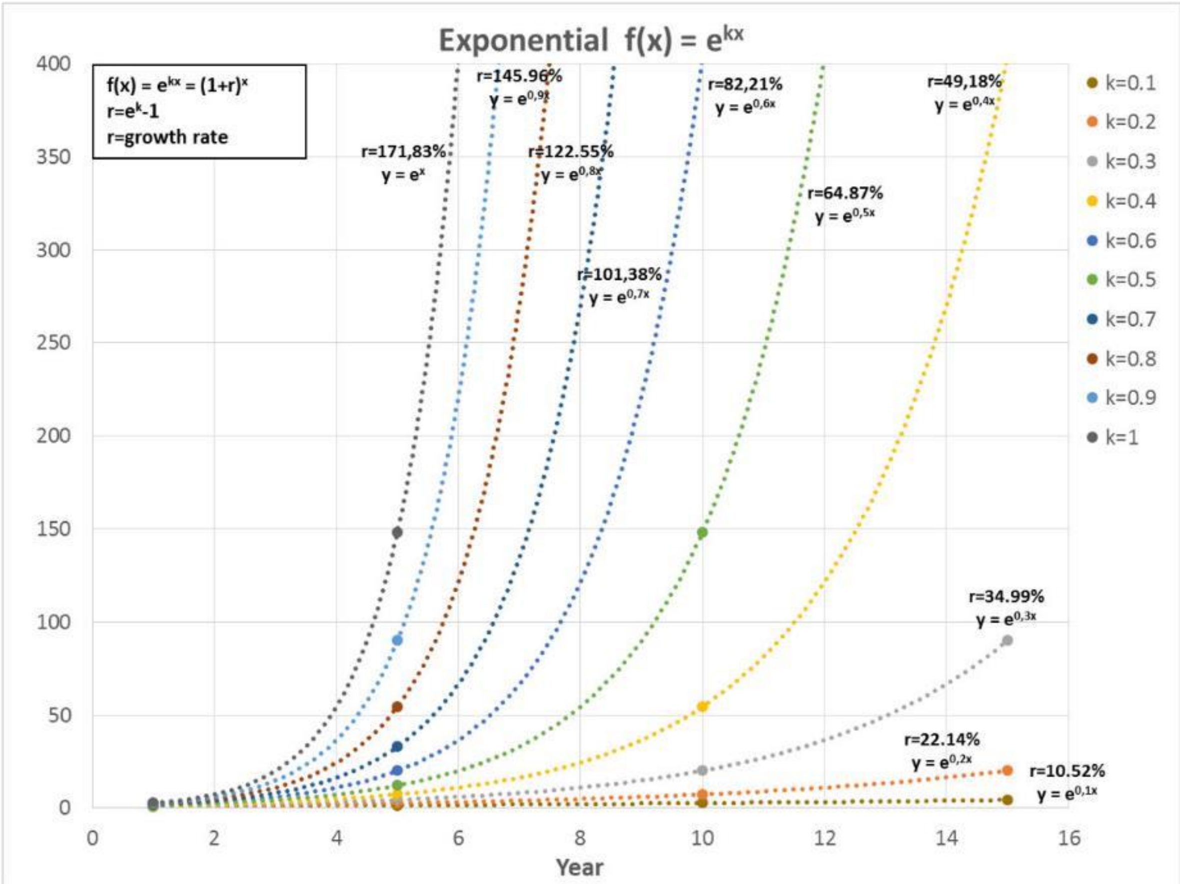


Figure 2.1.3-5 Exponential function $f(x) = ae^{kx}$ graphical representation (k=0.1, 0.2…1 and a=1)

Thus, the characterisation of the AFV-estimates / AFI-targets of the foreseen evolution at MS level can be performed by providing a parameter given by the best fitting exponential function, namely the growth rate (r). This parameter describes how quickly the MS envisioned its development of the corresponding AFV/AFI for the AF/transport mode pair under analysis between 2016 and 2030 by showing the corresponding annual percentage of growth.

2.1.3.4.1 Examples of the methodology application for the evaluation of the annual growth rate for AFV-estimates / AFI-targets

Two examples for the determination of the average annual growth rate from the exponential function fitting the four points corresponding to the foreseen AFV-estimates / AFI-targets evolutions are illustrated in Figure 2.1.3-6 and Figure 2.1.3-7 in the cases of EVs for one MS and of CNG AFI for another MS.

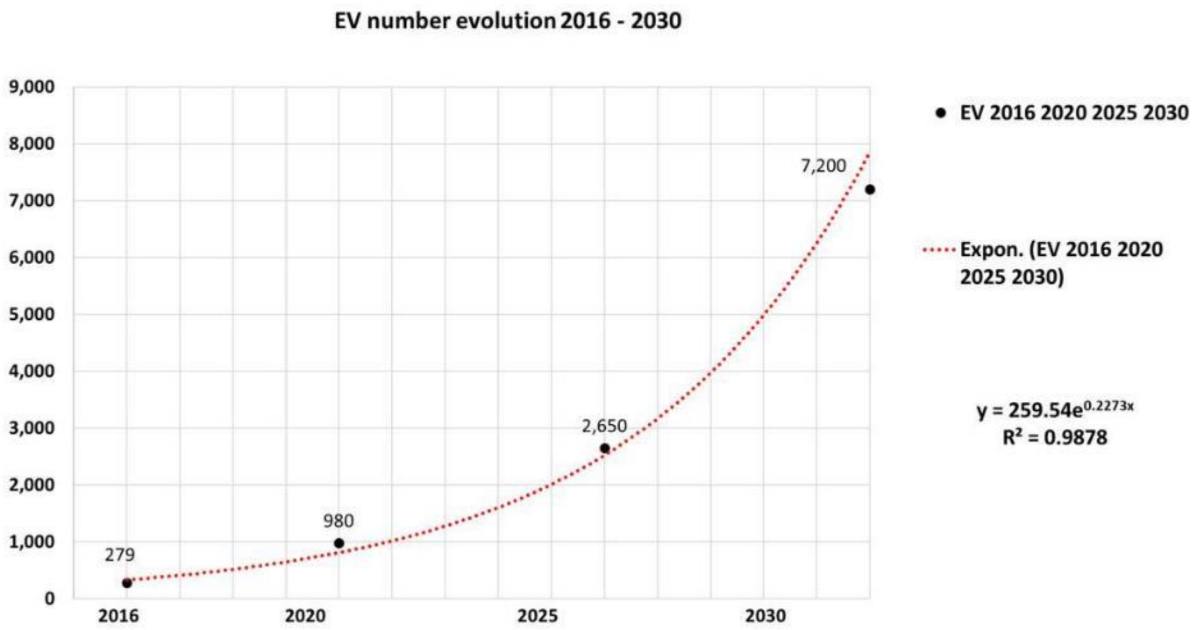


Figure 2.1.3-6 Example of EV number 2016 – 2020 – 2025 – 2030 evolution

In the case of foreseen EV evolution, the exponential function fitting the 2016, 2020, 2025 and 2030 data has a good R^2 and an annual growth rate of 25.52% is obtained.

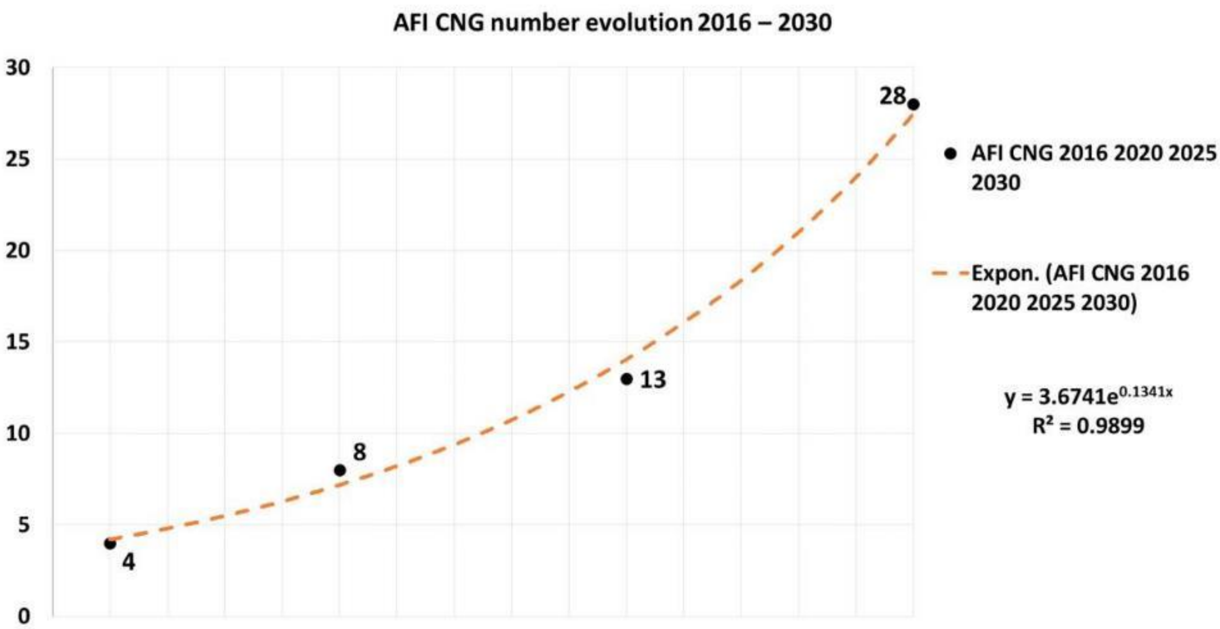


Figure 2.1.3-7 Example of CNG AFI 2016 – 2020 – 2025 – 2030 evolution

In the case of foreseen CNG AFI evolution, the good exponential fitting (R^2 = 0.9899) leads to an annual growth rate of 14.35%.

2.1.4 *Level of AFV-estimates / AFI-targets attainment*

The level of AFV-estimates / AFI-targets attainment can be expressed by the percentage represented by the number of AFI/AFV existent in 2018 over the total number of AFV/AFI foreseen to exist in 2020/2025/2030. The level of attainment corresponding to a certain future year (2020/2025/2030) is calculated according to the formula:

$$\textit{level of attainment [\%]} = \frac{\textit{NIR value (2018)}}{\textit{NIR value (2020/2025/2030)}} * 100$$

As an example, the results for AFV electricity/road for one MS are presented in the table below:

Year	2018	2020	2025	2030
EV existent/estimated value	7,464	59,219	181,263	936,363
Level of attainment (2018 vs 2020/2025/2030)		12.60%	4.12%	0.80%

Because of the significant increase of the EV fleet foreseen by this MS during the period 2016-2030, the corresponding 2018 ***attainment*** of future estimates has reduced values and varies moderately, from 12.60% for 2020 to 0.80% for 2030.

We mention that attainment can be > 100% if the 2018 value is higher than the 2020 one, illustrating a foreseen descending tendency. This is shown in the table below for the CNG AFV evolution in one MS.

Year	2018	2020	2025	2030
CNG AFV existent/estimated value	314	180	125	100
Level of attainment (2018 vs 2020/2025/2030)		174.44%	251.20%	314.00%

2.1.5 *Adequacy between alternative fuels vehicles and infrastructure*

For road transport, where the number of AFV and AFI can be relevant in almost all the MSs, the adequacy between AFV and publicly accessible AFI at MS level is monitored by calculating the sufficiency index that is the ratio between AFV estimates and AFI targets for each of the reference years for which the MSs provided values in their NIR[9]. When an AFV estimate or an

[9] The sufficiency index is also shown when the values of AFV and/or AFI are not available in the NIR but are available either in the NPF or in EAFO.

AFI target is not provided for a certain year, the corresponding ratio cannot be calculated. An example of this is shown in the table below:

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	3.07		4.23	7.60	12.39	11.43

Where applicable, the evolution trend of the sufficiency index will be analysed and considerations will be made on the value of the index. In particular, for the electricity/road pair, an assessment is provided concerning the adequacy of the ratio between the number of vehicles and the number of recharging points. The adequacy assessment is based mainly on the indicative threshold value of 10, as mentioned by the Directive[10], however, the share of high power (>22kW) recharging points in the total number of recharging points is also taken in consideration.

For the CNG/road pair, the adequacy assessment is based on the indicative value of 600 as considered in (European Commission, 2019)[11]. For all the other AFs/road pairs, only the sufficiency index is shown, without any comment.

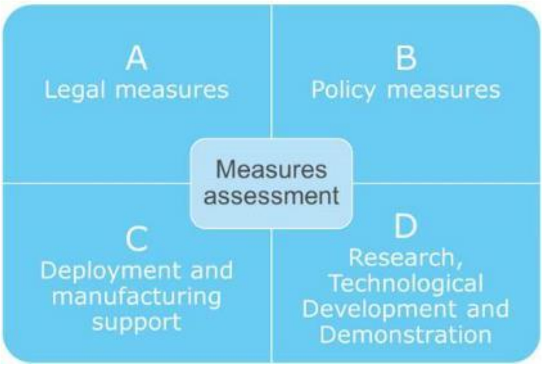
[10] "As an indication, the appropriate average number of recharging points should be equivalent to at least one recharging point per 10 cars".

[11] The average ratio in Member States between conventional vehicles and gasoline/diesel refuelling points is 600 to one (one fuel station typically has several refuelling points).

2.2 Measure assessment method

A key aspect of the Directive is that the Member States are asked to plan and adopt measures to support the achievement of the alternative fuels infrastructure and transport system targets and objectives of their NPF. The Annex I of the Directive mentions that the implementation report of the NPF of each MS required by Article 10(1) of the Directive "*shall include at least the following elements:*

1. *Legal measures [...]*
2. *Policy measures supporting the implementation of the national policy framework [...]*
3. *Deployment and manufacturing support [...]*
4. *Research, technological development and demonstration (RTD&D) [...]"*



2.2.1 ***Overview of measure assessment activities***

The flowchart in Figure 2.2.1-1 delivers an overview of the assessment performed for the measures present in the NIR by presenting the main activities (rectangles) that are performed and their different inputs and outputs (parallelograms). In the following sections, the methodology employed to perform the listed activities on the four types of measures included in the NIR is presented.

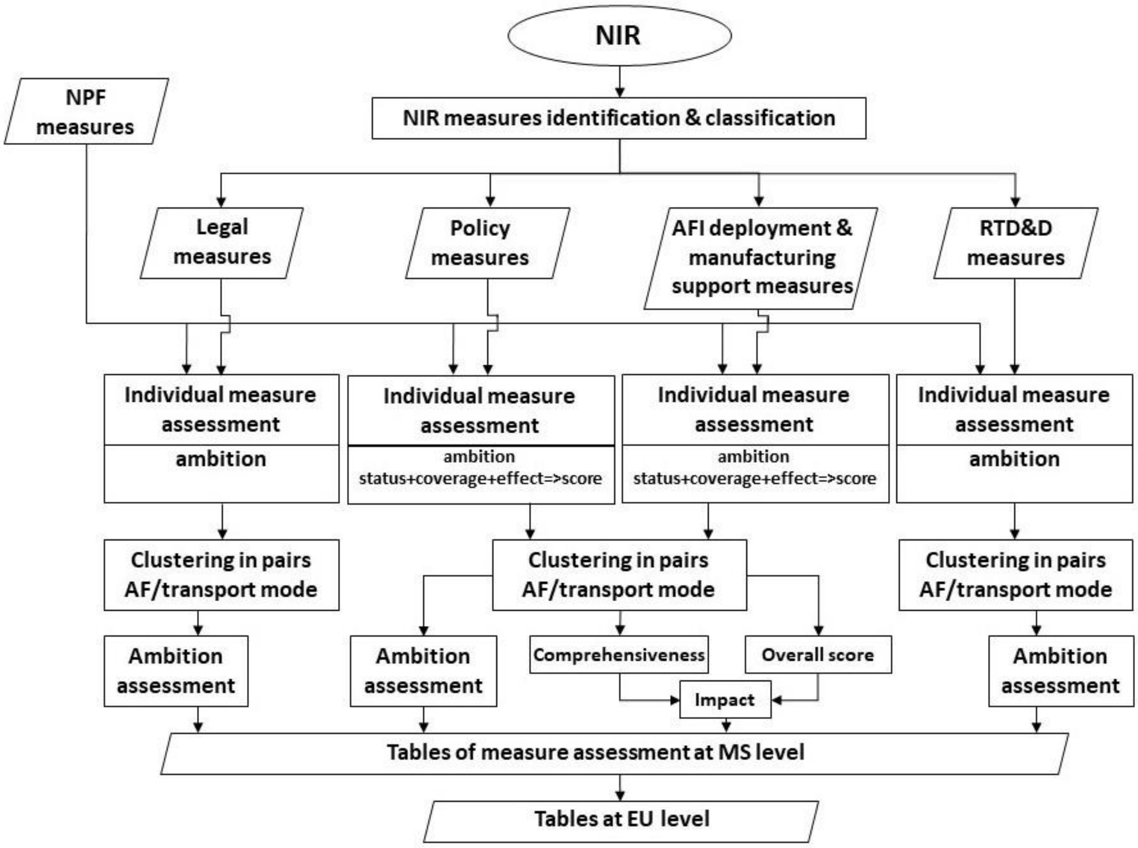


Figure 2.2.1-1 Overview of the NIR measures assessment

The first step of the measure assessment is the identification and classification of the measures as presented by the MSs in their NIRs. In doing so, it can happen that a measure placed by a MS in a category (ex. Legal measures) is moved to another category (ex. Deployment & Manufacturing) because it fits better with the classification presented in the support guidance (European Commission, 2018) and the assessment methodology. However, all the NIR measures, either confirmed or moved, are analysed and assessed.

2.2.2 *Legal measures*

According to the support guidance (European Commission, 2018) concerning the NIR content, it is possible to classify the legal measures in two categories which are disaggregated by type[12] as it can be observed in Figure 2.2.2-1.

Therefore, the legal measures provided by a MS in their NIR are identified and classified using these proposed categories.

[12] The proposed categorisation of legal measures is an adaptation of the "Better regulation toolbox" (European Commission, n.d.)

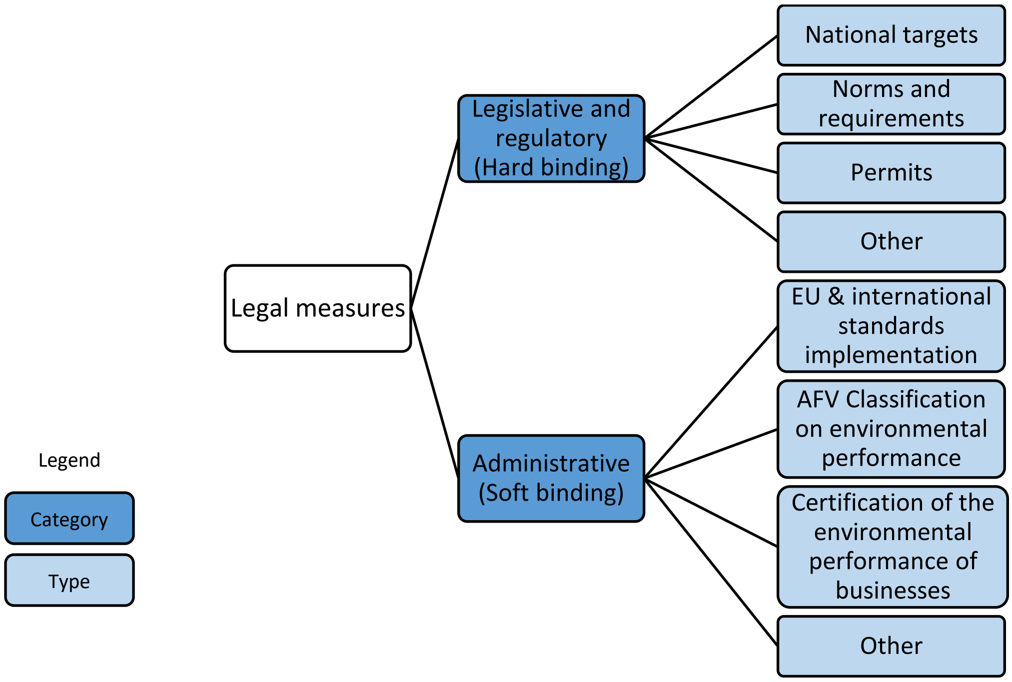


Figure 2.2.2-1 Types of legal measures

2.2.3 ***Policy measures***

The policy measures are supporting the implementation of the national policy framework. The proposed categorisation[13] of policy measures derives from Article 3(1) and Article 4(3) of the Directive. Three categories are available for policy measures:

- Measures to ensure that the national targets and estimates are reached (Art. 3 (1) 3rd indent)
- Measures that can promote AFI deployment in public transport services (Art. 3 (1) 4th indent)
- Measures to encourage and facilitate the deployment of recharging points not accessible to the public (Art. 4 (3))

According to the support guidance (European Commission, 2018) concerning the NIR content, it is possible to classify the policy measures in these three categories which are further disaggregated by type and indicator as it can be observed in Figure 2.2.3-1. Therefore, the policy measures provided by MSs in their NIRs are identified and classified using these proposed parameters.

[13] This categorisation of policy measures was used in (European Commission, 2017) and (European Commission, 2019).

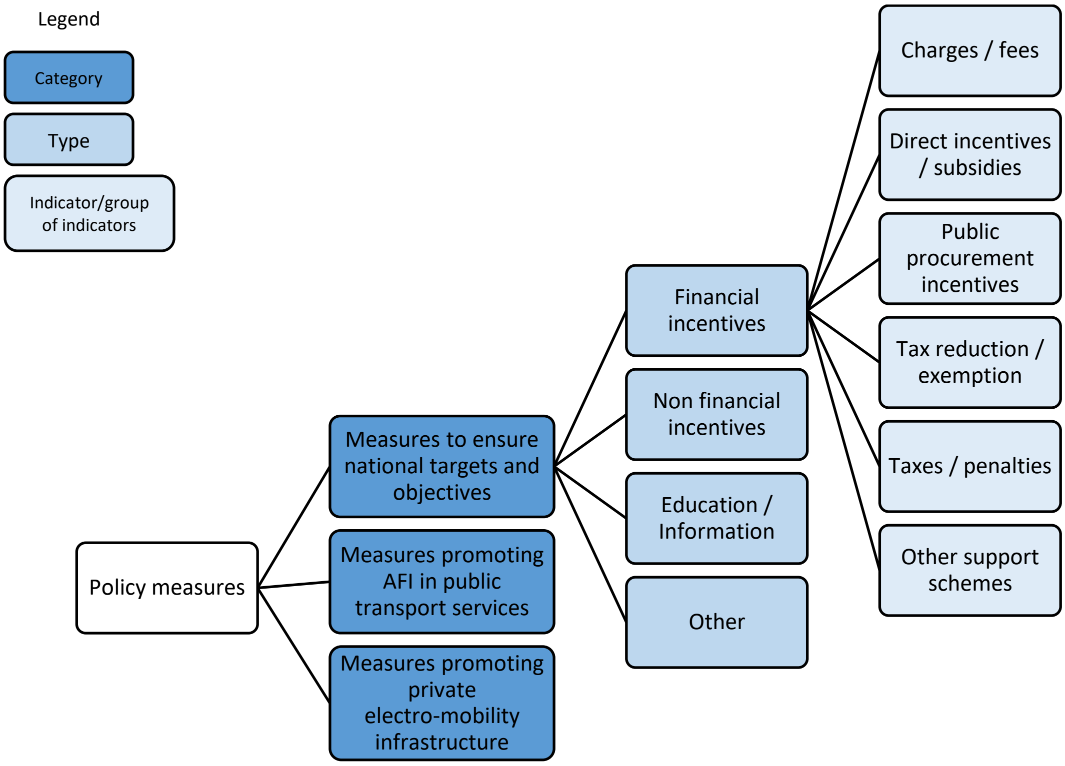


Figure 2.2.3-1 Types of policy measures

2.2.4 *Deployment and manufacturing support measures*

According to the support guidance (European Commission, 2018) concerning the NIR content prepared for the MSs, it is possible to classify the deployment and manufacturing support in two categories: a) AFI deployment and b) support of manufacturing plants for alternative fuels technologies. Manufacturing plants for AF technologies include both production sites and research facilities for any of the key components of AF technologies such as connectors of charging systems, batteries, fuel cell systems or hydrogen storage tanks.

Therefore, the deployment and manufacturing support measures provided by MSs in their NIRs are identified and classified using these proposed categories.

2.2.5 *Research, technological development and demonstration (RTD&D) activities*

Annex I of the Directive requires the reporting of "annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode".

The activities of research, technological development and demonstration (RTD&D) are identified and classified according to the alternative fuel, transport mode and to the application field (AF, AFI, AFV or combination).

2.2.6 *Assessment methodology at individual measure level*

Once the identification and classification of all the measures contained in the NIR is concluded, the assessment continues with the analysis of all the measures, one by one. The methodology employed to assess each individual measure involves several activities that are described in detail in the following subsections. Some assessment activities are common to all four types of measures while others are dedicated only to some types of measures.

2.2.6.1 NIR and NPF measure correspondence identification

An assessment activity that is common to all four types of measures in the NIR is represented by the verification of the existence in the NPF of a similar measure. In a positive case, a comparative analysis of the two measures from the NIR and NPF is performed to determine if their descriptions coincide or contain differences. This activity has four possible results:

- the measure appears only in the NIR
- the measure appeared only in the NPF
- the measure appears in both NIR and NPF with the same characteristics
- the measure appears in both NIR and NPF with different characteristics

2.2.6.2 Adoption status determination

The adoption status determination of a measure represents another common activity to all four types of measures. This parameter can be assigned to one of the following five categories:

- Existed [2016-2018]
- Existing [2019]
- Adopted (but not yet in effect)
- In process of adoption
- Under consideration

2.2.6.3 Ambition level determination

Another common activity to all four types of measures regards the determination of the level of ambition of each measure in the NIR compared to the NPF. The level of ambition is a parameter that describes qualitatively the characteristics of the measure in the NIR compared to NPF from the perspective of the influence to reaching the MS alternative fuels related targets and objectives. The determination of this parameter takes into account whether there is a new measure in the NIR that was not in the NPF, or the opposite, or any change in the measure's characteristics (e.g. the degree of coverage, the duration of application, the amount of a subsidy/tax, the funding level, etc.). For each measure, the comparative analysis of its ambition in the NIR versus NPF can have three types of results expressed by the following symbols:

- "+" describes an increased level of ambition in the NIR vs NPF
- "=" describes a similar level of ambition in the NIR and NPF
- "-" describes a decreased level of ambition in the NIR vs NPF

In general, the level of ambition is assessed to be decreasing when a measure appeared only in the NPF and to be increasing when a new measure appears only in the NIR.

2.2.6.4 Type of funding determination

When the assessment involves research, technological development and demonstration (RTD&D) measures, the determination of the funding available is carried out.

The options for this parameter include the following nature of funding categories:

- national
- EU
- international
- co-funding
- other

2.2.6.5 Measure score determination

As explained earlier, the four groups of measures are not assessed in the same way. Legal measures and RTD&D measures are analysed and described qualitatively. In addition, the three characterisations presented in paragraphs 2.2.6.1, 2.2.6.2 and 2.2.6.3 are carried out and, where possible, some considerations on the ambition level are provided.

For the individual measures belonging to the Policy and AFI Deployment & Manufacturing support categories, the assessment methodology includes more steps and the introduction of a scoring for some parameters (similarly to the NPF assessment [EC17]). This is explained below.

Status

For Policy and AFI Deployment & Manufacturing support measures the status is characterised as in paragraph 2.2.5.2, but depending on the status level identified a score is assigned:

- Low (L): if the measure is under consideration,
- Medium (M): if the measure is adopted or in process of adoption,
- High (H): if the measure existed [2016-2018] or is existing in 2019.

Scope

The scope of a measure is evaluated against two dimensions, coverage and effect, as summarised in Table 2.2.6-1.

Table 2.2.6-1 Criteria for determining the scope of a measure

	Alternative Fuels Infrastructure	**Alternative Fuels Vehicles**
Coverage	Number of eligible recharging/refuelling points versus the total AFI target foreseen in the period of the application of the measure	Number/share of eligible vehicles versus the total AFV estimate foreseen in the period of the application of the measure
Effect (Financial Measures)	Investment Cost Difference versus no-measure case	Purchase Price Difference or Total Cost of Ownership (TCO) versus no-measure case
Effect (Non-financial Measures)	Qualitative	Qualitative

Coverage

Coverage is an indicator of the number or share of vehicles or refuelling/recharging points eligible to benefit from the measure**.** For coverage, the assessment is performed based on the ratio between the maximum number of vehicles or refuelling/recharging points that can benefit from the measure versus the total number of vehicles or AFI points that are foreseen by the Member States' NIR AFV estimates or AFI targets during the period when the measure is applied. Depending on this ratio of vehicles or refuelling/recharging points in scope for a measure, three categories for coverage have been defined as follows:

- Low (L): share covered by the measure is < 10%,
- Medium (M): share covered by the measure is in between 10% and 50%,
- High (H): share covered by the measure is > 50%.

Effect

Effect is an indicator of how much a measure could influence the purchase or investment decision for a given alternative fuels vehicle or refuelling/recharging point. Effect is calculated in quantitative terms for financial measures only and is assessed qualitatively for non-financial measures. In the case of financial measures, two different calculations are made for AF vehicles and for recharging/refuelling infrastructure. For AF vehicles, the effect level is assessed by calculating the amount covered by the measure with respect to the price difference (or TCO difference, depending on the availability of data) between conventional and AF vehicles. In the second case, the effect level is assessed by calculating the amount of the investment cost of each single recharging/refuelling point covered by the measure.

The likely effect on deployment or development decisions by market actors has been classified in three categories depending on the amount covered by the measure:

- Low (L): amount covered by the measure is < 10%,
- Medium (M): amount covered by the measure is in between 10% and 50%,
- High (H): amount covered by the measure is > 50%.

Overall Score of a single measure

For each measure where a score could be assigned to status, coverage and effect, its overall score is assessed based on these three evaluations, as shown in Table 2.2.6-2. Following the precautionary principle, the overall measure score is determined by the lowest evaluation the measure has received regarding its three attributes of status, coverage and effect. For example, if the measure has a high (H) coverage and effect but is only under consideration (thus low (L) adoption status), the overall measure assessment score will be low (L) because it cannot be guaranteed that it will ever come into effect. Likewise, if its status is H (measure in effect) but the measure covers only few infrastructure items or has a low effect, its overall assessment score will also be low. The overall measure assessment score will be H only if all three attributes are evaluated as high.

Table 2.2.6-2 Assessment of Overall Measure Score

Measure	**Status**	**Scope**		**Overall Measure Score**
		Coverage	**Effect**	

Measure x	H	H	H	H
Measure x	M	H or M	H or M	M
Measure x	H or M	M	H or M	M
Measure x	H or M	H or M	M	M
Measure x	L	any	any	L
Measure x	any	L	any	L
Measure x	any	any	L	L

2.2.7 *Assessment methodology at alternative fuel / transport mode pairs level*

The assessment of the policy measures and AFI deployment and manufacturing support measures includes also an analysis of whether these existing or planned support actions or measures seem sufficient and are coherent with the vehicle estimates and infrastructure targets.

These measures, defined by a Member State in its NIR, are assessed individually in terms of their adoption status, coverage and effect and they receive a score (as described in subsection 2.2.6.5).

For a given fuel/transport mode pair, all the relevant measures are clustered and the resulting cluster receives an overall assessment regarding its score, comprehensiveness, and on its impact to support the uptake of the AFV-estimates / AFI-targets as presented in the NPF and revised in the NIR. The cluster's impact can be low, medium or high based on the score and comprehensiveness, as explained below.

2.2.7.1 Cluster's score

For each cluster, the general rule is that the maximum score from all individual measure scores is taken as the cluster score. Consequently, if a Member State has defined for a given fuel/transport mode cluster at least one measure with a high adoption status, high coverage, and high effect, the total score for the cluster would also be high.

2.2.7.2 Comprehensiveness

Comprehensiveness indicates to which extent the totality of measures for a given fuel and transport mode addresses various deployment barriers. It will take into account whether both infrastructure and vehicles are addressed or just one of them, what part of the vehicle population is addressed (e.g. for vehicles, whether private cars, company cars, light commercial vehicles or several groups are subject to measures), and if financial as well as nonfinancial incentives are provided within a cluster. The score for comprehensiveness is binary: comprehensive/not comprehensive. The comprehensiveness assessment is independent of the measure score.

2.2.7.3 Impact

Once the cluster's score and comprehensiveness have been assigned, the expected impact to support the uptake of the AFV-estimates / AFI-targets as presented in the NPF and revised in the NIR is calculated. If the cluster of measures for a given pair has a high score and is comprehensive, then the impact is considered high. In all other cases, the impact is considered either medium or low, as shown in Table 2.2.7-1.

Table 2.2.7-1 Assessment of the impact of the measures from an AF/transport mode pair

	Score	**Comprehensiveness**	**Impact**
AF/TM 1	H	C	**H**
AF/TM 2	M	C	**M**
AF/TM 3	H	N	
AF/TM 4	M	N	**L**
AF/TM 5	L	C	
AF/TM 6	L	N	

Legend: Score and Impact: H = high; M = medium; L = low. Comprehensiveness: C = comprehensive; N = not comprehensive.

For example, it is possible that a Member State defines a very comprehensive package of measures for a certain pair alternative fuel/transport mode, but this cluster has a low total score. In this case the resulting impact of the measures for this pair is assessed as low.

3 OVERVIEW OF THE MAIN RESULTS OF THE ASSESSMENT OF ALL NIRS

This section presents an overview of the outcome of the assessment of the 28 NIRs. When considering all these results together, it is necessary to keep in mind two important points. First, the amount and quality of data and information provided by the Member States for each alternative fuel/transport mode combination differ quite considerably. Second, for a given combination of alternative fuel/transport mode, there can be important differences among NIRs in terms of details and type of data (for example recharging/refuelling points versus recharging/refuelling stations). Therefore, although the results of the NIR assessments are shown here all together for the 28 MSs, they should not be read and interpreted on a comparative basis, but more by single MS. The opposite could lead to wrong conclusions.

For the most complete alternative fuel/transport mode pairs (i.e. electricity/road and CNG/road) there are tables showing the results by AFV and AFI. In particular, for AFV:

- ✓ Changes between NIR and NPF for 2020, 2025 and 2030;
- ✓ Level of Attainment in 2018 with respect to the vehicle estimates for the years 2020, 2025 and 2030;
- ✓ Progress in 2018;
- ✓ Average annual growth rate (2016-2030);
- ✓ AFVs shares in 2018, 2020, 2025 and 2030.

For AFI:

- ✓ Changes between NIR and NPF for 2020, 2025 and 2030;
- ✓ Level of Attainment in 2018 with respect to the infrastructure targets for the years 2020, 2025 and 2030;
- ✓ Progress in 2018;
- ✓ Average annual growth rate (2016-2030);
- ✓ Ratio between AFV and AFI (i.e. sufficiency index).

After that, there is a table showing the summary of the measure assessments, i.e.:

- ✓ Change of ambition between NIR and NPF for the Legal measures;
- ✓ For the Policy and Deployment & Manufacturing support measures:
    - o Overall score of the clusters of measures
    - o Comprehensiveness
    - o Impact
    - o Change of ambition between NIR and NPF
- ✓ Change of ambition between NIR and NPF for the RTD&D measures.

For the other combinations of alternative fuel/transport mode, only some of the above results could be computed and are shown.

3.1 Road transport

3.1.1 *Electricity (alternative fuels vehicles and infrastructure)*

Table 3.1.1-1 gives an overview of the results for electric vehicles in each country. When a cell is empty in the columns under Changes, it means that the NPF had not provided any estimate for that year. However, if the cell is highlighted in yellow, it indicates that the NIR has provided an estimate (but the Change could not be calculated). Overall, a good coverage in terms of assessable information can be seen for the large majority of the NIRs. Only for two of the assessed NIRs, due to the limited information provided, it was possible to compute only one parameter.

Table 3.1.1-1 Overview of electricity / road AFV

Electric Vehicles, EV (excl.PTW)	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	ANNUAL GROWTH RATE	AFV SHARE (excl PTWs)			
	%	%	%	%				%	%			
MEMBER STATES	2020	2025	2030	2020	2025	2030		2016 - 2030	2018	2020	2025	2030
BE	-3.43%			52.11%	12.13%	3.01%	adequate	37%	0.64%	1.18%	4.87%	18.81%
BG	-78.20%	-63.50%	-49.08%	92.20%	27.53%	10.63%	adequate	23%	0.22%	0.22%	0.72%	1.80%
CZ	-41.90%	-23.93%	-13.13%	32.08%	4.12%	1.46%	adequate	44%	0.05%	0.22%	1.58%	4.09%
DK	16.50%	67.33%		45.18%	14.68%	4.86%	slow	27%	0.53%	1.05%	3.12%	8.97%
DE	0.00%			16.46%		1.94%	adequate	43%	0.33%	1.99%		17.17%
EE									0.16%			
IE	136.83%	-30.97%	13.71%	12.60%	4.12%	0.80%	adequate	50%	0.29%	2.46%	6.63%	30.19%
EL	0.00%	0.00%	0.00%	9.86%	4.31%	2.30%	adequate	35%	0.01%	0.05%	0.12%	0.24%
ES	59.57%		92.31%	21.67%	4.06%	0.65%	adequate	53%	0.11%	0.49%	2.48%	15.56%
FR	-35.78%			32.48%	8.23%	2.89%	adequate	34%	0.52%	1.32%	5.13%	14.03%
HR									0.04%			
IT	0.00%			29.90%		0.44%	slow	56%	0.06%	0.20%		13.30%
CY	-29.00%			39.44%	20.00%	4.00%	slow	27%	0.00%	0.01%	0.02%	0.11%
LV	31.19%			56.02%	20.72%	7.63%	adequate	26%	0.07%	0.12%	0.32%	0.81%
LT	150.92%			51.68%	3.02%	0.63%	adequate	61%	0.10%	0.15%	2.73%	14.80%
LU	-73.84%	130.23%	322.08%	32.23%	3.33%	1.66%	adequate	46%	0.73%	2.17%	19.22%	34.36%
HU	9.72%	137.38%	114.29%	39.72%	4.77%	2.37%	adequate	47%	0.22%	0.59%	4.66%	8.59%
MT				42.85%	7.50%	1.95%	adequate	43%	0.27%	0.69%	3.90%	14.56%
NL	12.73%			92.80%	19.76%	10.08%	adequate	41%	1.53%	1.57%	7.31%	13.96%
AT	-24.88%		-26.97%	32.13%	7.12%	3.00%	adequate	35%	0.53%	1.77%	7.46%	16.15%
PL	0.00%	0.00%		4.34%	0.32%	0.18%	adequate	69%	0.01%	0.30%	3.62%	6.86%
PT	322.91%	516.22%	1020.20%	34.95%	7.46%	2.31%	adequate	45%	0.31%	0.96%	4.56%	14.32%
RO				85.73%	57.15%	42.87%	fast	13%	0.24%	0.32%	0.44%	0.56%
SI	0.00%	0.00%	0.00%	16.19%	2.72%	0.89%	adequate	50%	0.15%	1.02%	5.85%	17.53%
SK	0.00%	-0.25%	-0.29%	16.91%	8.48%	4.85%	adequate	31%	0.06%	0.49%	0.91%	1.42%
FI		51.64%	45.55%		9.83%	4.13%	adequate	41%	0.38%		4.17%	9.96%
SE	-10.95%			48.33%	18.54%	10.67%	adequate	24%	1.24%	2.44%	5.82%	9.96%
UK	0.00%			46.37%	33.34%	20.62%	adequate	16%	0.53%	0.99%	1.37%	2.12%

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFV estimate provided only in the NIR

Table 3.1.1-2 gives an overview of the results for publicly accessible recharging points[14] in each country. Due to the limited information provided, for one of the assessed NIRs it was possible to compute only one parameter.

Table 3.1.1-2 Overview of electricity / road AFI

Recharging points (publicly accessible)	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	ANNUAL GROWTH RATE	RATIO AFV vs AFI			
	%	%	%	%				%				
MEMBER STATES	2020	2025	2030	2020	2025	2030		2016 - 2030	2018	2020	2025	2030
BE	-12.30%			48.36%	9.97%	3.74%	adequate	41%	12.35	11.46	10.15	15.30
BG	-88.00%	-66.67%	-44.44%	48.33%	7.25%	2.90%	adequate	43%	48.51	25.43	12.78	13.24
CZ	0.00%			57.62%	12.08%	3.94%	slow	31%	4.23	7.60	12.39	11.43
DK	80.63%			67.32%	37.04%	12.39%	adequate	21%	4.42	6.58	11.15	11.27
DE	0.00%			40.10%		1.72%	adequate	42%	9.54	23.26		8.50
EE									3.64			
IE	0.00%	0.00%	-4.00%	84.84%	73.27%	67.17%	slow	3%	9.26	62.34	164.79	780.30
EL	0.00%	0.00%	0.00%	6.57%	1.15%	0.46%	slow	49%	7.50	5.00	2.00	1.50
ES				51.87%	30.51%		slow	16%	6.27	15.00	47.06	
FR	0.00%			70.86%	24.80%		adequate	23%	8.07	17.61		
HR	73.99%			61.17%			fast	54%	2.51			
IT	7.61%			25.02%		2.93%	slow	31%	7.62	6.38		51.28
CY	-58.00%	-19.00%	0.00%	85.71%	44.44%	36.00%	slow	9%	0.78	1.69	1.73	7.00
LV	152.67%			60.95%	49.57%	49.57%	fast	23%	2.38	2.59	5.69	15.45
LT	198.00%	210.00%		71.14%	68.39%	1.41%	adequate	66%	7.34	10.10	166.24	16.51
LU	-7.00%	163.00%	375.58%	51.44%	16.30%	8.15%	adequate	31%	4.01	6.40	19.63	19.63
HU	-33.33%	80.25%	93.37%	44.73%	4.60%	1.92%	adequate	45%	13.77	15.51	13.27	11.14
MT	-38.64%			28.18%			slow	37%	9.08	5.97		
NL	180.21%			77.95%			fast	17%	3.76	3.16		
AT	-14.63%			119.37%			fast	10%	6.90	25.65		
PL	-6.69%			12.02%			slow	111%	4.34	12.02		
PT	-8.10%			57.27%	8.40%	3.50%	slow	39%	16.42	26.91	18.49	24.89
RO	0.00%		0.00%	114.73%		92.54%	fast	6%	4.32			
SI	0.00%	0.00%	0.00%	27.33%	4.69%	1.47%	slow	39%	5.80	9.79	10.00	9.55
SK	0.00%	0.00%		31.60%	15.80%	7.90%	adequate	24%	7.14	13.33	13.30	11.63
FI	0.00%		0.00%	119.95%		9.60%	adequate	29%	6.59			15.31
SE	0.00%			74.44%			fast	36%	10.26	15.80		
UK	0.00%			80.85%	5.89%	1.93%	adequate	42%	18.60	32.43	3.29	1.74

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFI target provided only in the NIR

[14] The meaning of publicly accessible recharging point, as reported in the NIR, may differ by country.

3.1.2 *CNG (alternative fuels vehicles and infrastructure)*

Table 3.1.2-1 gives an overview of the results for CNG vehicles in each country. Due to the limited information provided, for ten of the assessed NIRs it was possible to compute only one parameter.

Table 3.1.2-1 Overview of CNG / road AFV

CNG Vehicles (excl. PTW)	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	ANNUAL GROWTH RATE	AFV SHARE (excl PTWs)			
	%	%	%	%				%	%			
MEMBER STATES	2020	2025	2030	2020	2025	2030			2018	2020	2025	2030
BE	8.75%			25.31%	7.72%	1.82%	adequate	41%	0.17%	0.65%	2.06%	8.38%
BG									0.68%			
CZ	-48.66%	-71.57%	-76.83%	86.13%	59.81%	47.71%	fast	8%	0.34%	0.56%	0.76%	0.87%
DK				67.05%	37.98%	26.85%	adequate	13%	0.02%	0.03%	0.04%	0.06%
DE									0.15%			
EE									0.12%			
IE									0.00%			
EL	-80.96%	-85.57%	-83.50%	54.71%	27.84%	12.17%	adequate	19%	0.03%	0.04%	0.08%	0.18%
ES	33.72%			53.88%	12.39%	6.20%	adequate	31%	0.04%	0.07%	0.31%	0.62%
FR				131.95%	15.65%	7.37%	slow	26%	0.04%	0.02%	0.21%	0.42%
HR									0.02%			
IT	0.00%	0.00%		77.88%	51.28%		slow	8%	2.42%	3.06%	4.62%	
CY									0.00%			
LV									0.02%			
LT				71.68%	27.00%	3.29%	slow	28%	0.03%	0.03%	0.08%	0.73%
LU	-10.00%	25.00%	0.00%	174.44%	251.20%	314.00%			0.07%	0.04%	0.02%	0.02%
HU	-82.50%	-92.94%	-87.76%	46.19%	21.41%	8.08%	slow	21%	0.08%	0.18%	0.36%	0.88%
MT									0.00%	0.00%	0.08%	0.29%
NL									0.08%			
AT									0.14%			
PL	0.00%	0.00%		88.51%	15.66%	13.95%	adequate	30%	0.03%	0.04%	0.19%	0.22%
PT	63.17%			42.14%	25.65%	19.03%	adequate	15%	0.01%	0.02%	0.04%	0.05%
RO				72.66%	48.44%	36.33%	fast	12%	0.00%	0.01%	0.01%	0.01%
SI	3.48%	3.65%	4.09%	15.41%	7.08%	4.89%	slow	25%	0.04%	0.26%	0.55%	0.79%
SK	-10.00%	-4.67%	-20.00%	54.53%	17.16%	10.23%	slow	20%	0.08%	0.22%	0.65%	0.98%
FI		49.04%	-0.40%		24.89%	11.95%	adequate	26%	0.15%		0.66%	1.37%
SE	-10.16%	15.12%		100.26%	78.25%	55.22%	slow	4%	0.77%	0.73%	0.85%	1.19%
UK									0.01%			

Legend for changes		
		change < -15%
		-15% <= change < = 15%
		change > 15%
		AFV estimate provided only in the NIR

Table 3.1.2-2 gives an overview of the results for publicly accessible CNG refuelling points[15] in each country. Due to the limited information provided, for six of the assessed NIRs it was possible to compute just two parameters or less.

Table 3.1.2-2 Overview of CNG / road AFI

CNG refuelling points (public)	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	ANNUAL GROWTH RATE	RATIO AFV vs AFI			
	%	%	%	%				%				
MEMBER STATES	2020	2025	2030	2020	2025	2030		2016 - 2030	2018	2020	2025	2030
BE						21.25%	adequate	18%	93.02			1,086.67
BG									213.95			
CZ	-7.00%	0.00%	76.47%	99.46%	61.67%	30.83%	adequate	12%	119.51	138.01	123.22	77.23
DK	-15.00%			100.00%	100.00%	100.00%	fast	1%	34.00	50.71	89.53	126.65
DE									90.78			
EE	18.75%			52.63%	52.63%	52.63%	fast	7%	101.40			
IE	-92.31%	-14.81%	-14.29%	100.00%	4.35%	2.38%	adequate		8.00			
EL	0.00%	0.00%	0.00%	59.09%	37.14%	23.64%	slow	12%	108.15	116.82	144.29	210.00
ES	97.37%			40.00%	30.00%		adequate	21%	206.55	153.33	500.00	
FR	0.00%	4.31%		77.22%	50.41%	21.40%	adequate	14%				
HR	-76.92%			66.67%				11%	169.00			
IT	0.00%	0.00%		89.70%	69.20%	50.46%	slow	6%	868.14	1,000.00	1,171.43	
CY							slow					
LV	-60.00%						slow					
LT	-20.00%	30.00%		50.00%	30.77%	14.29%	slow	14%	101.25	70.63	115.38	439.29
LU	100.00%	0.00%		100.00%	200.00%	200.00%			157.00	90.00	125.00	100.00
HU	-81.11%	-82.99%	-76.94%	111.00%	52.72%	19.71%	adequate	15%	248.69	597.69	612.37	606.43
MT												
NL	17.24%			88.24%	88.24%	88.24%	adequate	1%	52.47			
AT									47.29			
PL	5.56%	218.75%		34.21%	25.49%		slow	16%	326.54	126.21	531.43	
PT	62.50%	17.65%		61.54%	40.00%	30.77%	slow	9%	73.75	107.69	115.00	119.23
RO	0.00%			5.45%			slow	129%	727.67			
SI	0.00%	0.00%	0.00%	28.57%	28.57%	28.57%	slow	8%	116.75	216.43	470.93	682.29
SK	-56.10%	-15.56%		66.67%	15.79%	10.53%	slow	20%	204.50	250.00	188.16	210.53
FI	-9.09%	0.00%		80.00%	72.73%		fast	20%	157.68		460.67	
SE	0.00%	0.00%		80.43%	80.43%		fast	3%	229.53	184.13	235.95	
UK	0.00%	-17.78%		18.18%	10.81%	10.81%	slow	8%	1,486.50			

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFI target provided only in the NIR

[15] The meaning of publicly accessible refuelling point, as reported in the NIR, may differ by country.

3.1.3 *Measures (Electricity and CNG)*

Table 3.1.3-1 provides an overview of the measure assessment results for the pairs electricity/road and CNG/road for each country. As it can be seen, for the latter pair it was not possible to compute the impact for three of the assessed NIRs, due to the limited information provided.

Table 3.1.3-1 Overview of the measure assessment results for electricity / road and CNG / road

Measure assessment	Electricity / road						CNG / road					
	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D
Member States	Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition	Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition
BE	+	M	C	M	+	+	=	M	N	L	+	+
BG	=	M	C	M	+	+	=	X				=
CZ		H	N	M	=	=		L/M	N	L	-	
DK	+	H	N	M	+		+	M	N	L	+	
DE	+	H	C	H	+	+	+	M	C	M	+	
EE	+	M	C	M	+			H	N	M	+	
IE	+	H	C	H	+	+	+	H	C	H	+	+
EL	+	M	C	M	+			M	N	L	-	
ES	+	M/H	C	M/H	+	+	=	M	C	M	+	+
FR	+	H	C	H	+	+	+	M	C	M	+	
HR	+	H	C	H	+	+	=	H	N	M	+	+
IT	=	M	C	M	=		=	M	C	M	=	
CY	+	M	C	M	+			X	N		+	+
LV	=	H	C	H	=	-	=	L/M	N	L	-	-
LT	+	M	C	M	+	+	+	M	C	M	+	+
LU	+	H	C	H	+		+	M	N	L	+	
HU	+	H	C	H	+	+	=	M	N	L	-	+
MT	+	M	C	M	+	+						=
NL	+	H	C	H	+	+	=	M	N	L	=	=
AT	+	M	C	M	+	+	+	M	N	L	=	=
PL	+	M	C	M	+	+	+	L	C	L	+	+
PT	+	M	C	M	+	+	+	L	N	L	+	+
RO	+	H	C	H	=	+	+	L	C	L	+	=
SI	+	M	C	M	+	+	+	M	C	M	+	+
SK	=	M	C	M	=	+	=	M	N	L	+	
FI	+	H	C	H	+	+	+	H	C	H	+	=
SE	+	H	C	H	+	+	+	M	C	M	+	+
UK	+	H	C	H	+	=	+	L	N	L	=	=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

3.1.4 *LNG (alternative fuels vehicles and infrastructure)*

Table 3.1.4-1 gives an overview of the results for LNG vehicles and the corresponding publicly accessible refuelling points[16] in each country. As it can be seen, the level of coverage in terms of assessable information is quite sparse.

Table 3.1.4-1 Overview of LNG / road

Member States	LNG Vehicles (excl. PTW)							LNG refuelling points (public)						
	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS
	%	%	%	%				%	%	%	%			
	2020	2025	2030	2020	2025	2030		2020	2025	2030	2020	2025	2030	
BE														
BG														
CZ	-55.56%	360.00%	430.77%	2.50%	0.09%	0.03%	0.03%	100.00%	180.00%	114.29%	33.33%	7.14%	3.33%	3.33%
DK														
DE									0.00%			44.44%		
EE														
IE														
EL		0.00%	0.00%					0.00%	0.00%	0.00%				
ES	150.00%			48.00%	13.71%	3.84%	2.60%	93.18%	150.00%		40.00%	30.91%		
FR									0.00%			80.00%	48.78%	47.50%
HR														
IT			0.00%	55.55%		3.42%	3.25%	362.50%	41.25%	0.00%	37.84%	24.78%	3.50%	3.14%
CY														
LV														
LT				100.00%	42.95%	16.53%	2.88%		200.00%			66.67%	40.00%	40.00%
LU	66.67%			26.00%	8.67%	8.67%	8.05%							
HU		-67.94%	-43.45%					-95.65%	-81.93%	-82.14%				
MT														
NL				76.17%	15.62%	8.70%	2.18%		7.14%			90.00%		
AT									0.00%			100.00%		
PL	0.00%	-8.50%		47.76%	8.56%	5.84%	4.49%					21.43%		
PT		250.00%		2.45%	0.57%	0.29%	0.14%	83.33%	63.64%		45.45%	27.78%	20.83%	0.00%
RO														
SI	0.00%	0.00%	0.00%	4.47%	0.42%	0.18%	0.00%	0.00%	0.00%	0.00%	33.33%	33.33%	33.33%	33.33%
SK				15.00%	3.78%	0.79%	0.79%		300.00%					
FI								0.00%	0.00%		66.67%	54.55%		
SE								0.00%	0.00%		27.27%	27.27%		
UK								0.00%	-7.35%		81.25%	41.27%	41.27%	9.76%

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFV estimate / AFI target provided only in the NIR

[16] The meaning of publicly accessible refuelling point, as reported in the NIR, may differ by country.

3.1.5 *Hydrogen (alternative fuels vehicles and infrastructure)*

Table 3.1.5-1 gives an overview of the results for hydrogen vehicles and the corresponding publicly accessible refuelling points[17] in each country. Also in this case the level of coverage is quite scarce, although it is worth reminding that, according to the Directive, it was not compulsory to include hydrogen in the NPF (hence in the NIR).

Table 3.1.5-1 Overview of hydrogen / road

Member States	Hydrogen Vehicles (excl. PTW)							Hydrogen refuelling points (public)						
	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS
	%	%	%	%				%	%	%	%			
	2020	2025	2030	2020	2025	2030		2020	2025	2030	2020	2025	2030	
BE				84.38%		0.11%	0.07%							
BG		-72.50%	-38.33%						-80.00%	-92.00%				
CZ				33.33%	0.01%	0.00%	0.00%		400.00%					
DK				26.90%	9.56%	8.91%	1.81%							
DE								0.00%	0.00%		66.00%	16.50%		
EE														
IE														
EL														
ES	-90.00%			56.00%	14.00%	2.80%	1.62%	-70.00%			66.67%	26.67%		
FR				149.36%	3.88%				233.33%			20.00%	5.00%	2.31%
HR											50.00%			
IT	0.00%	0.00%	0.00%	2.18%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	15.00%	1.53%	0.67%	-0.23%
CY														
LV														
LT														
LU														
HU		340.00%	873.33%						20.00%	85.71%				
MT														
NL	3.92%			3.13%	0.20%	0.04%	0.02%	400.00%			40.00%	16.00%		
AT								0.00%			100.00%			
PL														
PT														
RO														
SI	0.00%	0.00%	0.00%					0.00%	0.00%	0.00%	50.00%	14.29%	14.29%	0.00%
SK														
FI														
SE	0.00%	0.00%						0.00%	0.00%		46.15%	46.15%		
UK									0.00%			12.31%	12.31%	-14.00%

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFV estimate / AFI target provided only in the NIR

[17] The meaning of publicly accessible refuelling point, as reported in the NIR, may differ by country.

3.1.6 *Measures (LNG and Hydrogen)*

Table 3.1.6-1 provides an overview of the measure assessment results for the pairs LNG/road and hydrogen/road for each country. As it can be seen, due to the limited information provided, it was not possible to compute the impact for nine of the assessed NIRs in the case of LNG/road and four in the case of hydrogen/road.

Table 3.1.6-1 Overview of the measure assessment results for LNG / road and hydrogen / road

Measure assessment	LNG / road						H2 / road					
	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D
Member States	Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition	Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition
BE	=	L	N	L	+	+	+	L	N	L	+	+
BG							=	M	C	M	+	+
CZ		H	N	M	+			H	N	M	+	=
DK	+							M	N	L	+	
DE	+	M	C	M	+		+	H	C	H	+	+
EE												
IE	=	L	N	L	=	=		L	C	L	=	
EL	+				-	-		L	N	L	=	
ES	=	M	C	M	+	+	+	M	C	M	+	+
FR	+	M	C	M	+		+	M	C	M	+	+
HR	+	H	N	M	+			H	N	M	+	
IT	=	M	C	M	=		=	L	C	L	=	
CY	+	X	N		+	+		L	N	L	+	
LV	=	L	N	L	=	-						
LT	+	L	C	L	+		+	L/M	C	L/M	+	+
LU	-					-	+	M	N	L	+	
HU	+	M	N	L	-	+						
MT						=						
NL	-	M	C	M	=	-		M	C	M	+	
AT	+					=	+	L	N	L	=	+
PL	+	L	C	L	+	+	+	L	C	L	+	+
PT							+	L	N	L	+	+
RO	+	L	C	L	+	=	+	M	C	M	+	+
SI	+	L	N	L	+	+	=	M	N	L	+	+
SK	=	L	N	L	=	+		L	N	L	+	
FI	+	M	C	M	+	+	+	L	N	L	+	+
SE	+	M	N	L	+	+	=	M	N	L	+	=
UK	+	L	N	L	=	=	+	M	C	M	=	=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = not comprehensive. Ambition level: ‘+’ means ‘higher’; ‘=’ means ‘comparable’; ‘-‘ means ‘lower’.

3.2 Waterborne transport

3.2.1 *Inland waterborne transport*

The following tables give an overview of shore-side electricity (Table 3.2.1-1) and LNG supply[18] (Table 3.2.1-2) for vessels in TEN-T Core inland ports in each country. For nine Member States this requirement was not applicable since they have no TEN-T Core inland ports[19]. The tables show the results of the assessable data provided in the NIRs in terms of Changes, Attainment, Progress and measures[20].

Table 3.2.1-1 displays that some information on shore-side electricity for vessels in inland ports to compute at least one of these metrics was available in only a few of the assessed NIRs. Due to the limited information provided, it was possible to compute the impact of the measures only for four of the assessed NIRs in the case of electricity/water (inland).

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[18] The meaning of alternative fuel supply in waterborne transport, as reported in the NIR, may differ by country. It is not always clear whether the value reported refers to maritime or inland, to a port or another location along the waterway/shore, to a station or a refuelling point.

[19] Finland has not TEN-T Core inland ports but included an AFI target and measures for LNG supply in inland ports.

[20] The measures reported in theTables of this Section refer principally to infrastructure but for a few MSs also to vessels.

Table 3.2.1-1 Overview of electricity / water (inland)

Member States	Shore-side electricity supply for inland waterway vessels in inland ports												
	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D
	%	%	%	%									
	2020	2025	2030	2020	2025	2030		Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition
BE	0.58%	1.85%							L	N	L	=	
BG													
CZ													
DK													
DE									L	C	L	+	
EE													
IE													
EL													
ES													
FR								+	L	N	L	+	
HR									X			+	
IT													
CY													
LV													
LT													
LU				83.33%	50.00%	50.00%	50.00%						
HU	0.00%			77.78%	77.78%	77.78%	0.00%						
MT													
NL									M	C	M	+	
AT													
PL													
PT													
RO		0.00%	0.00%										
SI													
SK									X				
FI(*)									X				
SE													
UK													

(*) Finland does not have inland waterways in the TEN-T network, but the Finnish NIR reported some information

Legend

Not applicable (no TEN-T core inland ports)

Legend for changes

change < -15%
-15% <= change < = 15%
change > 15%
AFI target provided only in the NIR

Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

Table 3.2.1-2 displays that some information on LNG supply for vessels in inland ports to compute at least one of these metrics was available in only a few of the assessed NIRs. Due to the limited information provided, it was possible to compute the impact of the measures only for six NIRs in the case of LNG/water (inland).

Table 3.2.1-2 Overview of LNG / water (inland) AFI

Member States	LNG supply - Inland Ports												
	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D
	%	%	%	%									
	2020	2025	2030	2020	2025	2030		Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition
BE									X				
BG													
CZ													
DK													
DE								+	L	C	L	+	
EE													
IE													
EL													
ES									X				
FR			0.00%					+	L	N	L	+	
HR													
IT									M	N	L	=	
CY													
LV													
LT		0.00%						+	M	N	L	+	+
LU													
HU	0.00%	50.00%	25.00%					+	X	N			+
MT													
NL			0.00%	85.71%		46.15%	46.15%		X				
AT		0.00%						=					=
PL													
PT								+	L	N	L	+	
RO		0.00%	0.00%										=
SI													
SK			0.00%										
FI(*)			0.00%						H	C	H	+	
SE								+	M	N	L	+	+
UK													

(*) Finland does not have inland waterways in the TEN-T network, but the Finnish NIR reported some information

Legend

Not applicable (no TEN-T core inland ports)

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFI target provided only in the NIR

Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

3.2.2 *Maritime waterborne transport*

The following tables give an overview of shore-side electricity (Table 3.2.2-1) and LNG supply[21] (Table 3.2.2-2) for vessels in TEN-T Core maritime ports in each country. For five

[21] The meaning of alternative fuel supply in waterborne transport, as reported in the NIR, may differ by country. It is not always clear whether the value reported refers to maritime or inland, to a port or another location along the waterway/shore, to a station or a refuelling point.

Member States this requirement was not applicable since they have no TEN-T Core maritime ports. The tables show the results of the assessable data provided in the NIRs in terms of Changes, Attainment, Progress and measures[22].

Table 3.2.2-1 displays that some information on shore-side electricity for vessels in maritime ports to compute at least one of these metrics was available in just a few of the assessed NIRs. Due to the limited information provided, it was possible to compute the impact only for seven of the assessed NIRs.

Table 3.2.2-1 Overview of electricity / water (maritime)

Member States	Shore-side electricity supply for seagoing ships in maritime ports												
	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D
	%	%	%	%									
	2020	2025	2030	2020	2025	2030		Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition
BE	18.18%								L	N	L	=	
BG												=	
CZ													
DK				50.00%	18.18%	18.18%	18.18%						
DE									L	C	L	+	
EE													
IE									L	N	L	-	
EL	0.00%	0.00%	0.00%										
ES	800.00%			4.44%					H	N	M	+	
FR								+	M	C	M	+	
HR									X			+	
IT													
CY													
LV				100.00%	66.67%	50.00%	50.00%		X			=	
LT													
LU													
HU													
MT									L/M	N	L	+	
NL		0.00%			40.00%				X				
AT													
PL									L	C	L	+	+
PT													
RO		0.00%	0.00%										
SI													
SK													
FI									X				
SE													
UK													

[22] The measures reported in theTables of this Section refer principally to infrastructure but for a few MSs also to vessels.

Legend

Not applicable (no TEN-T core maritime ports)

Legend for changes

- change < -15%
- -15% <= change < = 15%
- change > 15%
- AFI target provided only in the NIR

Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

Table 3.2.2-2 displays that some information on LNG supply[23] for vessels in maritime ports to compute at least one of these metrics was available in several of the assessed NIRs. Due to the limited information provided, it was possible to compute the impact only for ten of the assessed NIRs.

Table 3.2.2-2 Overview of LNG / water (maritime)

Member States	LNG supply - Maritime Ports												
	CHANGES (NIR vs NPF)			ATTAINMENT (2018)			PROGRESS	Legal measures	Policy measures + Deployment & manufacturing support				RTD&D
	%	%	%	%									
	2020	2025	2030	2020	2025	2030		Ambition	Score	Comprehensiveness	Impact	Ambition	Ambition
BE									X				
BG													
CZ													
DK				100.00%	100.00%	100.00%	100.00%	=	X			=	
DE								=	L	C	L	+	=
EE													
IE								=	L	N	L	=	=
EL	100.00%	150.00%	25.00%					+				-	+
ES	230.77%	2.38%		100.00%	100.00%	100.00%	100.00%	+	M/H	C	M/H	+	+
FR		0.00%			57.14%			+	L	C	L	+	
HR								+	H	N	M	=	+
IT	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%		M	N	L	=	
CY								+					+
LV	0.00%	100.00%							X			=	
LT	0.00%	0.00%		100.00%	100.00%	100.00%	100.00%	+	L/M	N	L	+	
LU													
HU													
MT													=
NL		-33.33%			25.00%				X				
AT													
PL		0.00%						+	L	C	L	+	+
PT		0.00%			0.00%								
RO		0.00%	0.00%										=
SI													
SK													
FI		0.00%			33.33%			+	H	C	H	+	+
SE		0.00%	0.00%		64.71%	64.71%	60.00%	+	M	N	L	+	+
UK		0.00%			75.00%								+

[23] The meaning of alternative fuel supply in waterborne transport, as reported in the NIR, may differ by country. It is not always clear whether the value reported refers to maritime or inland, to a port or another location along the waterway/shore, to a station or a refuelling point.

Legend	
	Not applicable (no TEN-T core maritime ports)

Legend for changes	
	change < -15%
	-15% <= change < = 15%
	change > 15%
	AFI target provided only in the NIR

Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

4 Overall contribution of NIRs to EU policy targets

4.1 Deployment of alternative fuels infrastructure and transport systems

This section provides an EU-wide overview of the AFV-estimates / AFI-targets and the results of the measure assessment for the most relevant alternative fuels and transport modes.

AFV-estimates / AFI-targets

For the two best-covered pairs, namely electricity/road and CNG/road, the results will be presented from two points of view. First, the numerical values of AFV/AFI in 2016 and 2018, and the objectives for 2020, 2025 and 2030 will be shown on diagrams including all the Member States. Then, in addition to the summary tables presented in Chapter 3, some considerations regarding "coverage", "change NIR vs. NPF", "attainment", "progress", "average growth rate" and "sufficiency index" will be provided, according to the results of the assessment methodology described in Chapter 2. Finally, the calculated shares of electric vehicles and CNG vehicles in 2018, and the estimated shares in 2020, 2025 and 2030, will be shown in EU maps with the use of different colours.

Secondly, an analysis and interpretation of data from an EU-wide perspective will be presented. Concerning numerical values that can be summed up, this will simply consist in adding the individual values from the MS to the total sum to represent the EU value (for example the total number of electric vehicles in 2018, 2020, 2025 and 2030, or the total number of recharging points). Instead, for those parameters that cannot be summed up (for example the "change NIR vs. NPF"), two averaged European values will be shown:

- an unweighted average, where each MS counts one (UWA)
- a weighted average, based on the population of each MS (PWA)

It is considered that both averages are important and indicative. The first gives a better vision of the average strategy of all the MSs and provides a more balanced geographical representation of the situation. The results of UWA are presented when there is information available from more than 50% of the MSs (i.e. more than 14 MSs). The second average provides holistic EU numbers, which are closer to the real situation from an EU-wide point of view. The PWA can be used for example to check the current or foreseen EU state of play versus the objectives of the Green Deal, or when comparing Europe to the other major actors in the field. There is however an important caveat when considering the PWA as representative of the whole EU situation. For some parameters the information was not available from all the 28 Member States. Thus the calculated PWA represents an approximation of the EU situation. This approximation becomes less robust as the number of MSs providing information becomes lower. Therefore, the results of PWA are displayed only when the population of all the MSs with available information is above 50% of the whole EU population.

For the other road-related fuels (LNG, hydrogen, LPG), only the diagrams with the individual numerical values of the MSs will be shown (both AFV and AFI), because the amount of available data does not allow to calculate representative EU average results.

For waterborne transport, only individual AFI data (shore-side supply points and LNG refuelling points) will be shown in diagrams, while for rail and air transport only a mention of the number of MSs that have delivered data will be provided.

Measure assessment

In addition to the analysis and assessment provided in each assessment report in Chapter 5 (where the measures for all the pairs AF/transport mode are presented), a paragraph summarising the total EU-wide number of measures and their impact is also presented for road transport.

4.1.1 ***Road transport***

4.1.1.1 Electricity

Of all the alternative fuel and transport mode combinations, the pair electricity/road is the best covered as electro-mobility seems to be a priority for most Member States.

Figure 4.1.1-1 summarises the information for the EV estimates and targeted publicly accessible recharging points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation. It is worth noting that a logarithmic scale is used for these diagrams, in order to have readable data for all MSs, however there are big absolute differences among them.

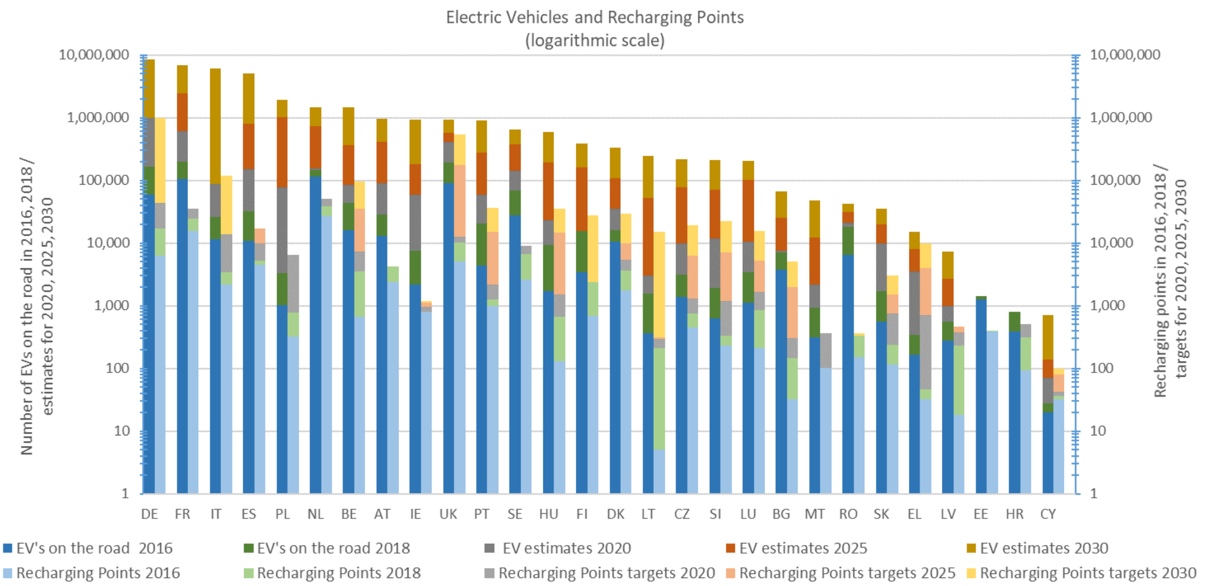

Figure 4.1.1-1 EV estimates and recharging points targets for 2020, 2025 and 2030[24]

Electric Vehicles

- **(Coverage)** Twenty-five MSs NIRs out of the total 28 assessed (89%) have provided at least some historical data (2016-2018)[25] and twenty-six MSs (93%) at least one estimate for the decade 2020-2030[26]. For the three years of the next decade when estimates were requested, the NIRs contained globally 27 more inputs than the NPFs, showing the improving MSs' strategies regarding electro-mobility (in particular, one more estimate in 2020, 12 more estimates in 2025 and 14 more estimates in 2030 compared to the NPF).

[24] Member States are ordered by their estimated fleet of electric vehicles (from high to low values).
[25] With the exception of Czechia, Estonia and Italy
[26] With the exception of Estonia and Croatia

- **(Change NIR vs NPF)** Considering the 47 cases where a change could be computed (EV estimates provided both in the NPF and NIR), a decrease of ambition is noticeable in 11 cases, a similar ambition in 20 cases and an increase of ambition in 16 cases. The changes range from -78.20% (Bulgaria) to +322.91% (Portugal) in 2020; from -63.50% (Bulgaria) to +516.22 (Portugal) in 2025; from -49.08% (Bulgaria) to +1,020.20% (Portugal) in 2030. In other 28 cases, an estimate was provided only in the NIR and the changes could not be computed.

  Considering the changes from an EU-wide point of view, the unweighted average (UWA) and the population weighted average (PWA) are reported in the following table. As mentioned earlier, the values for 2025 and 2030 are not displayed since the MSs providing information are less than 15 and represent less than 50% of the overall EU population. To be noted that the 2020 values of the two average changes are different, with the lower PWA value indicating lower changes for the most populated MSs.

EU-wide change of EV estimates			
Year	**2020**	**2025**	**2030**
Number of MSs	23	12	12
UWA [%]	19.23		
EU population [%]	93.96	21.60	23.89
PWA [%]	7.95		

- **(Attainment)** The 2018 attainment of the foreseen EV estimates ranges significantly across EU, from 4.34% (Poland) to 92.80% (Netherlands) for 2020, from 0.32% (Poland) to 57.15% (Romania) for 2025, and from 0.18% (Poland) to 42.87% (Romania) for 2030. It is worth reminding that a low 2018 attainment could be due to either a slow uptake of EVs in 2018 and/or to a very ambitious estimate for the target year compared to 2018.

  The average situation from an EU-wide perspective is reported in the following table:

EU-wide attainment of EV estimates			
Year	**2020**	**2025**	**2030**
Number of MSs	25	24	26
UWA [%]	39.37	12.64	5.65
EU population [%]	98.94	70.98	98.94
PWA [%]	33.23	15.11	6.37

- **(Progress)** Considering the 26 MSs that provided at least one estimate for the decade 2020-2030, and comparing the 2018 situation with their foreseen EV fleet evolution, 3 MSs result to progress slowly, 22 adequately and 1 fast (Romania).
- **(Growth rate)** The average annual growth rate characterising the foreseen evolution of electric vehicles for the next decade ranges from 13% (Romania) to 69% (Poland). Out of the 26 computed annual growth rates, 2 are below 20%, 11 are in between 20% and 40%, 11 are in between 40% and 60% while 2 are above 60% (Lithuania and Poland).

  The average situation from an EU-wide perspective is reported in the following table:

EU-wide average growth rate of EV	
Year	**2016 - 2030**
Number of MSs	26
UWA [%]	39
EU population [%]	98.94
PWA [%]	40

- **(EV share)** The maps in Figure 4.1.1-2 and Figure 4.1.1-3 show the evolution of the shares of electric vehicles in 2018, 2020, 2025 and 2030 (according to the estimates provided in the NIRs), allowing a comparison among MSs since the absolute numbers shown in Figure 4.1.1-1 are normalised by the existing (2018) or estimated (2020, 2025 and 2030) total fleet[27] of each MS in the reference year. The share of electric vehicles in the total vehicle fleet (excluding PTWs) varies significantly across MSs ranging:
    - from less than 0.01% (Cyprus) to 1.53% (Netherlands) with 8 MSs above 0.5% share in 2018,

  and is foreseen to vary also in the future

    - from 0.01% (Cyprus) to 2.46% (Ireland) with 10 MSs above 1% share in 2020,
    - from 0.02% (Cyprus) to 19.22% (Luxembourg) with 7 MSs above 5% share in 2025, and
    - from 0.11% (Cyprus) to 34.36% (Luxembourg) with 13 MSs above 10% share in 2030.

[27] Similarly to the NPF assessment, the future total vehicle fleets are based on the Baseline scenario of the Impact Assessment accompanying the Proposal for a Directive amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures (SWD/2017/0180), and thus on the EU Reference scenario 2016, but excluding the incentives for alternative fuels provided at the Member State level. It has been developed with the PRIMES-TREMOVE model (i.e. the same model used for the EU Reference scenario 2016) by ICCS-E3MLab.

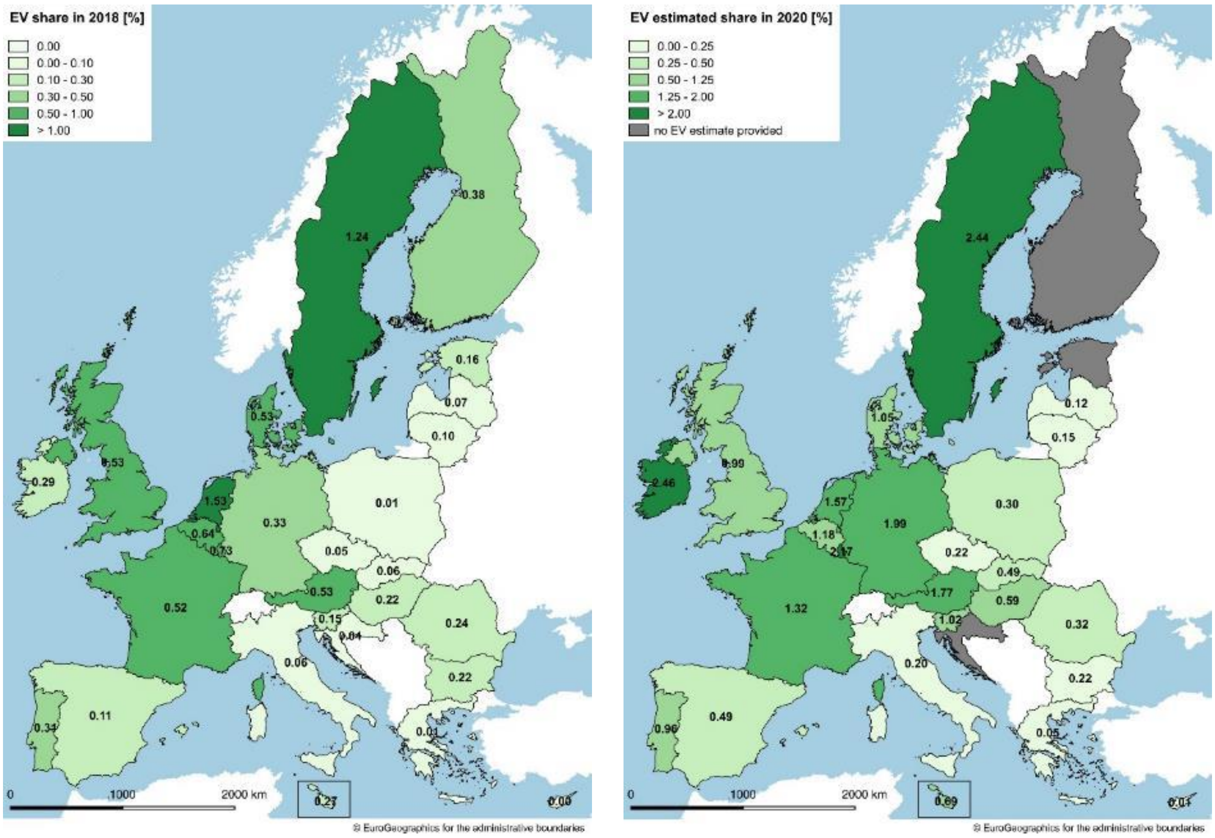

Figure 4.1.1-2 Shares of electric vehicles in use in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

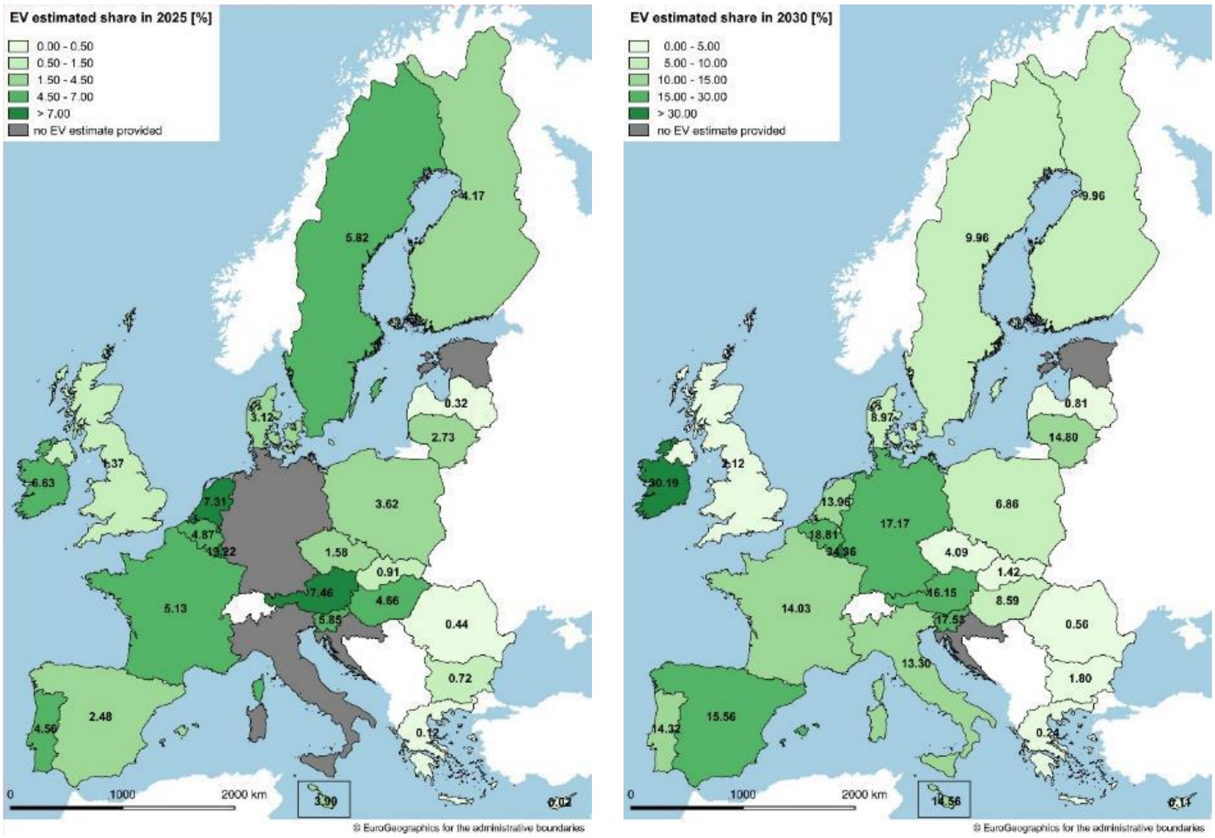

Figure 4.1.1-3 Shares of estimated electric vehicles (from the NIRs) in 2025 (left map) and in 2030 (right map)

Also for the EV share, the EU-wide average situation is shown in the following table:

EU-wide EV shares				
Year	2018	2020	2025	2030
	(calculated)	(estimated)		
Number of MSs	28	25	24	26
UWA [%]	0.33	0.91	4.04	11.16
EU population [%]	100.00	97.87	70.98	98.94
PWA [%]	0.35	0.99	3.38	11.16

The maps in Figure 4.1.1-4 and Figure 4.1.1-5 show the evolution of the shares of alternative fuels vehicles normalized by population (that can be named as AFV motorisation) per Member State in 2018, 2020, 2025 and 2030 (according to the estimates provided in the NIRs) for the pair electricity/road. In 2018, there were 5 MSs having more than 3 EVs per 1,000 inhabitants, and the leader is Netherlands with the value of 8.52 for this parameter. In 2020, there are 5 MSs foreseen to have more than 10 EVs per 1,000 inhabitants. In 2025, there are 8 MSs foreseen to have values above 30 EVs per 1,000 inhabitants, while in 2030, there are 8 MSs foreseen to exceed the value of 100 for this parameter. In all estimated future cases, Luxembourg leads with the values of 17.38 in 2020, 168.27 in 2025, and 336.54 in 2030.

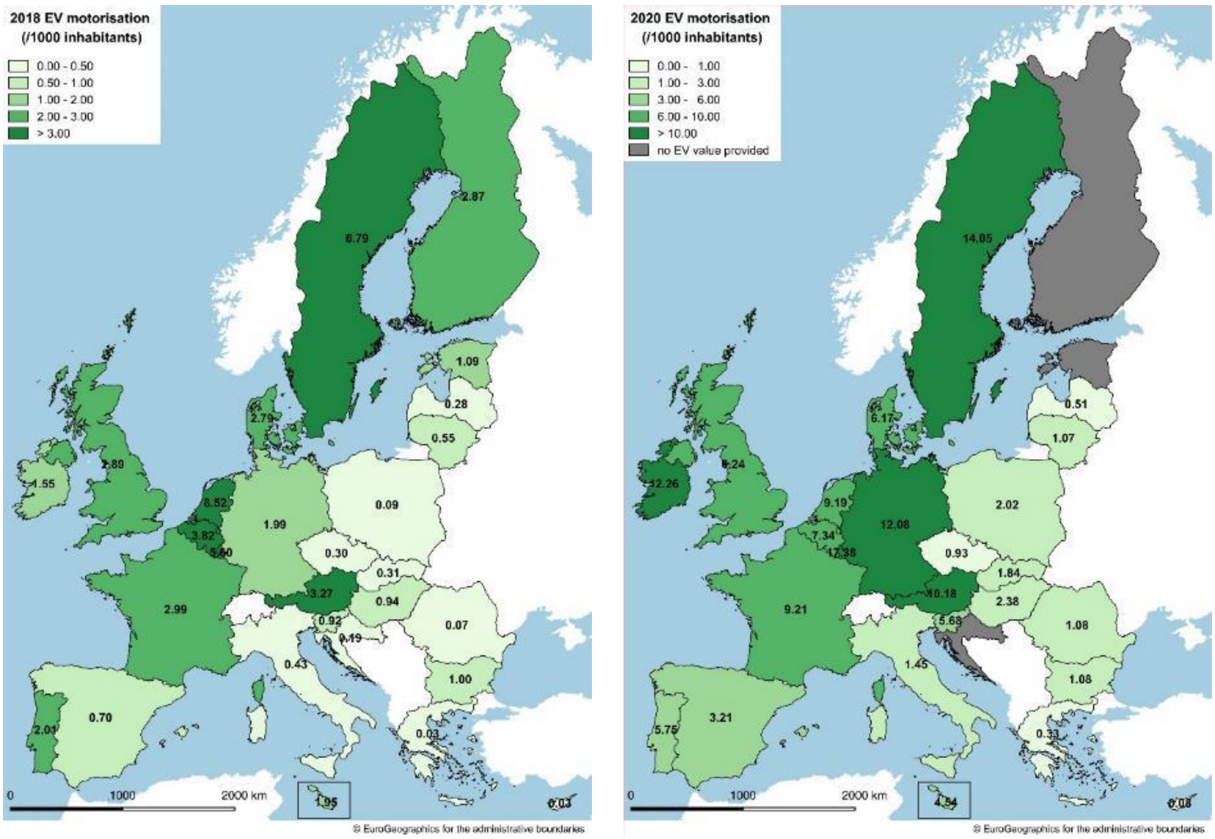

Figure 4.1.1-4 Shares of electric vehicles normalized by population (EV motorisation) in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

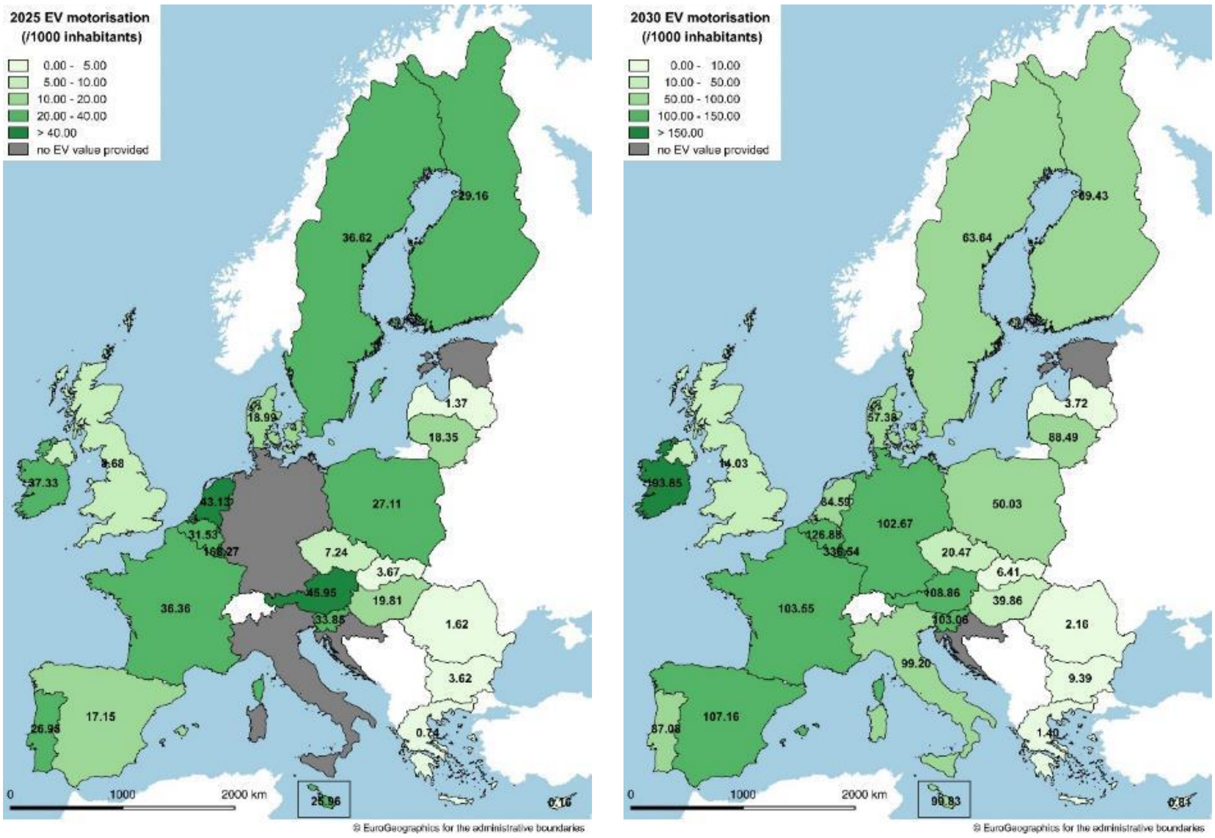

Figure 4.1.1-5 Shares of estimated electric vehicles (from the NIRs) normalized by population (EV motorisation) in 2025 (left map) and in 2030 (right map)

Recharging points (publicly accessible)

- **(Coverage)** Twenty-six MSs NIRs out of the total 28 assessed (93%) have provided at least some historical data (2016-2018)[28] and 27 at least one target for the decade 2020-2030. For the three years of the next decade when targets were requested, the number of provided targets is higher in the NIRs than in the NPFs (57 vs 48).
- **(Change NIR vs NPF)** Considering the 44 cases where a change could be computed (recharging infrastructure targets provided both in the NPF and NIR), a decrease of ambition is noticeable in 7 cases, a similar ambition in 27 cases and an increase of ambition in 10 cases. The changes range from -88.00% (Bulgaria) to +198.00% (Lithuania) in 2020; from -66.67% (Bulgaria) to +210.00% (Lithuania) in 2025; from -44.44% (Bulgaria) to +375.58% (Luxembourg) in 2030. In other 19 cases, a target was provided only in the NIR and the changes could not be computed.

  The average situation from an EU-wide perspective is reported in the following table. In this case, only the 2020 averages have been computed as EU-wide representative.

[28] With the exception of Estonia and Italy

EU-wide change of AFI electricity/road targets			
Year	**2020**	**2025**	**2030**
Number of MSs	26	9	9
UWA [%]	16.40		
EU population [%]	90.64	8.62	11.90
PWA [%]	7.65		

- **(Attainment)** The 2018 attainment of the MSs foreseen recharging points targets ranges significantly across EU, from 6.57% (Greece) to 119.95% (Finland) for 2020, from 1.15% (Greece) to 73.27% (Ireland) for 2025, and from 0.46% (Greece) to 92.54% (Romania) for 2030.
  The average situation from an EU-wide perspective is reported in the following table:

EU-wide attainment of AFI electricity/road targets			
Year	**2020**	**2025**	**2030**
Number of MSs	24	15	16
UWA [%]	59.99	24.36	16.28
EU population [%]	71.12	36.59	35.47
PWA [%]	54.34		

  The UWA values shown for 2025 and 2030 should be considered with more caution, due to the limited numbers of NIRs available to calculate the EU averages.

- **(Progress)** Considering the 27 MSs that provided at least one target for the 2020-2030 decade in their NIR or NPF, and comparing the 2018 situation with their foreseen recharging points infrastructure evolution, 10 MSs result to progress slowly, 11 adequately and 6 fast .
- **(Growth rate)** The average annual growth rate characterising the foreseen evolution of recharging points for the next decade ranges from 3% (Ireland) to 111% (Poland). Out of the 27 computed annual growth rates, 6 are below 20%, 12 are in between 20% and 40%, 7 are in between 40% and 60% while 2 are above 60% (Lithuania and Poland).
  The average situation from an EU-wide perspective is reported in the following table:

EU-wide average growth rate of AFI electricity/road	
Year	**2016 - 2030**
Number of MSs	27
UWA [%]	34
EU population [%]	99.74
PWA [%]	37

The maps in Figure 4.1.1-6 and Figure 4.1.1-7 show the evolution of the density of publicly accessible recharging points (number of recharging points normalized by the total length of roads[29]) per Member State in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs). Also in this case, very big differences can be seen among MSs. To be noted is the group of central European MSs (Belgium, Netherlands, Luxembourg and Germany). In 2018, their densities exceeded the value of 5 recharging points per 100 km. In 2020, their densities are foreseen to exceed the value of 10 for this parameter, while in 2030, their densities are foreseen to be well above 100 recharging points per 100 km (or more than 1 recharging point per km).

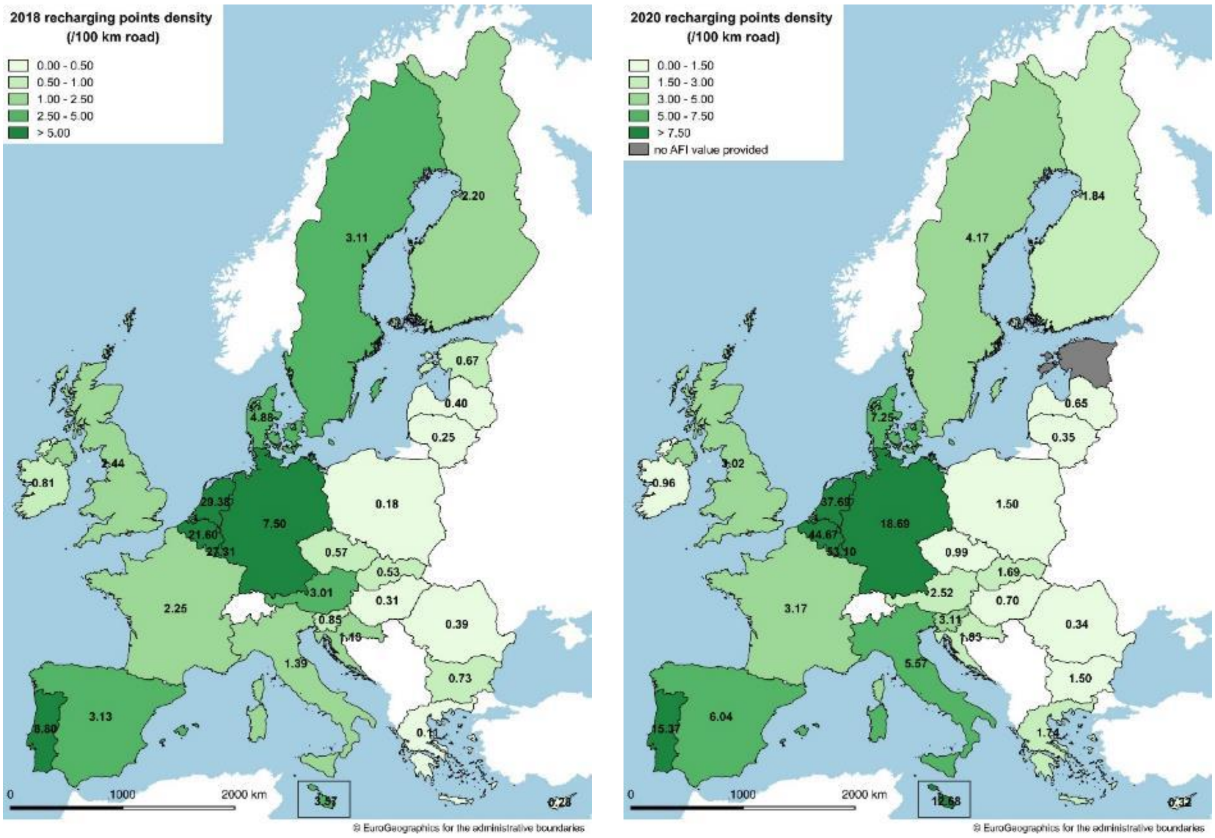

Figure 4.1.1-6 Density of publicly accessible recharging points in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

[29] Including motorways, main/national and secondary/regional roads

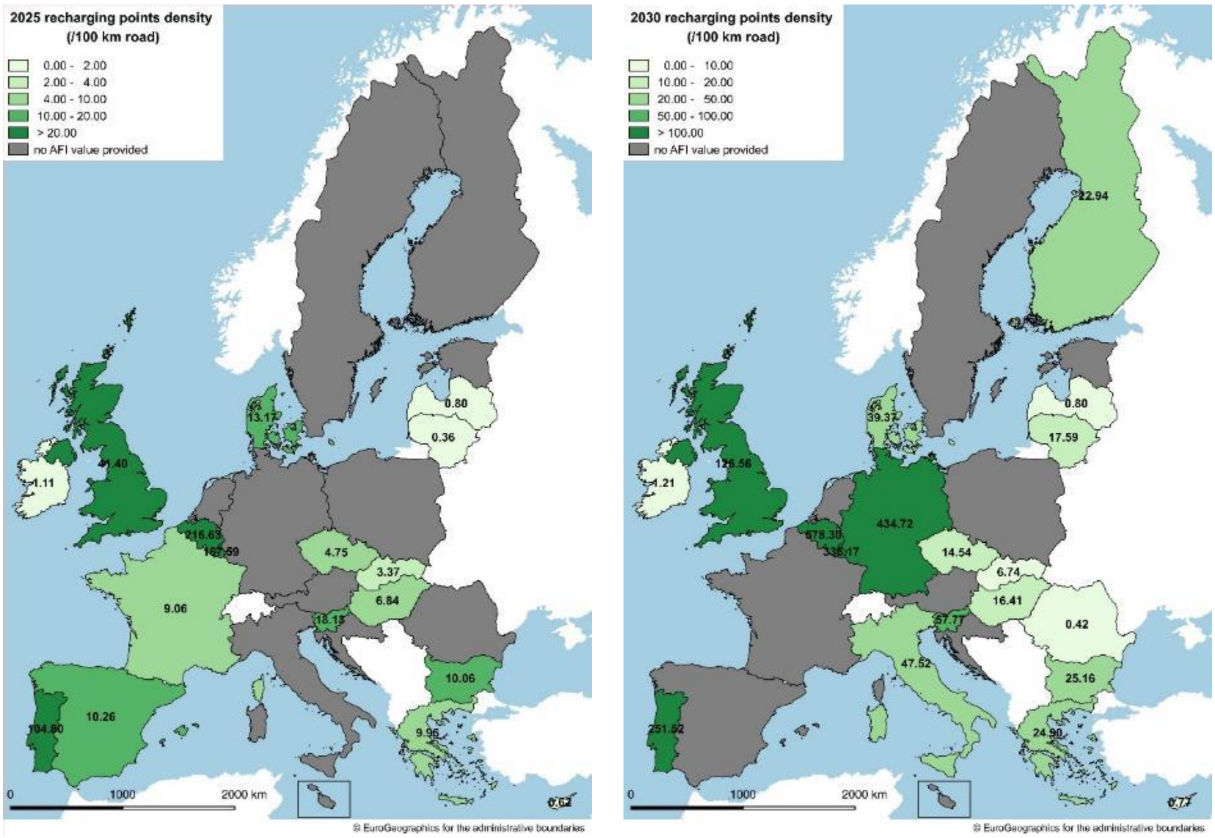

Figure 4.1.1-7 Estimated density of publicly accessible recharging points (from the NIRs) in 2025 (left map) and in 2030 (right map)

Sufficiency Index (Ratio AFV/AFI)

From NIR data, it is possible to compute the forecasted ratio (sufficiency index) of electric vehicles and publicly accessible recharging points for 25 MSs (with the exception of Estonia, Croatia and Romania). Concerning the adequacy of this ratio (the Directive has indicated a value of 10), it has to be considered that there are other elements influencing it, which were not included when setting the value of 10 (e.g. the share of high power (>22kW) publicly accessible recharging points and the number of private recharging points).

The maps in Figure 4.1.1-8 and Figure 4.1.1-9 show the evolution of the sufficiency index for electricity/road in 2018, 2020, 2025 and 2030 (according to the estimates provided in the NIRs). For the 2020-2030 decade, NIR data allow computing 58 ratios while NPF data had allowed computing only 37. For 2020, the ratio can be computed for 24 MSs and ranges from 1.69 (Cyprus) to 62.34 (Ireland), with 4 MSs situated below 5, 11 MSs in between 5 and 15, and 9 MSs above 15. For 2025, the ratio can be computed for 16 MSs and ranges from 1.73 (Cyprus) to 166.24 (Lithuania), with 3 MSs situated below 5, 8 MSs in between 5 and 15, and 5 MSs above 15. For 2030, the 18 computable ratios range from 1.50 (Greece) to 780.30 (Ireland), with 2 MSs situated below 5, 8 MSs in between 5 and 15, and 8 MSs above 15.

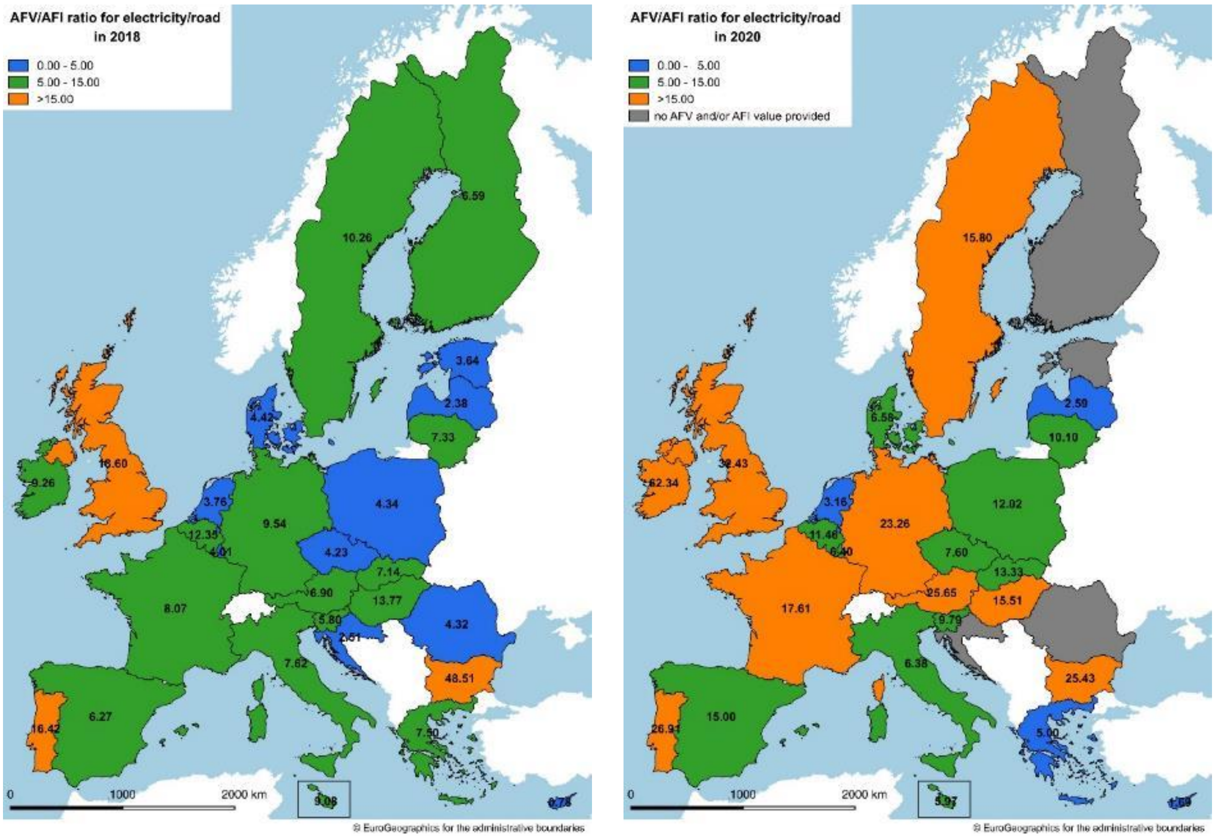

Figure 4.1.1-8 Ratio AFV/AFI (sufficiency index) for electricity/road in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

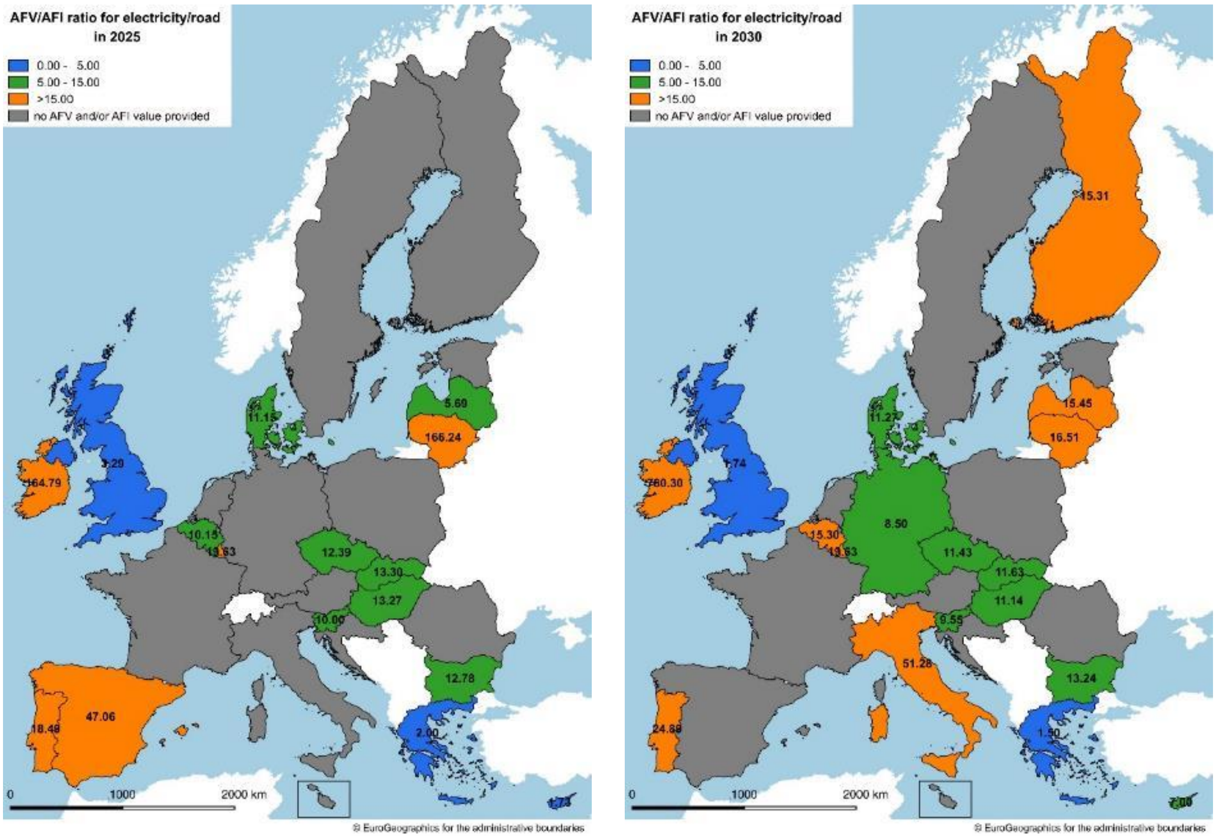

Figure 4.1.1-9 Estimated ratio AFV/AFI (sufficiency index) for electricity/road (from the NIRs) for 2025 (left map) and for 2030 (right map)

Looking at these data from an EU-wide point of view, the obtained results are shown in the following table:

EU-wide sufficiency index for electricity/road				
Year	**2018**	**2020**	**2025**	**2030**
Number of MSs	28	24	16	18
UWA	8.76	15.08	32.00	56.98
EU population [%]	100.00	94.05	38.47	58.41
PWA	9.59	17.81		29.36

From these average sufficiency indexes one would deduct that EU is clearly moving from an adequate balance between EV and recharging points in 2018 to a progressively increasing inadequate balance in 2030. However, it is worth to note that, if the extreme MS (IE) is excluded, the EU averages are both below 25 in 2025 and below 20 in 2030.

Measures

The pair electricity/road is the most numerous in terms of dedicated measures by the majority of MSs.

- The **legal measures**' level of ambition in the NIRs vs. NPFs has increased for 23 MSs out of the 27 NIRs assessed[30].
- The importance given to this pair is revealed also by its presence in all the 28 NIRs assessed and the good score obtained for the assessment of the **policy and deployment & manufacturing support measures** in relation to reaching the MSs electro-mobility objectives (15 MSs sets of measures obtained a high score and the rest a medium score). Among the MSs with a high score, there are front-running countries in the field (e.g. DE, FR and NL, which are distinguished by the consistency of their policies in electro-mobility development) but also late-starting countries (e.g. HU and RO). An expression of the serious commitment in the deployment of electro-mobility is represented by the fact that 26 MSs have measure sets for this field that were assessed to be comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, 13 MSs are assessed having a high level impact (of which one medium/high) and 15 a medium level. Regarding the ambition in the NIR vs. NPF, the measure sets of 23 MSs have an increased level and none a decreasing one.
- In twenty-two cases, the ambition of **RTD&D measures** targeting electro-mobility in the NIRs could be determined, and among these 19 measure sets show an increased ambition compared to the NPF situation.

[30] For Czechia this assessment was not possible.

EUROPEAN
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Brussels, 16.2.2022
SWD(2022) 33 final

PART 2/4

COMMISSION STAFF WORKING DOCUMENT

Updated detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure. Implementation of Art 10 (3) of Directive 2014/94/EU

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4.1.1.1 CNG

Of all the alternative fuel and transport mode combinations, the pair CNG/road is the second best covered. Figure 4.1.1-10 summarises the information for the CNG vehicle estimates and targeted publicly accessible refuelling points as provided in the NIRs for the next decade, as well as the 2016 and 2018 situation.

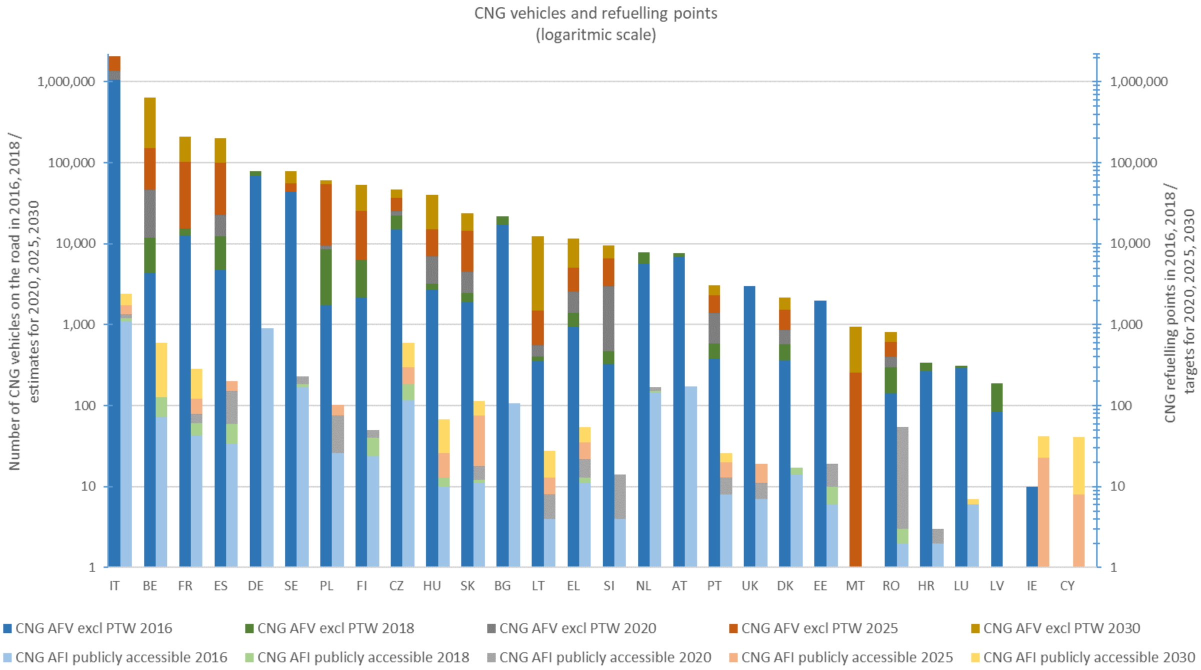

Figure 4.1.1-10 CNG vehicle estimates and refuelling points targets for 2020, 2025 and 2030[1]

CNG vehicles

- **(Coverage)** In the NIRs, 24 MSs have provided at least some historical data (2016-2018) (86%), and 18 MSs have provided at least one estimate for the decade 2020-2030 (64%). In the NPFs, only 14 MSs had provided at least one estimate for this decade.
- **(Change NIR vs NPF)** Considering the 29 cases where a change could be computed (CNG estimates provided both in the NPF and NIR), a decrease of ambition is noticeable in 10 cases (3 in 2020), a similar ambition in 14 cases (7 in 2020) and an increase of ambition in 5 cases (2 in 2020). In other 22 cases, an estimate was provided only in the NIR and the changes could not be computed.

  Regarding the EU-wide perspective the criteria used for representativity did not allow the display of the resulting averages for the next decade (i.e. there were less than 50% of the number of MSs for UWA results and less than 50% of the EU population for the PWA results).

[1] Member States are ordered by their estimated fleet of CNG vehicles (from high to low values).

EU-wide change of CNG vehicle estimates			
Year	2020	2025	2030
Number of MSs	12	10	7
UWA [%]			
EU population [%]	42.19	29.93	8.73
PWA [%]			

- **(Attainment)** The 2018 attainment of the foreseen CNG vehicle estimates ranges significantly across MSs from 15.41% (Slovenia) to more than 100% (France and Sweden) for 2020, from 7.08% (Slovenia) to 78.25% (Sweden) for 2025, and from 1.82% (Belgium) to 55.22% (Sweden) for 2030. One Member State (Luxembourg) foresees a decreasing trend of its CNG vehicle fleet in the future.
  The average situation from an EU-wide perspective is reported in the following table:

EU-wide attainment of CNG vehicles estimates			
Year	2020	2025	2030
Number of MSs	17	18	17
UWA [%]	72.67	42.91	36.19
EU population [%]	60.74	61.82	50.01
PWA [%]	82.09	29.20	15.60

- **(Progress)** Considering the 16 MSs for which progress could be calculated, comparing the 2018 situation with their foreseen CNG vehicle fleet evolution, 7 MSs result to progress slowly, 7 adequately and 2 fast .
- **(Growth rate)** The average annual growth rate characterising the foreseen evolution of CNG vehicles for the next decade ranges from 4% (Sweden) to 41% (Belgium). Out of the 16 computed annual growth rates, 3 are below 10%, 4 are in between 10% and 20%, 7 are in between 20% and 30% while 2 are above 30% (Belgium and Spain).
  The average situation from an EU-wide perspective is reported in the following table:

EU-wide average growth rate of CNG vehicles	
Year	2016 - 2030
Number of MSs	16
UWA [%]	20
EU population [%]	61.70
PWA [%]	21

- **(CNG vehicle share)** The maps in Figure 4.1.1-11 and Figure 4.1.1-12 show the evolution of the shares of CNG vehicles in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs). The share of CNG vehicles in the total vehicle fleet (excluding PTWs) ranges from 0% (Cyprus and Malta) to 2.42% (Italy) in 2018. This share is also foreseen to vary in the future in the 18 MSs providing CNG vehicle estimates

- from 0% (Malta) to 3.06% (Italy), with 4 MSs above 0.5% share (Belgium, Czechia, Italy and Sweden) in 2020,
- from 0.01% (Romania) to 4.62% (Italy), with 4 MSs above 0.75% share (Belgium, Czechia, Italy and Sweden) in 2025, and
- from 0.01% (Romania) to 8.38% (Belgium), with 3 MSs above 1% share (Belgium, Finland and Sweden) in 2030.

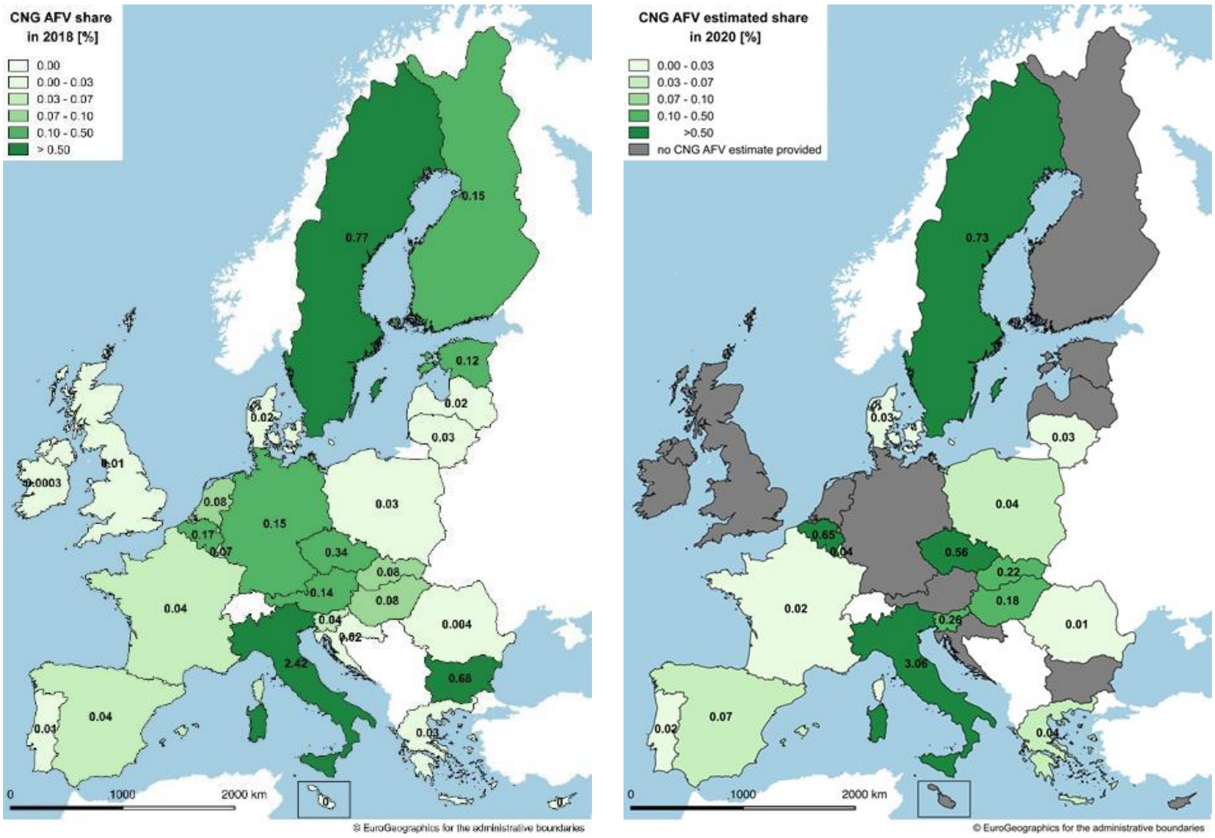

Figure 4.1.1-11 Shares of CNG vehicles in use in 2018 (left map) and estimated in 2020 (from in the NIRs) (right map)

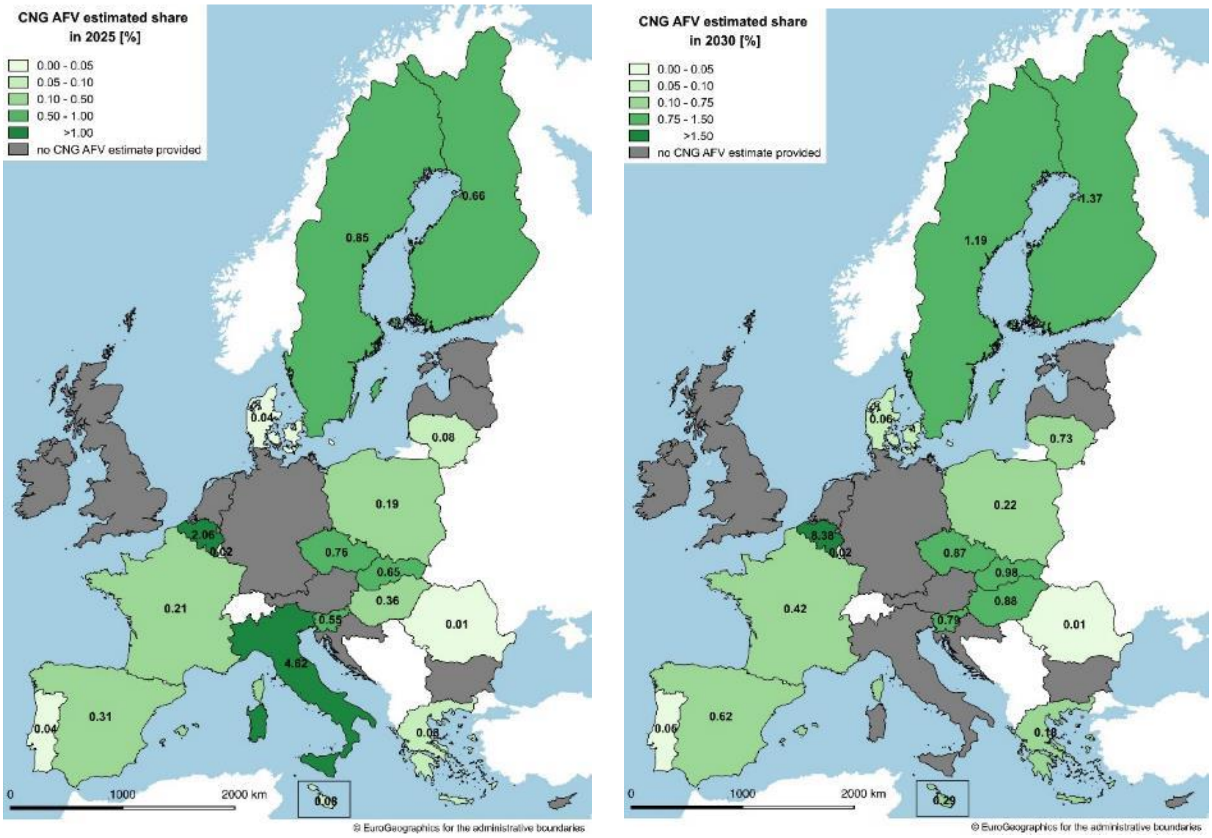

Figure 4.1.1-12 Shares of estimated CNG vehicles (from the NIRs) in 2025 (left map) and in 2030 (right map)

The EU-wide average situation concerning CNG vehicle shares is shown in the following table (it should be noted that the decrease of the PWA in 2030 compared to 2025 is due to the absence of the Italian share in 2030):

EU-wide CNG vehicle shares				
Year	**2018**	**2020**	**2025**	**2030**
	(calculated)	(estimated)		
Number of MSs	28	17	18	17
UWA [%]	0.20	0.35	0.64	1.00
EU population [%]	100.00	60.83	61.91	50.10
PWA [%]	0.37	0.70	1.16	0.82

The maps in Figure 4.1.1-13 and Figure 4.1.1-14 show the evolution of the shares of alternative fuels vehicles normalized by population (that can be named as AFV motorisation) per Member State in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs) for the pair CNG/road. In 2018, there were 6 MSs having more than 1 CNG vehicle per 1,000 inhabitants. In 2020, there are 4 MSs foreseen to have more than 2 CNG vehicles per 1,000 inhabitants. In 2025, there are 6 MSs foreseen to have values above 3 CNG vehicles per 1,000 inhabitants. In 2030, there are 9 MSs foreseen to exceed the value of 4 CNG vehicles per 1,000 inhabitants. In 2018, 2020 and 2025, Italy presents the highest values of CNG vehicles per 1,000 inhabitants: 17.38 in 2018, 22.32 in 2020 and 33.89 in 2025. In 2030, Belgium presents the highest value of 56.53 CNG vehicles per 1,000 inhabitants.

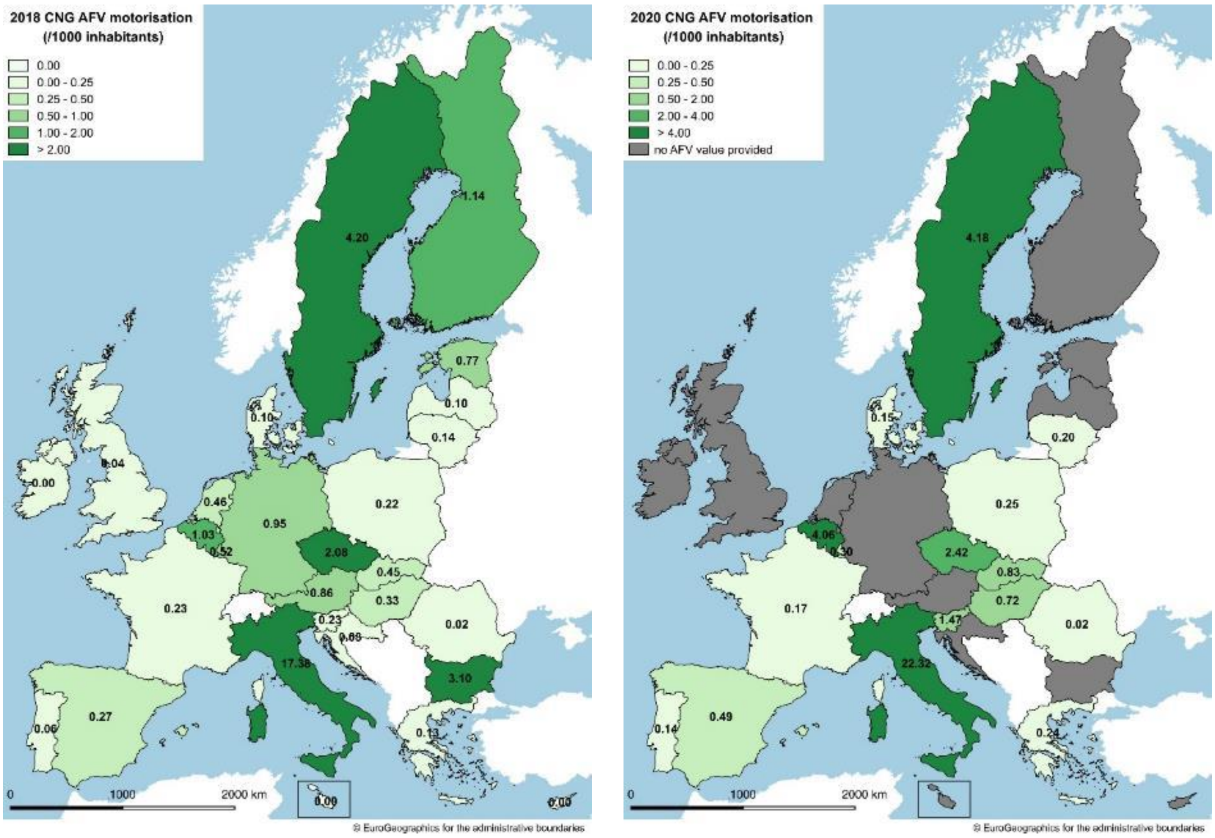

Figure 4.1.1-13 Shares of CNG vehicles normalized by population (CNG vehicle motorisation) in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

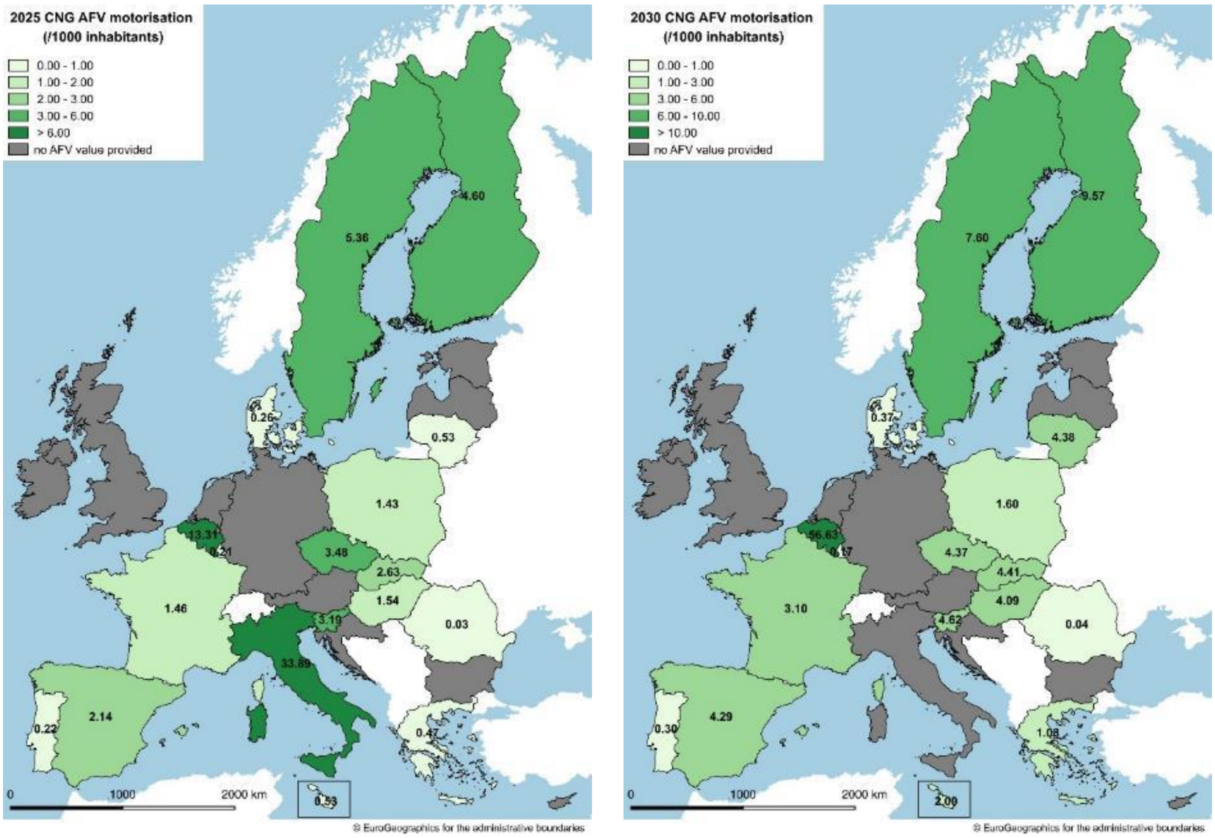

Figure 4.1.1-14 Shares of estimated CNG vehicles (from the NIRs) normalized by population (CNG vehicle motorisation) in 2025 (left map) and in 2030 (right map)

CNG AFI (publicly accessible)

- **(Coverage)** Twenty-three MSs (82%) have provided at least some historical data (2016-2018) and 24 MSs (86%) at least one target for the decade 2020-2030. For the three years of the next decade, the number of provided targets is higher in the NIRs than in the NPFs (60 vs 47).
- **(Change NIR vs NPF)** Considering the 42 situations where a change could be computed (CNG AFI targets provided both in the NPF and NIR), a decrease of ambition is noticeable in 10 cases (6 for 2020), a similar ambition in 23 cases (11 for 2020) and an increase of ambition in 9 cases (5 for 2020). In other 17 cases, a target was provided only in the NIR and the changes could not be computed.

  Looking at these data from an EU-wide point of view, the results shown in the following table are obtained. In this case, only the 2020 and 2025 averages have been displayed as EU-wide representative. It should be kept in mind that the 2025 values are less representative.

EU-wide change of AFI CNG/road targets			
Year	**2020**	**2025**	**2030**
Number of MSs	22	15	5
UWA [%]	-5.28	9.30	
EU population [%]	78.26	59.42	7.42
PWA [%]	8.82	22.06	

- **(Attainment)** The 2018 attainment of the foreseen CNG AFI targets ranges significantly across MSs, from 5.45% (Romania) to 100% or more (Denmark, Ireland, Hungary) for 2020, from 4.35% (Ireland) to 100% (Denmark) for 2025 and from 2.38% (Ireland) to 100% (Denmark) for 2030. One Member State (Luxembourg) foresees a decreasing trend of its CNG refuelling points in the future. Four Member States (Denmark, Estonia, Netherlands and Slovenia) foresee a constant number of refuelling stations in the next decade (2020-2030).

  Looking at these data from an EU-wide point of view, the results shown in the following table are obtained:

EU-wide 2018 attainment of AFI CNG/road targets			
Year	**2020**	**2025**	**2030**
Number of MSs	21 MS	19 MS	16 MS
UWA [%]	67.10	55.31	44.09
EU population [%]	77.88	73.27	55.92
PWA [%]	58.33	43.62	31.36

- **(Progress)** From the 24 MSs that provided at least one target for the 2020-2030 decade in their NIR or NPF, comparing the 2018 situation with their foreseen CNG refuelling infrastructure evolution, 11 MSs result to progress slowly, 7 adequately and 4 fast (for Croatia and Luxembourg the progress could not be computed).

- **(Growth rate)** The average annual growth rate characterising the foreseen evolution of CNG refuelling points for the next decade ranges from 1% (Denmark) to 129% (Romania). Out of the 20 computed annual growth rates, 8 are below 10%, 9 are in between 10% and 20%, 2 are in between 20% and 30% while 1 is above 60% (Romania).

  Looking at these data from an EU-wide point of view, the results shown in the following table are obtained:

EU-wide average growth rate of CNG AFI	
Year	**2016 - 2030**
Number of MSs	20
UWA [%]	17
EU population [%]	79.04
PWA [%]	17

The maps in Figure 4.1.1-15 and Figure 4.1.1-16 show the evolution of the density of publicly accessible CNG refuelling points (number of refuelling points normalized by the total length of roads[2]) per Member State in 2018, 2020, 2025 and in 2030 (according to the estimates provided in the NIRs). In 2018, a group of 7 MSs had a density superior to 0.1 CNG refuelling points per 100 km of road and Belgium had the highest value for this parameter (0.77). Because of the absence of several CNG AFI targets for the decade 2020-2030, the number of MSs foreseen to have a density above 0.1 CNG refuelling points per 100 km of road is 4 for 2020, 7 for 2025 and 7 for 2030.

[2] Including motorways, main/national and secondary/regional roads.

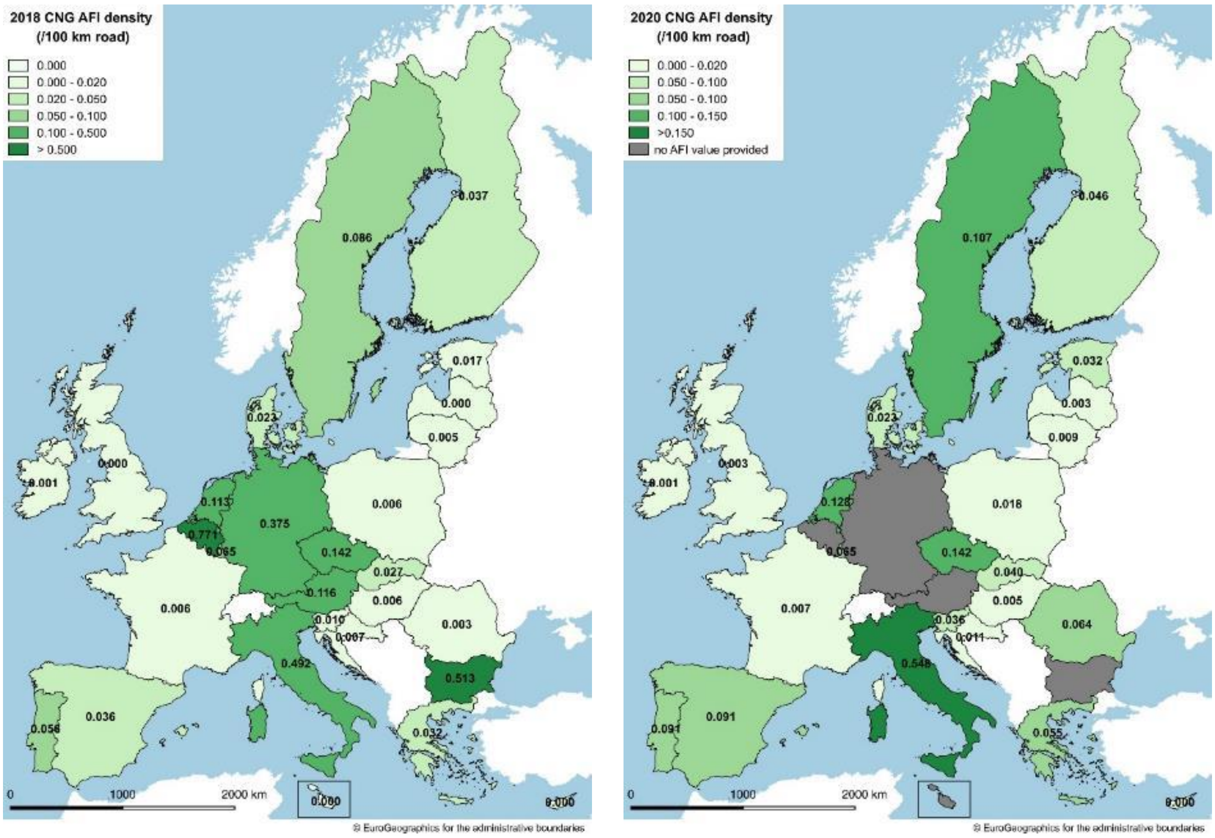

Figure 4.1.1-15 Density of publicly accessible CNG refuelling points in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

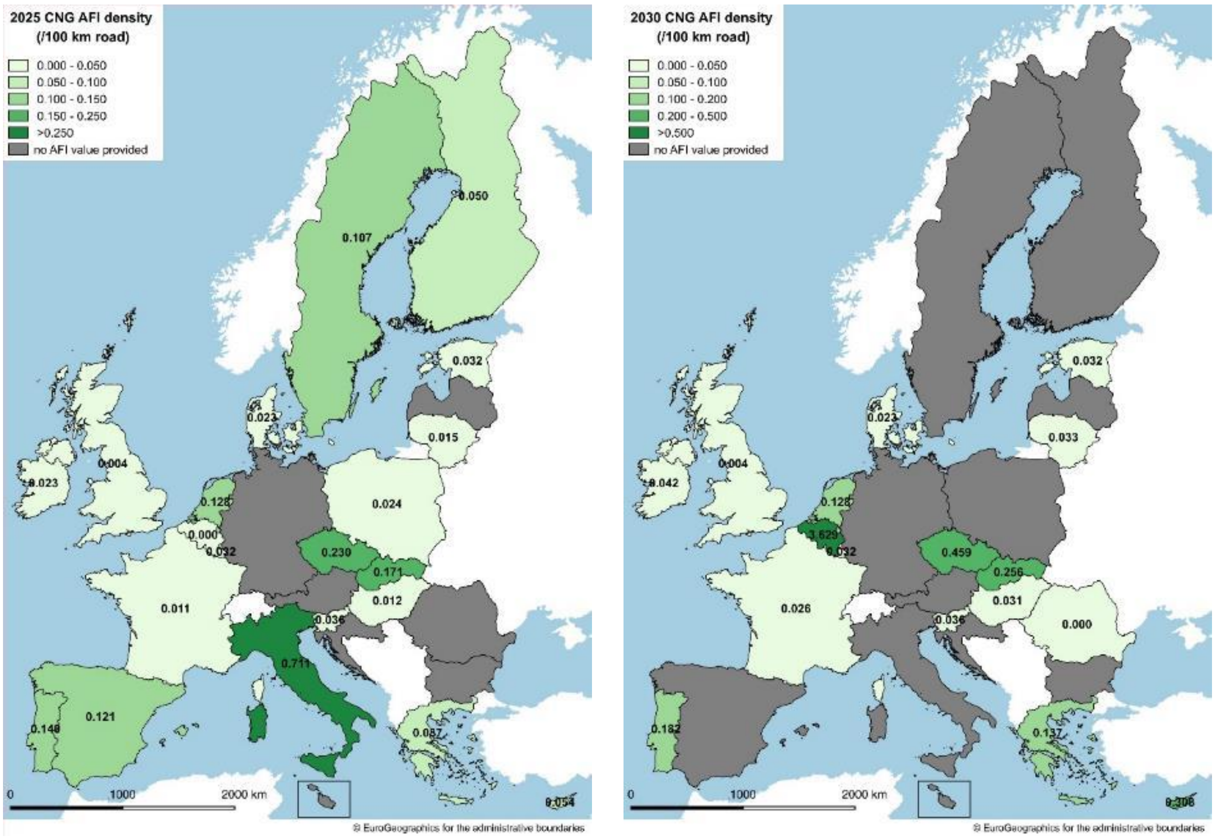

Figure 4.1.1-16 Estimated density of publicly accessible CNG refuelling points (from the NIRs) in 2025 (left map) and in 2030 (right map)

Sufficiency Index (Ratio AFV/AFI)

From NIR data, it is possible to compute the ratio of CNG vehicles and publicly accessible CNG refuelling points for 15 MSs for the 2020-2030 decade, overall in 37 cases compared with the NPF that allowed 30 cases. For 2020, the ratio can be computed for 13 MSs and ranges from 50.71 (Denmark) to 1,000.00 (Italy), with 11 MSs situated below 400, 1 MS in between 400 and 800 and 1 MS above 800. For 2025, the ratio can be computed for 14 MSs and ranges from 89.53 (Denmark) to 1,171.43 (Italy), with 8 MSs situated below 400, 5 MSs in between 400 and 800 and 1 MS above 800. For 2030, the 10 computable ratios range from 77.23 (Czechia) to 1,086.67 (Belgium), with 6 MSs situated below 400, 3 MSs in between 400 and 800, and 1 MS above 800.

The maps in Figure 4.1.1-17 and Figure 4.1.1-18 show the evolution of the sufficiency index for CNG/road in 2018, 2020, 2025 and in 2030 (according to the estimates and targets provided in the NIRs).

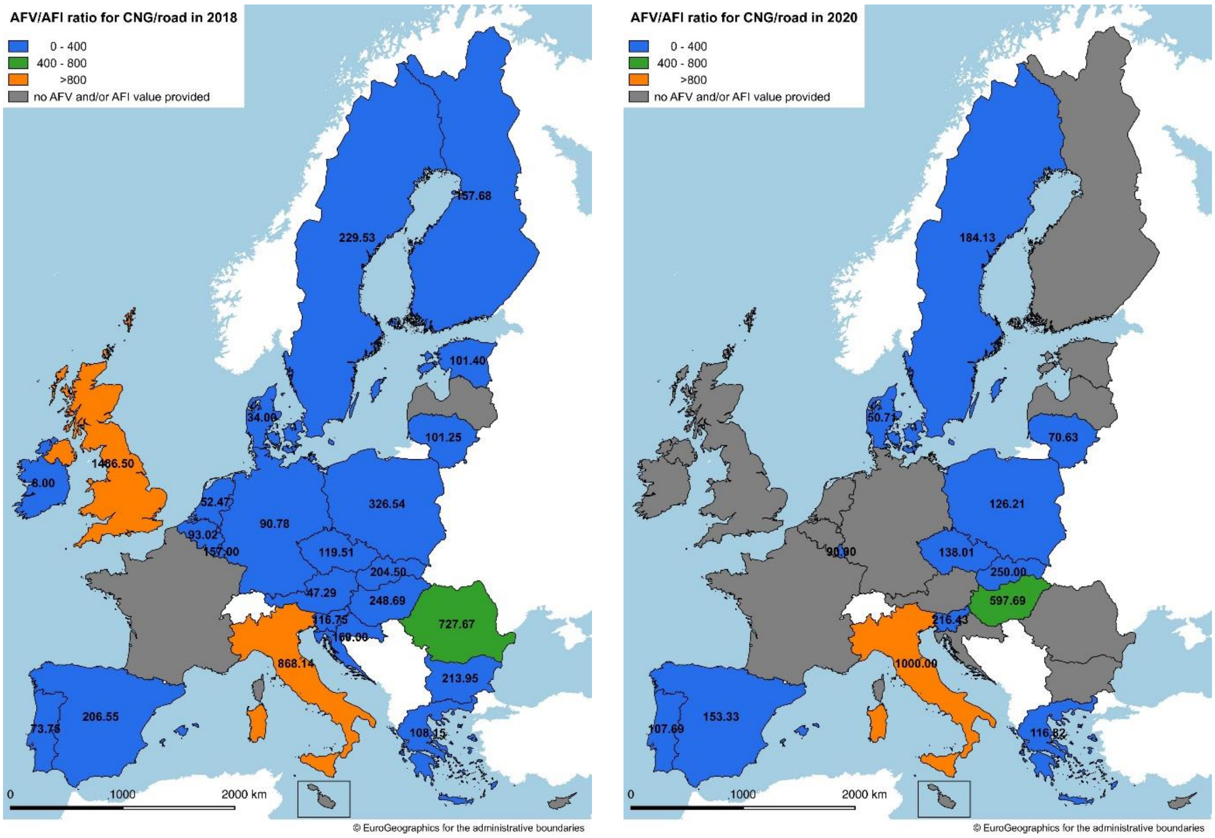

Figure 4.1.1-17 Ratio AFV/AFI (sufficiency index) for CNG/road in 2018 (left map) and estimated for 2020 (from the NIRs) (right map)

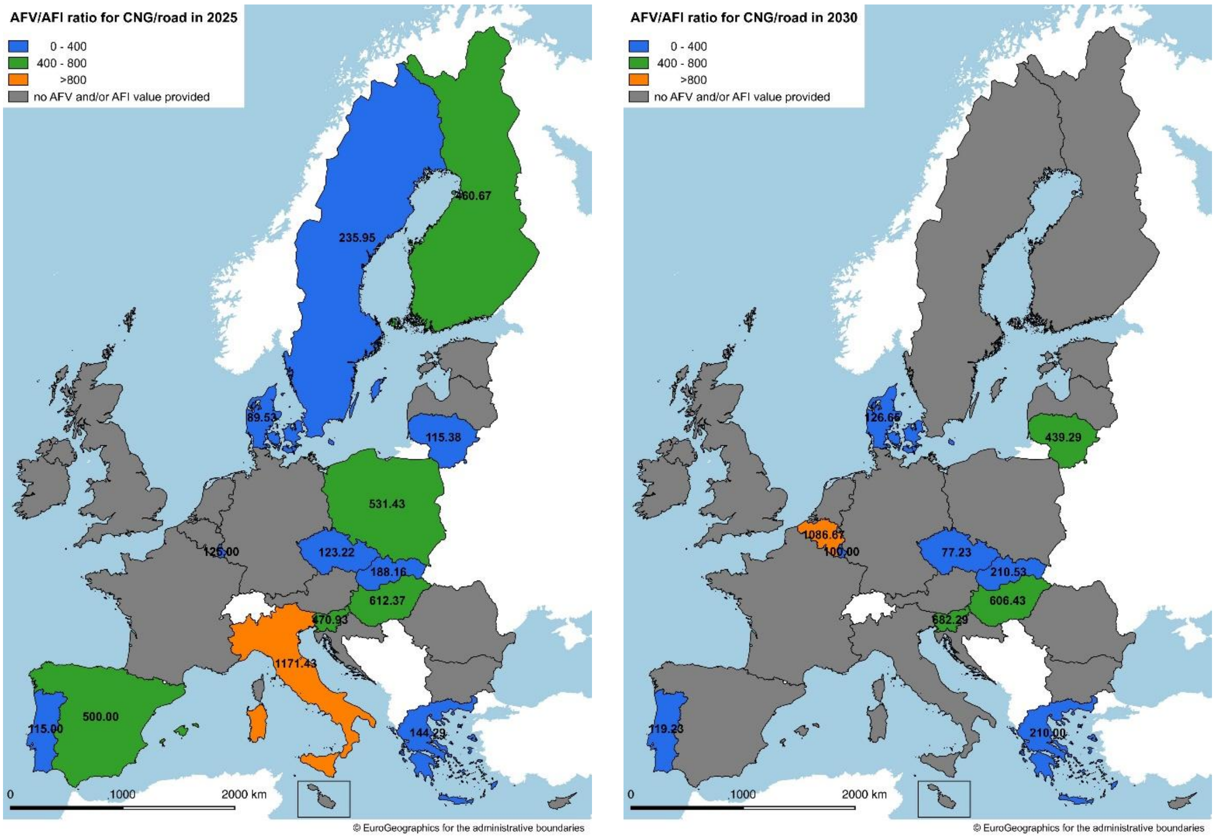

Figure 4.1.1-18 Estimated ratio AFV/AFI (sufficiency index) for CNG/road (from the NIRs) for 2025 (left map) and for 2030 (right map)

Looking at these data from an EU-wide point of view, the criteria used for representativity did not allow the presentation of results for the next decade and only the 2018 averages are reported in the following table.

EU-wide sufficiency index for CNG/road				
Year	**2018**	**2020**	**2025**	**2030**
Number of MSs	24	13	14	10
UWA	247.59			
EU population [%]	84.92	41.64	42.72	13.57
PWA	479.81			

Measures

The pair CNG/road is the second most covered in terms of dedicated measures by the majority of MSs. Compared to the electricity/road pair, for which a full commitment and positive outlook are shown by almost all MSs (although with important differences in absolute terms), the pair CNG/road presents a more articulated and MS-differentiated scenario:

- The **legal measures**' level of ambition in the NIR vs. NPF has increased for 14 MSs out of the 23 assessable NIR measure sets.
- Concerning the **policy and deployment & manufacturing support measures**, 26 MSs have reported assessable clusters of measures. Of these, only 4 clusters have obtained a high overall score, 15 clusters have obtained a medium score, 2 clusters a low/medium score, 4 a low score and 1 a not assessable score. Eleven clusters are comprehensive,

while the others are not comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, only 2 clusters are assessed as having a high level impact (Finland and Ireland), 9 a medium level and 14 a low impact. Regarding the ambition in the NIR vs. NPF, an increased level has been found in 18 cases.

- In nineteen cases, the ambition of **RTD&D measures** targeting CNG/road in the NIRs could be determined, and among these 11 measure sets show an increased ambition compared to the NPF situation.

4.1.1.2 LNG

Figure 4.1.1-19 summarises the information for the estimated LNG vehicles and targeted publicly accessible refuelling points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

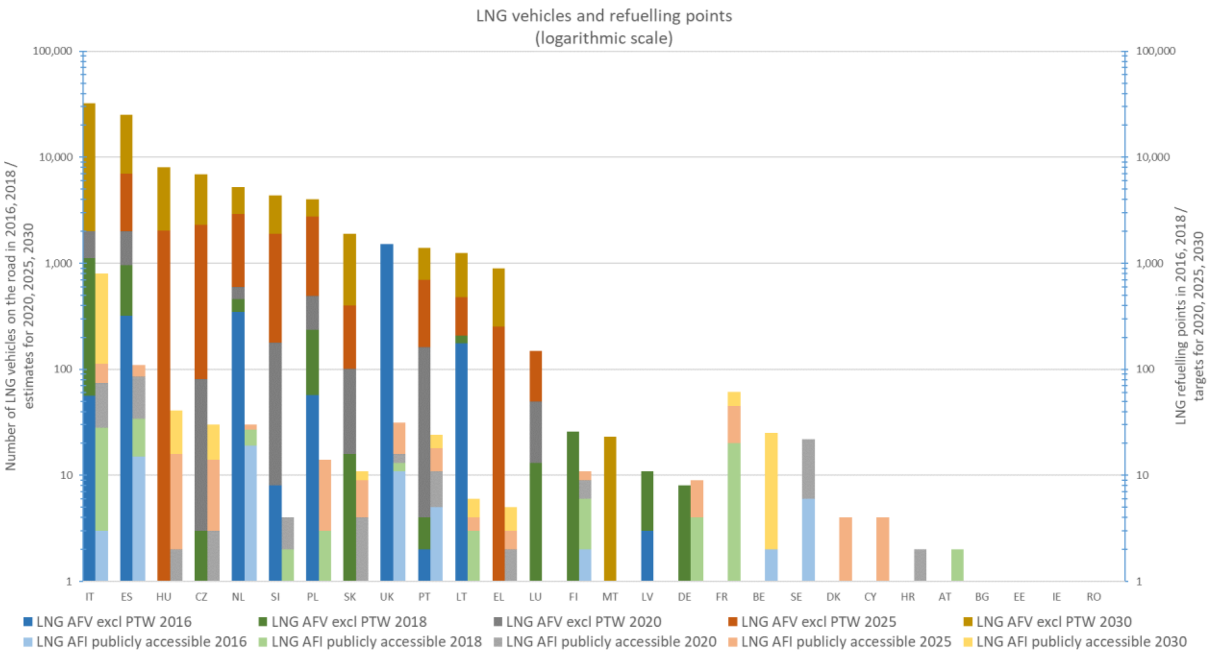

Figure 4.1.1-19 LNG vehicle estimates and refuelling points targets for 2020, 2025 and 2030[3]

With LNG, the level of coverage by the MSs starts to decrease and does not allow to provide averages at EU-wide level.

LNG vehicles

- **(Coverage)** In the NIRs, 14 MSs have provided at least some historical data (2016-2018) (50%). Among these, three MSs have declared zero LNG vehicles up to 2018. Thirteen MSs have declared at least one target for the decade 2020-2030 (46%).

[3] Member States are ordered by their estimated fleet of LNG vehicles (from high to low values) and afterwards, for the MSs without informations on vehicles, by their targeted LNG refuelling points (from high to low values).

- **(Change)** In the NPFs, there were only 9 MSs having at least one target. Comparing with NIR data, it results that the change is computable for 9 MSs and only 16 changes can be determined. Out of these 16 computable changes, 3 indicate less ambitious LNG vehicle estimates in the NIR compared to the NPF (1 MS in 2020), 8 changes indicate the same ambition as NPF (2 MSs in 2020) and 5 changes show increased ambition (2 MSs in 2020). In other 18 cases, an estimate was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen LNG vehicle estimates is computable for 10 MSs, with 29 attainment values as result. They range significantly across MSs from 2.45% (Portugal) to 100% (Lithuania) for 2020, from 0.09% (Czechia) to 42.95% (Lithuania) for 2025, and from 0.03% (Czechia) to 16.53% (Lithuania) for 2030.
- **(Progress)** Comparing the 2016-2018 LNG vehicle fleet evolution with their 2016-2030 foreseen evolution, the progress was computed for 10 MSs and it ranges from 0.00% (Slovenia) to 8.05% (Luxembourg).

LNG refuelling points

- **(Coverage)** In the NIRs, 17 MSs have provided at least some historical data (2016-2018) (61%). Among these, seven MSs have declared zero LNG infrastructure in 2018. Twenty-three MSs have declared at least one target for the decade 2020-2030 (82%).
- **(Change)** The NIR and NPF data allows computing 31 changes corresponding to 2020-2030 period, for 16 MSs. There are 3 decreasing changes (1 in 2020), 17 situations with the same ambition (5 in 2020) and 11 with increased ambition (4 in 2020). In other 13 cases, a target was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen LNG AFI targets is computed for 14 MSs and 29 determined attainment values result. They range across MSs from 27.27% (Sweden) to 81.25% (United Kingdom) for 2020, from 7.14% (Czechia) to 100% (Austria) for 2025, and from 3.33% (Czechia) to 48.78% (France) for 2030.
- **(Progress)** Comparing the 2016-2018 LNG AFI evolution with their 2016-2030 foreseen evolution, seven progress values are determined. They range from 0.00% (Portugal) to 47.50% (France).

Measures

- The level of NIR's ambition vs NPF for legal and RTD&D measures is assessed for 23 and 18 MSs respectively, and for the majority of them the level is increased (15 and 9 respectively).

- From the 20 NIRs offering assessable data regarding policy and deployment measures, only 2 have a high score and none of them displays a high impact. The ambition level is predominantly increased (13 MSs).

4.1.1.3 Hydrogen

Figure 4.1.1-20 summarises the information for the estimated hydrogen vehicles and targeted publicly accessible refuelling points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

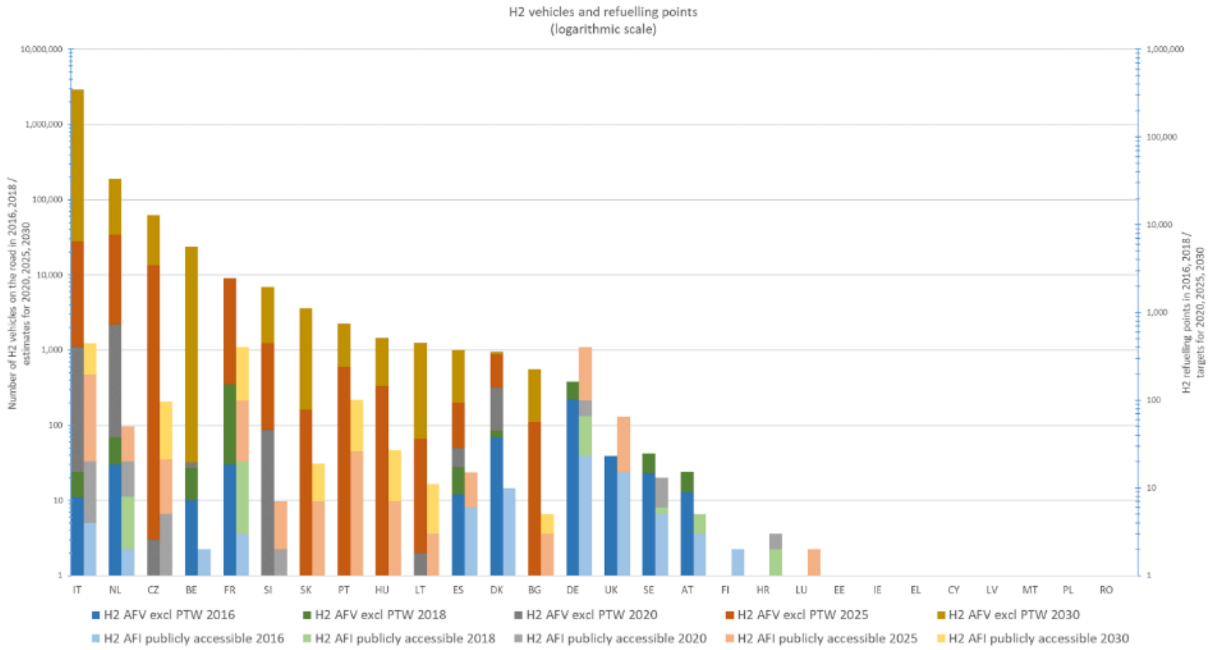

Figure 4.1.1-20 Hydrogen vehicle estimates and refuelling points targets for 2020, 2025 and 2030[4]

Hydrogen vehicles

- **(Coverage)** Twelve[5] MSs present positive values for hydrogen vehicles in 2018 (43%). Fourteen MSs have declared at least one positive estimate for the decade 2020-2030 (50%).
- **(Change)** The NPF and NIR data allow change computing for only 7 MSs. Two MSs have provided less ambitious AFI estimates in their NIR compared to the NPF (Bulgaria and Spain). Other four MSs have practically confirmed their initial NPF plans, while Hungary increased its ambition for 2025 and 2030. In other 22 cases, an estimate was provided only in the NIR and the changes could not be computed.
- **Attainment** The 2018 attainment of the foreseen hydrogen vehicle estimates are computed for 7 MSs and 19 attainment values result. For 2020, they range significantly across MSs, from 2.18% (Italy) to more than 100% (France), from 0.01% (Czechia) to 14% (Spain) for 2025 and from less than 0.01% (Czechia and Italy) to 8.91% (Denmark) for 2030. For one Member State (Sweden), the attainment was not computed since all the future estimates are below the 2018 value.
- **Progress** Comparing the 2016-2018 hydrogen vehicles evolution with the 2016-2030 foreseen evolution, six progress values are determined. They range from 0.00%

[4] Member States are ordered by their estimated fleet of hydrogen vehicles (from high to low values)

[5] According to the NIRs and EAFO

(Czechia) to 1.81% (Denmark). For one Member State (Sweden), the progress was not computed since the 2030 estimated value is below the 2018 existing one.

Hydrogen refuelling points

- **(Coverage)** Twenty MSs have provided at least some historical data (2016-2018) in their NIRs (71%). Twelve[6] MSs present hydrogen infrastructure by 2018 (43%). Twenty MSs have declared at least one target for the decade 2020-2030, but two of them have declared only targets of zero. Eighteen MSs out have set hydrogen infrastructure targets above zero by 2030 (64%).
- **(Change)** Twelve MSs allow the change computing. Two MSs have decreased their targets (Bulgaria and Spain). Six of them preserve the NPF target values and therefore the change values are zero. The remaining four have shown an increase of their ambition, significant in three cases: Netherlands (in 2020) and Czechia (in 2025), both with 400% change values, and France with 233% in 2025. In other 19 cases, a target was provided only in the NIR and the changes could not be computed.
- **(Attainment)** The 2018 attainment of the foreseen hydrogen refuelling points are computed for 10 MSs and 20 attainment values result. They range across MSs, from 15.00% (Italy) to 100% (Austria) for 2020, from 1.53% (Italy) to 46.15% (Sweden) for 2025 and from 0.67% (Italy) to 14.29% (Slovenia) for 2030. One Member State (Denmark) foresees a decreasing trend of its hydrogen refuelling points in the future.
- **(Progress)** Comparing the 2016-2018 hydrogen AFI evolution with the 2016-2030 foreseen evolution, four progress values are determined. They range from -14.00% (United Kingdom)[7] to 2.31% (France).

Measures

The pair hydrogen/road shows an increased interest from the MSs.

- The level of NIR's ambition vs NPF for legal and RTD&D measures is assessed for 16 MSs and 15 respectively, and for the majority of them the level is increased (12 in both cases).
- For this pair, 24 NIRs contain data regarding policy, and deployment and manufacturing support measures. Three measure sets are assessed with high score (Czechia, Germany and Croatia), 11 are comprehensive but only one receives a high level impact (Germany). An indicator of the increased interest is the fact that 19 NIRs out of the 24 have an increased ambition level in the comparison with the NPF.

[6] According to the NIRs and EAFO

[7] The negative value of progress for the United Kingdom means that a lower number of hydrogen refueling points was recorded in 2018 in comparison with 2016, however an increase of hydrogen infrastructure above the value recorded in 2016 is targeted for the next decade.

4.1.1.4 LPG

Figure 4.1.1-21 summarises the information for the LPG vehicle estimates and targeted publicly accessible refuelling points as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

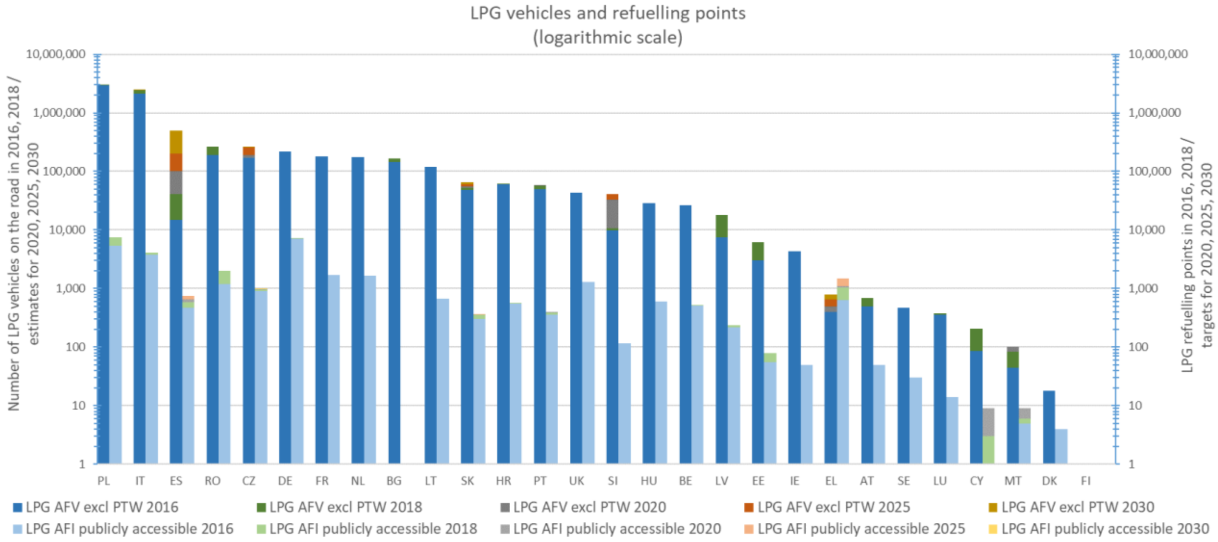

Figure 4.1.1-21 LPG vehicle estimates and refuelling points targets for 2020, 2025 and 2030[8]

LPG vehicles

- **(Coverage)** Twenty MSs (71%) have provided at least some historical data (2016-2018) in their NIRs. Eleven MSs (39%) have declared at least one vehicle estimate for the decade 2020-2030.

- **(Change)** Because only five MSs had estimates for the future in the NPF, only these MSs allow change computing. Italy and Slovenia preserve their estimates while Greece and Spain are decreasing their ambition. Hungary presents an increased ambition for 2020 and decreased ambition for 2025 and 2030. In other 19 cases, an estimate was provided only in the NIR and the changes could not be computed.

- **(Attainment)** The 2018 attainment of the foreseen LPG vehicle estimates is computed for 8 MSs, resulting in 21 attainment values. They range across EU from 32.05% (Slovenia) to 97.49% (Portugal) for 2020, from 20.54% (Spain) to more than 100% (Italy) for 2025, and from 8.22% (Spain) to 96.59% (Italy) for 2030. Two Member States (Denmark and France) foresee lower LPG vehicle fleets from 2020 onwards and Portugal from 2025 onwards.

- **(Progress)** Comparing the 2016-2018 LPG vehicles evolution with the 2016-2030 foreseen evolution, seven progress values are determined. They range from -14.33% (Greece)[9] to 76.53% (Italy). For three Member States (Denmark, France and Portugal),

[8] Member States are ordered by their estimated fleet of LPG vehicles (from high to low values).
[9] The negative value of progress for Greece means that a lower number of LPG vehicles was recorded in 2018 in comparison with 2016, however an increase of LPG vehicles above the value recorded in 2016 is estimated for the next decade.

the progress was not computed since they foresee a decreasing trend of their LPG vehicle fleets in the future.

LPG refuelling points

- **(Coverage)** Nineteen MSs (68%) have provided at least some historical data (2016-2018) in their NIRs. Ten MSs (36%) have declared at least one target for the decade 2020-2030.
- **(Change)** Because only five MSs had provided targets for the future in the NPF, only these MSs allow change computing. Greece and Portugal preserved in their NIRs the NPF targets, while Spain, Cyprus and Hungary have decreased their targets. In other 15 cases, targets were provided only in the NIR and the changes could not be computed.
- (**Attainment)** The 2018 attainment of the foreseen LPG refuelling points targets is computed for 7 MSs, resulting 13 attainment values. They range across EU from 25.00% (Cyprus) to 100% (Slovakia) for 2020, from 70.00% (Greece) to 99.18% (Slovakia) for 2025, and from 94.53% (Czechia) to 99.18% (Slovakia) for 2030. Three Member States (Denmark, Lithuania and Hungary) foresee a decrease of LPG refuelling points from 2020 onwards and Portugal from 2025 onwards.
- **(Progress)** Only two progress values are calculated (Czechia 42.7% and Slovakia 95.4%).

Measures

- The level of NIR's ambition vs NPF for legal measures is assessed for six MSs, and for three of them the level is increased.
- From the eight NIRs containing assessable policy and deployment & manufacturing support measures for this cluster, only Spain and Portugal had a medium score and only Spain a medium level of impact, the rest had low level impact. The level of ambition is similar to the one in the NPF for four NIRs.
- The level of NIR's ambition vs NPF for RTD&D measures is assessed for four MSs, and for three of them the level is considered increased.

4.1.2 *Rail transport*

4.1.2.1 Electricity

AFV

Six MSs[10] have provided in their NIRs the existing numbers of locomotives in the period 2016-2018 and at least one estimate for the next decade.
Six MSs[11] have provided only the existing numbers of locomotives.

4.1.2.2 Hydrogen

AFV

Germany has reported the existence of two hydrogen locomotives in 2018, while France, the Netherlands and Slovakia have announced plans for 15, 1 and 10 hydrogen locomotives, respectively within the next decade.

4.1.3 *Waterborne transport (maritime and inland)*

4.1.3.1 Electricity

AFI

Around 48% of the MSs that should have reported about the shore-side electricity supply infrastructure for their maritime ships have provided at least some historical data (2016-2018) while around 39% have declared at least one target for the decade 2020-2030. In the case of waterborne inland transport, these percentages become 42% of the MSs providing at least some historical data (2016-2018) and 32% declaring at least one target for the decade 2020-2030.

Figure 4.1.3-1 summarises the information for the shore-side electricity supply for waterborne transport (maritime and inland) as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

[10] Belgium, Czechia, Denmark, Lithuania, Hungary and Romania
[11] Germany, Greece, Austria, Portugal, Sweden and United Kingdom

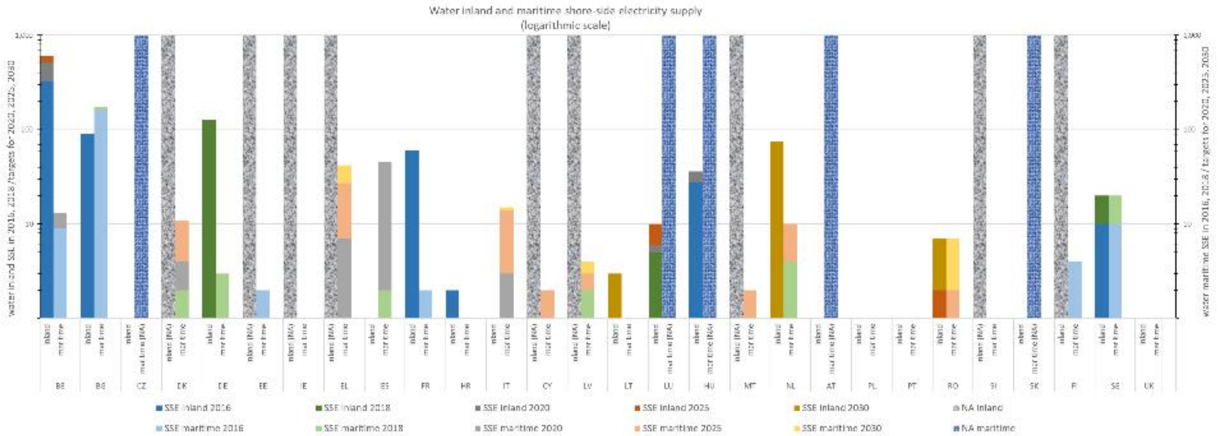

Figure 4.1.3-1 Shore-side electricity supply targets for 2020, 2025 and 2030 (maritime and inland waterborne transport)

4.1.3.2 LNG

AFI

Around 52% of the MSs that should have reported about the LNG supply infrastructure for their maritime ships have provided at least some historical data (2016-2018) while around 62% have declared at least one target for the decade 2020-2030. For the waterborne inland transport these percentages become 53% of the MSs both for providing at least some historical data (2016-2018) and declaring at least one target for the decade 2020-2030.

Figure 4.1.3-2 summarises the information for the LNG refuelling supply for waterborne transport (maritime and inland) as provided in the NIRs for the next decade as well as the 2016 and 2018 situation.

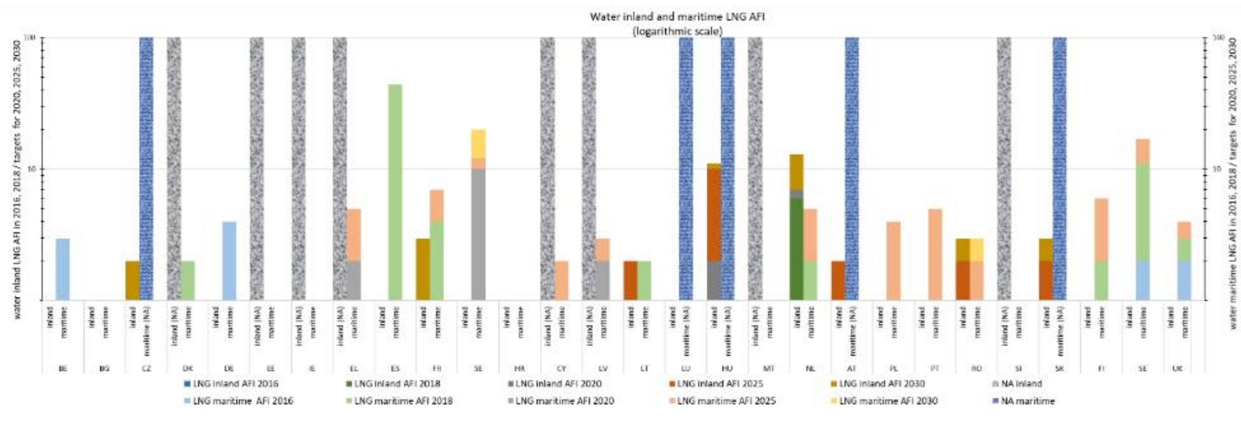

Figure 4.1.3-2 LNG refuelling supply targets for 2020, 2025 and 2030 (maritime and inland waterborne transport)

4.1.4 *Air transport*

4.1.4.1 Electricity

AFI (electricity supply for stationary airplanes)

Eight MSs[12] have provided in their NIRs the existing numbers of electricity supply for stationary airplanes in the period 2016-2018 and at least one estimate for the next decade. Two MSs[13] have provided only the existing numbers of electricity supply for stationary airplanes.

Changes could be computed for only three MSs: Luxembourg has increased its targets while Netherlands and Austria have similar targets as in the NPF.

4.2 Strengthening EU competitiveness and jobs

4.2.1 *Method to assess the strengthening of the EU's competitiveness and jobs*

A computational model was developed for calculating the value creation and employment effects resulting from AFI build-up as described in the NPFs and revised in the NIRs. It outputs Member States' domestic as well as the EU-wide effects resulting from infrastructure production and installation. Types of infrastructure covered by the model include electricity recharging points and CNG, LNG and hydrogen refuelling points for road transport.

4.2.1.1 Calculating the Gross Value Added (GVA) through AFI build-up

Figure 4.2.1-1 shows a model flowchart for the calculation of the domestic economic effects of recharging point build-up in a Member State. The calculations are intended to cover the period 2019-2030 by considering three sub-periods dictated by the years for which targets were requested by the Directive (i.e. 2019-2020, 2021-2025 and 2026-2030) and they are adapted to the AFI targets provided by the Member States. For each infrastructure type, Member State and sub-period, AFI build-up targets are derived in a first step, calculated as the target number of recharging or refuelling points for each requested year (2020, 2025 and 2030) minus the previously built or targeted number as given in the NIR[14] (e.g. 2020-2018, or 2025-2020, or 2030-2025). Summed over Member States, the number of total planned AFI of each type in the EU is obtained. AFI build-up is assumed to be linear for each sub-period in the model.

[12] Bulgaria, Greece, Spain, Lithuania, Luxembourg, Netherlands, Austria and Romania

[13] Ireland and Hungary

[14] Or in the NPF or EAFO, if absent in the NIR

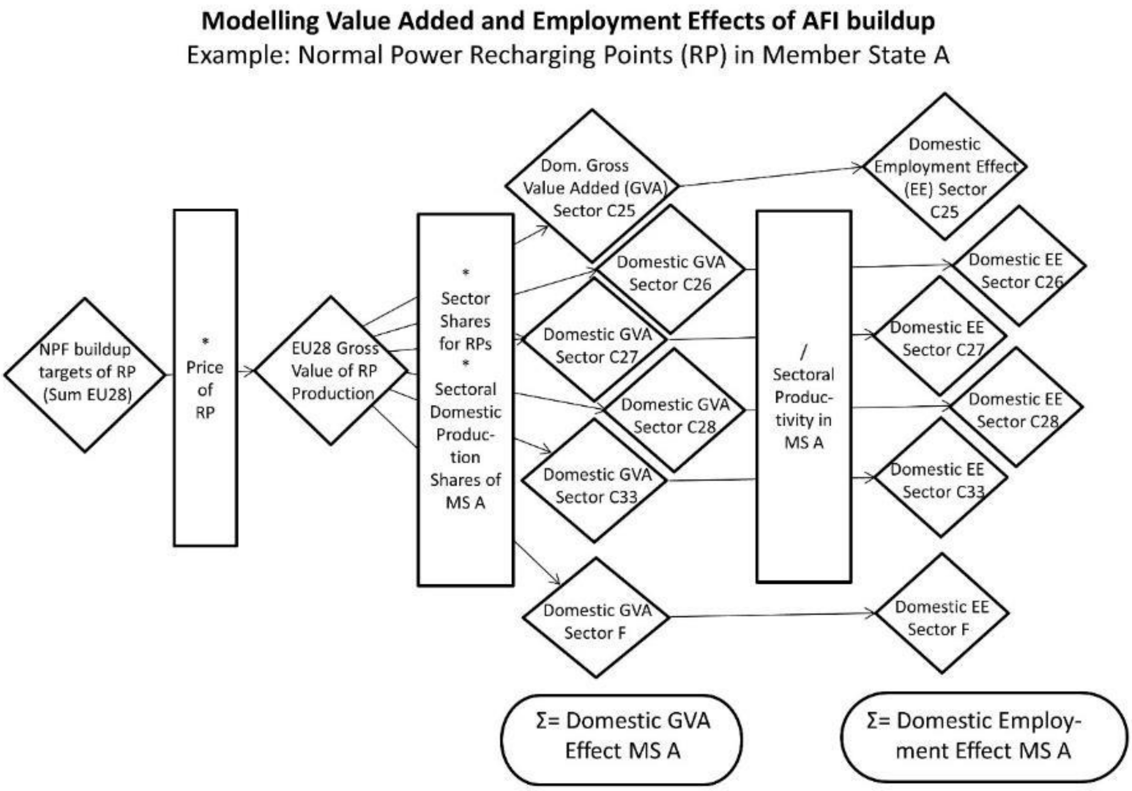

Figure 4.2.1-1 Flowchart of Added Value and Employment Calculation

Annual numbers of new AFI installed are multiplied by their net market prices to derive the Gross Value of Production (GVP). As the market price of a technology includes all value added along the value chain, it is a reasonable proxy for the calculation of gross value of production added.

In a next step, the share of each Member State in the production and installation of AFI needs to be determined, and imports from outside the EU need to be deducted. As the share of imported preliminary products differs among economic sectors, the GVP is sub-split. This is done by assigning the different technological components of an AFI installation (and thus their costs) to different economic sectors, on the basis of data on the composition and prices of the different AFI types. Price information was taken from studies and industry sources (Steer Davies Gleave, 2016), (Ludwig-Bölkow-Systemtechnik, 2016), (Nationale Plattform Elektromobilität (NPE), 2015), (European Commission, 2020). AFI GVP is assigned to the following sectors (in line with Eurostat NACE Rev. 2):

Table 4.2.1-1 Economic Sectors Considered

Sector	Fabricated metal products, except machinery and equipment	Computer, electronic and optical products	Electrical equipment	Machinery and equipment n.e.c.	Repair and installation services of machinery and equipment	Constructions and construction works
Eurostat Sector Number	C25	C26	C27	C28	C33	F

For each of these sectors, the sectoral GVP is multiplied by the sectoral domestic production share, yielding the sectoral domestic GVA for each of the six sectors for the AFI type and Member State under consideration. By default, the sectoral domestic share in AFI production in each Member State is assumed to be equal to the Member State's present sectoral share of production value within the EU, which is derived from Eurostat data[15]. The model allows reallocating domestic production shares as well as import shares from outside the EU for scenario analysis.

The national GVA effect resulting in the sectors C25, C26, C27 and C28 from the production is allocated completely (adjusted by preliminary imports) to the producing country. The costs of installing a recharging or refuelling point, occurring in sectors C33 and F, is divided into a GVA effect in the producing country and the country that installs the infrastructure.

Summing over the sectors, the Member States' domestic GVA effect from the particular infrastructure type results. For each Member State, total sectoral GVA effect includes the domestic effect of own AFI installation and the Member States exports of preliminary products for AFI installation to other EU countries. The sum over all AFI types per Member State is the total national GVA effect from the EU-wide implementation of AFI targets as envisaged in the NPFs and revised in the NIRs, and the sum over all Member States yields the EU-wide effect. AFI maintenance costs are included via a multiplier representing annual costs as percentage of total investment per facility.

4.2.1.2 Calculating the employment effect of AFI build-up

As shown in Figure 4.2.1-1, the employment effect of building a given type of infrastructure in each Member State is derived from domestic GVA per sector, dividing it by productivity. This yields the amount of person-years required to build the AFI envisaged in the NPF and revised in the NIR, which is assumed to translate into employment.

As labour productivity varies for each Member State and sector, this calculation is done on sectoral level. Data on the number of persons employed in the production of AFI is not available, thus productivities in the sectors contributing to AFI build-up (see Table 4.2.1-1) were used. These were derived by dividing each Member State's sectoral gross value added by the number of employed persons, both taken from Eurostat[16].

The domestic employment effect is derived by aggregating over all sectors, and the EU-wide effect by then aggregating over all Member States.

4.2.1.3 Sensitivities and scenario analysis

The model allows for running scenarios on a wide number of parameters. These include, for example:

- The allocation of AFI production and installation, intra-EU and international,
- Technology costs and sectoral shares,

[15] Total imports and EU-internal imports for each Member State are available from Eurostat at http://appsso.eurostat.ec.europa.eu/nui/show.do?wai=true&dataset=nama_10_exi, input-output tables for all member states based on http://ec.europa.eu/eurostat/de/web/esa-supply-use-input-tables/data/workbooks.

[16] Annual enterprise statistics for special aggregates, http://ec.europa.eu/eurostat/data/database.

- Technology types, e.g. normal power (≤22kW) vs. high power (>22kW) recharging points, number of points per recharging or refuelling station, etc.,
- The time frame of AFI build-up, and
- Labour productivity.

4.2.2 *Assessment of the strengthening of the EU's competitiveness and jobs*

The effects of AFI infrastructure build-up were calculated using the model described above (subsection 4.2.1). The model was run using AFI build-up targets for the different road transport AFI types (recharging points, CNG, LNG and hydrogen refuelling points) for the periods 2019-2020, 2021-2025 and 2026-2030. Table 4.2.2-1 shows the EU-wide value added and additional labour demand that can be achieved by fulfilling the targets for publicly accessible recharging points and CNG, LNG and hydrogen refuelling points for the next decade provided by the Member States in their NPF and revised in the NIR. The total value-added until 2030 sums up to more than 26 billion € with annual effects ranging from roughly 580 to 4,300 million €. The economic effect is strongest for the period 2026-2030, as the Member States foresee a significant increase of the number of AFI towards the end of the decade. The annual effects for the 2021-2025 period are smaller since several MSs did not provide targets for the year 2025 (in this case, if a target is provided for 2030, the model considers that all infrastructure build-up and the associated economic benefits related to the 2030 target take place in the period 2026-2030).

Table 4.2.2-1 Gross Value Added (GVA) and Employment Effects of Implementing the AFI targets for each year between 2019 and 2030

Years	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
GVA (million EUR)	576	594	884	910	936	962	988	3,930	4,028	4,126	4,223	4,321	**26,477**
Employment (person-years)	8,691	9,067	13,018	13,477	13,928	14,385	14,838	57,841	59,561	61,281	63,001	64,720	**393,808**

The total effect on labour demand amounts to roughly 394,000 person-years until 2030, again with higher effects of around 60,000 persons per year during the last period 2026-2030. Additional employment effects could be triggered by the substantial deployment of private recharging points that several MSs refer to in their NPF/NIR, but are not considered in this analysis. In conclusion, a consistent EU-wide build-up of alternative fuels infrastructure could trigger a sustained positive employment effect, and could contribute to translating the temporary extra labour demand resulting from NPFs and NIRs into permanent jobs. Moreover, the respective qualification of workforce, which is more likely to occur in the presence of longer-term targets, can support the maintenance or increase of domestic shares in AFI production and installation. This again can have a positive impact on the EU sector's competitiveness.

EUROPEAN
COMMISSION

Brussels, 16.2.2022
SWD(2022) 33 final

PART 3/4

COMMISSION STAFF WORKING DOCUMENT

Updated detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure. Implementation of Art 10 (3) of Directive 2014/94/EU

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5 FULL ASSESSMENT OF MEMBER STATES' NIRS

5.0 Assessment of the Member States National Implementation Reports (NIRs)

The following sections present the assessments of each individual NIR. The official date for the submission of the NIRs to the Commission was 18 November 2019. By that date only nine of the expected 28 NIRs had been delivered (by Belgium, Czechia, Germany, Ireland, Greece, Spain, Austria, Poland and Slovakia). Thus, an extension was granted to the remaining MSs to submit their NIRs. By the 1st of May 2020, which was the ultimate date for submitting the missing NIRs, as agreed between the Commission and the Member States, 3 NIRs were still outstanding. It was thus decided to prepare the previous Staff Working Document SWD/2021/0049 final (European Commission, 2021a) on the basis of the 25 Member States that had delivered their NIRs (i.e. without Italy, Portugal and UK).

The United Kingdom delivered its NIR in September 2020, followed by Portugal. Italy sent its NIR at beginning of 2021. This SWD includes all the 28 NIRs.

Similarly to the NPF reports, the NIRs vary in terms of length (from a minimum of 3 pages to a maximum of 205 pages) and level of detail provided for each of the subsections. However, there is an overall improvement in the consistency of the reports among MSs compared to the NPFs. Several MSs followed rather closely the structure of the requirements listed in Annex I of the Directive and the guidance documents provided by the Commission for the reporting. The remaining countries structured their reports differently, with some substantial deviations from both Annex 1 and the guidance documents.

Although the completion and delivery of the Excel® reporting template provided by the Commission was not a mandatory requirement of the Directive, 19 MSs have submitted the template as an annex separate to the report. From the remaining 9 MSs that have not submitted a separate Excel® template, 6 MSs included some tables into the main body of the report.

In conclusion, although there has been an overall improvement in the quality and consistency of the NIRs when compared to the NPFs, there are still several important gaps and flaws in the information reported by the MSs. The late delivery of the NIRs still represents a big problem for the majority of the MSs, with obvious consequences on the preparation and publication of their assessment by the Commission. When there was the suspicion that a NIR presented mistakes, the MS was asked to provide clarification. Unfortunately this was not always feasible and the assessment of some NIRs would not have been possible without filling some gaps, or retrieving additional information. In such circumstances, the assessor would collect the necessary data (for example from the NPF, when such value was not reported in the NIR, or using a value from EAFO[1], when both the NIR and NPF were lacking information), and highlight it in the assessment report. However, this has shifted the burden of the reporting (and the assumptions that underpin such process) onto the Commission.

5.0.1 *Structure of the assessment report*

The assessment of the individual NIR is based on the assessment methodology described in Chapter 2 and follows a fixed structure, which consists of:

[1] EAFO. (2020). European Alternative Fuels Observatory (EAFO). European Commission (EC). Retrieved from https://www.eafo.eu on 01/02/2020.

1. Main messages from the Commission assessment of the NPF
2. Overview of the fulfilment of the requirements in Annex I of the Directive
3. Quantitative assessment: vehicles and infrastructure
4. Measures assessment
5. Additional information on alternative fuels infrastructure developments
6. Summary of the assessment
7. Final remarks
8. ANNEX: Description of the Member State

Before explaining each point in more detail, it is important to stress that the assessment of the MS NIRs is carried out principally with reference to the Directive and to the respective NPF. This is particularly important when looking at the comparison of the ambition level between NIR and NPF concerning the AFV estimates and AFI targets, and concerning the measures. These assessments are "internal", in the sense that they refer to what has been presented in the NIR compared to what had been presented in the NPF by the same MS. It would be wrong to make a comparison among Member States based on such considerations. Furthermore, point seven (Final remarks) contains the concluding remarks from the Commission, based on the assessment of the national implementation reports of each Member State. In this section, the Commission might provide some additional comments on the latest development of the European policies on alternative fuels transport systems and infrastructure (for example the Green Deal).

5.0.2 *Main messages from the Commission assessment of the NPF*

The NIR assessment reports start with an excerpt from the Commission assessment of the NPFs (European Commission, 2019). This excerpt is the summary of the NPF assessment for each MS and provides the background for a better understanding of how the NIRs relate to the initial plans of the MS, as reported in the NPF.

5.0.3 *Overview of requirements' fulfilment from Annex I of the Directive*

The Directive requested the MSs to prepare and submit their NIRs in accordance with the requirements listed in Annex I. In this second section of the assessment report, a table (the Check List) that looks like Table 5.0.3-1 shows how each MS complied with this request.

Table 5.0.3-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne (inland) / Electricity, CNG, LNG, H2		Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne (inland) / Electricity, CNG, LNG, H2		Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / Electricity, LNG, H2		Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road / Electricity, LNG, H2		Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, waterborne (inland) / Electricity, CNG, LNG, H2, LPG		Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)			Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes			Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	All	All	Y

The first two columns report the content of Annex I to the Directive. The third column shows for which transport mode and alternative fuels the MS provided the required information in its NIR. When an alternative fuel or a transport mode is explicitly mentioned in the NIR, then it is

mentioned also in column three; when all alternative fuels and/or transport modes are mentioned, this is indicated by the word “All”. If instead in the NIR there was just a generic mention of the AF/transport mode, this is indicated by using the word “Combination” or “AF (in general)”.
Because there was no agreed methodology to assign a score to the level of quality and detail of the information provided, no score is provided here, but only a flag. When at least some information is reported in the third column, in the fourth column there is a “Y or Yes” (on a green background), otherwise there is an “N or No” (on an orange background) [2].

5.0.4 *Quantitative assessment: Vehicles and infrastructure*

This section starts with a table that looks like the following:

Table 5.0.4-1 National AFV estimates and AFI targets established in one NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	3,169	749	9,877	1,300	76,833	6,200	217,179	19,000
	Change NIR vs NPF [%]			-41.90%	0.00%	-23.93%		-13.13%	
	Attainment [%]			32.08%	57.62%	4.12%	12.08%	1.46%	3.94%
CNG / road	NIR	22,109	185	25,670	186	36,965	300	46,340	600
	Change NIR vs NPF [%]			-48.66%	-7.00%	-71.57%	0.00%	-76.83%	76.47%
	Attainment [%]			86.13%	99.46%	59.81%	61.67%	47.71%	30.83%
LNG / road	NIR	2	1	80	3	2,300	14	6,900	30
	Change NIR vs NPF [%]			-55.56%	100.00%	360.00%	180.00%	430.77%	114.29%
	Attainment [%]			2.50%	33.33%	0.09%	7.14%	0.03%	3.33%
LNG / water (inland)	NIR	0	0	0	0	20	0	40	2
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	1	0	3	4	13,380	20	62,559	95
	Change NIR vs NPF [%]						400.00%		
	Attainment [%]			33.33%		0.01%		0.00%	
H2 / water (inland)	NIR	0	NA	0	NA	5	NA	20	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	170,300	950	190,300	995	256,050	995	256,650	1,005
	Change NIR vs NPF [%]								
	Attainment [%]			89.49%	95.48%	66.51%	95.48%	66.35%	94.53%

For each AF/transport mode pair, the table shows three rows. The first row displays the state of play reported by the MS in the NIR in 2018 for AF vehicles/vessels/locomotives/airplanes

[2] For Belgium there is an additional column, which has been deemed useful to provide some additional, necessary information.

(AFV) and for their respective infrastructure (AFI). If the NIR did not report any data but the NPF did, then the latter is shown[3]. Then, the AFV estimates and AFI targets for the years 2020, 2025 and 2030 are also reported as given in the NIR. The second and third rows present the results of the calculations regarding changes between NIR and NPF, and attainment. These calculations follow the procedure explained in subsection 2.1.2 and subsection 2.1.4 of the assessment methodology.

As a general rule, the table shows the following AF/transport mode pairs for which the AFI Directive included specific infrastructure deployment requirements in its articles:

- Electricity/road (Article 4(1))
- CNG/road (Article 6(7))
- LNG/road (Article 6(4))
- LNG/waterborne maritime (if applicable to the MS) (Article 6(1))
- LNG/waterborne inland (if applicable to the MS) (Article 6(2))

If the MS has provided additional information in its NIR regarding other AF/transport mode pairs, these are also shown in the table. For example, the Table 5.0.4-1 also includes data on hydrogen/road because they were in the NIR of that MS.

The assessment report continues with the presentation and analysis of the most important points from Table 5.0.4-1. The order of such presentation is the following:

1. **Road**
   1.1. Electricity
   - Vehicles
   - Infrastructure
   - Ratio
   - Information on charging efficiency

   1.2. CNG
   - Vehicles
   - Infrastructure
   - Ratio

   1.3. LNG
   - Vehicles
   - Infrastructure
   - Ratio

   1.4. Hydrogen
   - Vehicles
   - Infrastructure
   - Ratio

   1.5. Biofuels
   - Vehicles
   - Infrastructure

[3] If the MS did not provide any information for the 2016-2018 period, neither in the NIR nor in the NPF, data from EAFO is used, if available.

- Ratio

1.6. LPG
- Vehicles
- Infrastructure
- Ratio

1.7. Other AF (if applicable)
- Vehicles
- Infrastructure
- Ratio

2. Rail

2.1. Electricity (if applicable)
- Vehicles
- Infrastructure

2.2. LNG (if applicable)
- Vehicles
- Infrastructure

2.3. Hydrogen (if applicable)
- Vehicles
- Infrastructure

2.4. Biofuels (if applicable)
- Vehicles
- Infrastructure

3. Waterborne maritime (if applicable to the MS)

3.1. Electricity (if applicable)
- Vessels
- Infrastructure (shore-side electricity supply)

3.2. LNG (if applicable)
- Vessels
- Infrastructure

3.3. Hydrogen (if applicable)
- Vessels
- Infrastructure

3.4. Biofuels (if applicable)
- Vessels
- Infrastructure

4. Waterborne inland (if applicable to the MS)

Same scheme as for waterborne maritime

5. Air

5.1. Electricity (if applicable)
- Airplanes
- Infrastructure (electricity supply for stationary airplanes)

5.2. Biofuels (if applicable)

- Airplanes
- Infrastructure (renewable jet fuel refuelling points in airports within the TEN-T Core Network)

It shall be noted that only for the pairs of alternative fuels and road, in addition to the analysis of vehicles and infrastructure, there is a point called "Ratio", which is also indicated as "Sufficiency index", representing the proportional relation between alternative fuels vehicles and infrastructure (see subsection 2.1.5 of the assessment methodology and (European Commission, 2019)). In particular, for the electricity/road pair, an assessment is provided concerning the adequacy of the ratio between the number of vehicles and the number of recharging points, either for the period 2016 - 2018, or estimated for 2020, 2025 and 2030. The adequacy assessment is based mainly on the indicative threshold value of 10, as mentioned by the Directive[4]. However, the share of high power (>22kW) recharging points in the total publicly accessible recharging points is also taken in consideration.
For the CNG/road pair, the adequacy assessment is based on the indicative value of 600 as considered in (European Commission, 2019)[5]. For all the other AFs/road pairs, only the sufficiency index is shown, without any comment.
The electricity/road pair has also an additional point on "Information on charging efficiency", which is a specific requirement of Annex I to the Directive[6]. When available in the NIR, this information is summarised in the assessment report.

5.0.5 *Measures assessment*

This part of the assessment report is carried out as described in the assessment methodology (Section 2.2). It contains five headings. Headings 1, 2, 3 and 5 are dedicated to the description and analysis of the main points related to the four different classes of measures required by Annex I of the Directive; heading 4 shows the result of a more detailed assessment of the Policy and Deployment & Manufacturing measures, as described in Section 2.2.

1. Legal measures
    - Legislative & Regulatory
    - Administrative
2. Policy measures
    - Measures to ensure national targets and objectives
    - Measures that can promote AFI in public transport services
    - Measures that can promote the deployment of private electro-mobility infrastructure
3. Deployment and manufacturing support
    - AFI deployment

[4] "As an indication, the appropriate average number of recharging points should be equivalent to at least one recharging point per 10 cars".
[5] The average ratio in Member States between conventional vehicles and gasoline/diesel refuelling points is 600 to one (one fuel station typically has several refuelling points).
[6] According to the Commission Frequently-Asked Questions document notified to the Member States on 16 September 2019, complying to this requirement can be ensured by providing information on usage from a representative sampling of high power recharging points.

- Support of manufacturing plants for AF technologies
- Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

4. Quantitative assessment of Policy and Deployment & Manufacturing support measures
5. Research, Technological Development & Demonstration

Concerning heading 4, the results of the quantitative assessment of Policy and Deployment & Manufacturing support measures are presented in a table like the following (see also Section 2.2.6):

Table 5.0.5-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	M	C	**M**	+
LNG	Road	L	N	**L**	+
	Water - maritime				
H2	Road	M	N	**L**	+
LPG	Road	L	N	**L**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

Similarly to the quantitative assessment of vehicles and infrastructure, the table presents always the results for the five pairs, regardless of whether a cluster of measures was found or not: electricity/road, CNG/road, LNG/road, LNG/waterborne maritime (if applicable to the MS) and LNG/waterborne inland (if applicable to the MS). In addition to that, if the NIR has provided evidence of Policy and Deployment & Manufacturing support measures for other AF/transport mode pairs, they are shown in the table. In the example above, the MS has not presented any measure regarding LNG/water-maritime transport, while the pair LNG/water-inland transport was not applicable to that MS (thus it is not shown).

5.0.6 *Additional information on alternative fuels infrastructure developments*

Annex I to the Directive also offered Member States the possibility to provide additional information in their NIR on AF consumption data, past and projected, plus any other comment or data not included in the list of the requirements for the compilation of the NIR.
Any information provided by the MS in its NIR is presented and commented in this section.

5.0.7 *Summary of the assessment*

This section starts with a table providing an overview as follows:

Table 5.0.7-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode						
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	10,667	4,785	318	NA	NA	12	14,823
		Situation (2018)	32,508	12,393	960	1	NA	28	41,085
		Estimate (2030)	5,000,000	200,000	25,000	12	NA	1,000	500,000
		Future share (2030) [%]	15.56%	0.62%	2.57%			0.00%	1.56%
		Estimate attainment (2018 vs 2030) [%]	0.65%	6.20%	3.84%	8.33%		2.80%	8.22%
		Progress (2018)	adequate	adequate	2.60%	8.33%		1.62%	5.41%
Publicly accessible AF Infrastructure		Past situation (2016)	4,547	34	15	NA	NA	6	468
		Situation (2018)	5,187	60	34	43	NA	4	589
		Target (2030)	NA	NA	NA	43	NA	NA	NA
		Target attainment (2018 vs 2030) [%]				100.00%			
		Progress (2018)	slow	adequate		100.00%			
Sufficiency Index		2016	2.35	140.74	21.20			2.00	31.67
		2018	6.27	206.55	28.24			7.00	69.75
		2020	15.00	153.33	23.53			8.33	153.85
		2025	47.06	500.00	63.64			13.33	266.67
		2030							
Measures	Legal measures	Ambition (NIR vs NPF)	+	=	=	+		+	=
	Policy measures + Deployment & manufacturing support	Score	M/H	M	M	M/H		M	M
		Comprehensiveness	C	C	C	C		C	C
		Impact	M/H	M	M	M/H		M	M
		Ambition (NIR vs NPF)	+	+	+	+		+	=
	RTD&D	Ambition (NIR vs NPF)	+	+	+	+		+	+

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

Table 5.0.7-1 provides a synthesis of the following elements:

- AFV/AFI state of play in 2016
- Main elements of Table 5.0.4-1 presented in point 5.0.3 (i.e. the situation at the end of 2018 and the objectives for 2030)
- Sufficiency indexes for the pairs AF/road
- Main outcome of the measure assessment

In addition to the above, for the vehicle and the infrastructure parts of the table, information on the progress in 2018 is provided, calculated according to the procedure described in the assessment methodology (Section 2.1.3). For the vehicle part, the future share in 2030 of AF road vehicles is also provided for each alternative fuel. This share is calculated by dividing the 2030 vehicle estimate provided in the NIR by the total vehicle fleet in the same year[7]. For all alternative fuels (excepting LNG) corresponding to road transport mode, the total number of relevant vehicles was considered as the number of all vehicles excluding powered two wheelers (i.e. sum of light and heavy-duty categories of vehicles). For LNG vehicles, only the heavy-duty category was considered.

[7] Similarly to the NPF assessment, these future total fleet values are based on the Baseline scenario of the Impact Assessment accompanying the Proposal for a Directive amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures (SWD/2017/0180), and thus on the EU Reference scenario 2016, but excludes the incentives for alternative fuels provided at the Member State level. It has been developed with the PRIMES-TREMOVE model (i.e. the same model used for the EU Reference scenario 2016) by ICCS-E3MLab.

After the table, this section of the assessment report presents a summary of all the preceding sections, in the same order.

5.0.8 *Final remarks*

This section provides final remarks addressing the following common elements:

- to what extent the Member State has fulfilled the requirements of Annex I to Directive
- to what extent the Member State is aligned with the overall objectives of the Directive
- how do the Member State planning, presented in the NPF and revised in the NIR, fits with the new objectives set in the Green Deal
- observations on benefits of additional action in specific areas

5.0.9 *ANNEX: Description of the Member State*

This section provides a general description of the Member State with special focus on the transport sector. This is similar to what had been presented in the NPF assessment report (European Commission, 2019), with the only difference that now all the data are updated to reflect the situation in 2018. A brief explanation on the data sources used is provided below.

Data on surface area and population is retrieved from the European Commission's Statistical Pocketbook 2019 (European Commission, 2019). Information on the number of main urban agglomerations (Eurostat, 2020a) and on the per capita gross domestic product at market prices and in purchasing power standards expressed in relation to the EU-28 average (Eurostat, 2020b) is retrieved from Eurostat.

Regarding information on the TEN-T Core Network two sources exist. The lengths of roads and inland waterways of the TEN-T Core Network are obtained from the TENtec portal (Mobility and Transport - European Commission, 2020) and complemented by general country-specific road network length data retrieved from the Statistical Pocketbook (European Commission, 2019) and (Eurostat, 2020c). Other specific information on the TEN-T Network, such as number of ports and airports, is in accordance with Regulation (EU) No 1315/2013 (European Parliament, 2013)

Information on the number of registered road vehicles for all vehicle categories is obtained from Eurostat (passenger cars (Eurostat, 2020d), light goods vehicles (Eurostat, 2020e), heavy goods vehicles (Eurostat, 2020f) and (Eurostat, 2020g), buses and coaches (Eurostat, 2020h)) or the Statistical Pocketbook (European Commission, 2019). When available and relevant, information from the Member State's NPF and/or NIR has also been considered.

5.1 Belgium (BE)

5.1.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Belgian NPF the Commission concluded:

The Belgian NPF fully addresses the requirements of Article 3. It contains tables of the current state and future estimates for alternative fuels vehicles in the transport sector. For all fuels and modes, it establishes targets as required by Article 3 of the Directive.

The Belgian NPF puts a lot of emphasis on electric cars. It contains high estimates for the future deployment of EV with an estimated roughly 1.3% electric vehicles on the road in 2020. Today, the spatial distribution of recharging points seems to appropriately cover the needs of electric vehicles in terms of distance requirements in Belgium. For the future, the targeted ratio of less than one public recharging point per 10 electric vehicles estimated for 2020 could evolve to become a barrier for the further market deployment of electric vehicles, especially in the Walloon and Brussels-Capital Region. This could also lead to market fragmentation within the EU. It will be important to closely monitor this development and correct infrastructure targets in line with the market developments. Belgium has also defined ambitious targets for electric buses, especially in the Brussels-Capital Region. Other initiatives for electrifying public transport, such as taxi fleets and carpooling are presented in the Belgian NPF. Electric bikes as well as their infrastructure also receive support. The Belgian NPF contains targets for further increasing shore-side electricity in its ports but no plans to increase the electricity supply for stationary airplanes.

The Belgian NPF sees a growing role for CNG cars. It contains modest estimates for the further evolution of CNG cars, with an estimated share of 0.6% on the road in 2020. Belgium has today a sufficient network of public recharging and CNG refuelling points.

LNG refuelling is planned for all maritime ports in the TEN-T Core Network and several inland ports. Furthermore, at least 2 LNG refuelling points for heavy-duty vehicles are targeted in the ports of Antwerp and Oostende. According to the results of a sector survey, that is mentioned in the NPF, these targets could be significantly exceeded. Altogether, the planned LNG refuelling points could guarantee that the maximum distance requirement for LNG refuelling points along the TEN-T Core Network would be fulfilled on Belgian territory.

The Belgian NPF displays a strong commitment towards hydrogen. The deployment of 19 publicly accessible hydrogen refuelling points in addition to the three existing is planned.

The Belgian NPF contains a comprehensive list of measures, most already in place and foreseen to stay. Most of them can be considered having a medium impact on market actor's decisions, especially for electric and CNG cars as well as electrification of public transport. The measures listed in the Belgian NPF differ for the three different regions (Flemish Region, Walloon Region, and Brussels Capital Region). A number of measures are defined at the federal level and apply for all three regions. The level of support varies greatly across the three regions. This could lead to a certain market fragmentation within the country.

The consideration of the interests of regional and local authorities, as well as stakeholders during the drafting of the Belgian NPF is evident throughout the text of the NPF.

Belgium is actively involved in coordinating its plans on alternative fuels infrastructure with the Benelux countries and is collaborating with them in this field. It may be advisable to extend this cooperation effort also towards other neighbouring countries such as France and Germany.

5.1.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.1.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No	Notes
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / All		Yes	
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	All / All		Yes	
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No	
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	All / All		Yes	No information provided at the federal level.
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Road / Electricity		Yes	Information provided only for Brussels-Capital.
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.	All / All		Yes	
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	All / All		Yes	
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, rail / Electricity, CNG		Yes	No information provided at the federal level, except for locomotives.
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, rail / Electricity, CNG, LNG, hydrogen, LPG		Yes	No information provided at the federal level, except for locomotives.
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, water / Electricity, CNG, LNG, hydrogen		Yes	No information provided at the federal level.
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points			No	
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)			No	Information provided at the federal level only for July / August 2019.

The checklist shows that almost all the requirements of Annex I from the Directive are covered, though not necessarily at federal level (see Section 5.1.3).

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; LNG for road and waterborne (inland and maritime) transport; CNG, hydrogen and LPG are partially covered for road transport; all the other combinations are either absent or not applicable.

The Belgian NIR reports 119 measures, most of them regional ones. Under the Policy and Deployment & Manufacturing sections it was possible to identify eight AF/transport mode clusters of measures, of which six were assessable.

5.1.3 *Quantitative assessment: Vehicles and infrastructure*

The Belgian NIR reports historical data and future vehicle estimates and infrastructure targets by region, without providing an aggregation at national level. Information on the number of locomotives is the only exception of figures being reported at federal level. Maritime-related data, which concerns only the region of Flanders, can also be considered an exception (i.e. representing the national level). To address this issue, we summed up the relevant values reported by the NIR for Flanders, Walloon and Brussels-Capital. Since there are differences in the type of information available in the NIR for each region, the values aggregated and used in this assessment sometimes reflect the values of two or even just one region. In the exceptional cases that this posed a clear distortion in comparison with the NPF, as in Table 5.1.3-1, we ignored the regional value(s) and indicated that the aggregate value was not available (NA). For simplicity, we do not indicate in this written assessment which value refers to which region(s) and we do not report values for specific regions, with the exception of LNG and hydrogen infrastructure. Thus, the reader should refer to the Belgian NIR for further details and be mindful that the Walloon data on infrastructure targets and vehicle estimates is, as the NIR states, "*for information only, as the Walloon Energy and Climate Plan is being amended in response to the Commission's comments*". It is recommended that for the next exercise the Belgian NIR is compiled at federal level only.

Table 5.1.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	43,599	3,530	83,669	7,300	359,402	35,400	1,446,286	**94,500**
	Change NIR vs NPF [%]			-3.43%	-12.30%				
	Attainment [%]			52.11%	48.36%	12.13%	9.97%	3.01%	3.74%
CNG / road	NIR	11,721	126	46,305	NA	151,744	NA	644,393	**593**
	Change NIR vs NPF [%]			8.75%					
	Attainment [%]			25.31%		7.72%		1.82%	21.25%
LNG / road	NIR	NA	4*	NA	NA	NA	NA	NA	≥25
	Change NIR vs NPF [%]								
	Attainment [%]								16.00%
LNG / water (maritime)	NIR	NA	NA**	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (inland)	NIR	NA	NA**	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	27	2*	32	≥2	NA	≥10	23,719	≥20
	Change NIR vs NPF [%]								
	Attainment [%]			84.38%				0.11%	
Shore-side electricity supply / water (maritime)	NIR		NA		13		NA		NA
	Change NIR vs NPF [%]				18.18%				
	Attainment [%]								
Shore-side electricity supply / water (inland)	NIR		NA		516		606		NA
	Change NIR vs NPF [%]				*0.58%*		*1.85%*		
	Attainment [%]								

Legend:		
	(grey)	not applicable
	(white)	the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken from EAFO 2018; **See Sections 5.1.3.3.2 and 5.1.3.4.2

Note: The **bold** values reflect the fact that the information was available for all the regions. AFI 2020 and 2025 values for CNG are reported in the NIR for the regions of Brussels-Capital and Flanders. However, they are not reported in this assessment due to the fact that this would have led to a strong reduction in percentage change NIR vs. NPF, which may not reflect the actual (unreported) country-wide target. Consequently, the 2020 and 2025 values are not shown in the ratio table of Section 5.1.3.1.2 either.

5.1.3.1 Road transport

5.1.3.1.1 Electricity

Vehicles

It is estimated that Belgium recorded around 43,599 battery-electric and plug-in hybrid electric vehicles in use in 2018 (Table 5.1.3-1), of which 43,181 were passenger cars (75% were plug-in hybrids). The estimate of 83,669 EVs for 2020 is 3.43% lower than the NPF estimate, signalling a slight decline in the level of ambition. The NPF lacked 2025 and 2030 estimates. The NIR reports an estimated value of 359,402 EVs in 2025 and 1,446,286 EVs in 2030. Specific data on the heavy-duty sector were not available.

The 2018 ***attainment*** of future EV estimates is 52.11% for 2020 and 3.01% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Belgium is equal to 37%.

Infrastructure

It is estimated that Belgium recorded around 3,530 publicly accessible recharging points in 2018 (Table 5.1.3-1). Limited information on the split between normal and high-power points is available in the NIR at regional level only. The estimated target of 7,300 points for 2020 is 12.30% lower than the NPF target, signalling a slight decline in the level of ambition. The NPF lacked 2025 and 2030 target. The NIR reports a target of 35,400 points in 2025 and 94,500 points in 2030.

Limited information on the number of private recharging points is available in the NIR at regional level only.

The 2018 ***attainment*** of future public recharging infrastructure targets is 48.36% for 2020 and 3.74% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Belgium is equal to 41%.

Ratio

Based on the BE NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that the sufficiency index was 12.35 in 2018. The foreseen sufficiency index is 11.46 in 2020, 10.15 in 2025 and 15.30 in 2030. Without specific information on the share of high power

(>22kW) recharging points, it is not possible to assess the adequacy of the sufficiency index in 2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	24.49	15.47	12.35	11.46	10.15	15.30

Information on charging efficiency

The only information found in the Belgian NIR relates to a project for the development of an AFI data collection methodology.

5.1.3.1.2 CNG

Vehicles

It is estimated that Belgium recorded around 11,721 CNG vehicles in use in 2018 (Table 5.1.3-1), of which 11,184 were passenger cars. The estimate of 46,305 CNG vehicles for 2020 is 8.75% higher than the NPF estimate, signalling a slight increase in the level of ambition. The NPF lacked 2025 and 2030 estimates. The NIR reports an estimated value of 151,744 CNG vehicles in 2025 and CNG vehicles 644,393 in 2030. Also in this case it was not possible to extract specific information on the heavy-duty sector.

The 2018 ***attainment*** of future CNG vehicles estimates is 25.31% for 2020 and 1.82% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Belgium is equal to 41%.

Infrastructure

It is estimated that Belgium recorded around 126 publicly accessible CNG refuelling points in 2018 (Table 5.1.3-1), an increase compared to the 98 points available in the three regions in the previous year. Concerning the 2020 and 2025 targets, the limited regional values reported in the NIR are well below the target of 333 points indicated in the NPF for 2020. The NPF lacked 2025 and 2030 targets. The NIR reports a target of 593 points in 2030.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 21.25% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Belgium is equal to 18%.

Ratio

Based on the BE NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index was well below the indicative value of 600 (see Section 2.1.5) in 2018 and was thus adequate to support CNG vehicle uptake. The foreseen sufficiency index instead exceeds this value by a large margin in 2030. As indicated above, the 2020 and 2025 values can only be computed at regional level.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	60.12	74.81	93.02			1,086.67

5.1.3.1.3 LNG

Vehicles

The Belgian NIR does not provide information on the number of LNG vehicles in use between 2016 and 2018 (Table 5.1.3-1). Both the NPF and NIR lacked future LNG vehicle estimates. For this reason the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Belgian NIR does not provide information on the number of publicly accessible LNG refuelling points in 2018. EAFO provides a value of four refuelling points in 2018. Whereas the NPF lacked targets for 2025 and 2030, the NIR provides only one regional target for 2030: 25 refuelling points in Walloon.

Based on the EAFO value, the 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 16.00% for 2030. Due to the lack of data, the ***progress*** could not be computed.

Ratio

Due to the lack of information in the BE NIR, the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) could not be computed for the pair LNG/road.

5.1.3.1.4 Hydrogen

Vehicles

It is estimated that Belgium recorded around 27 hydrogen vehicles in use in 2018 (Table 5.1.3-1), all of them being passenger cars. The NPF lacked future estimates. The NIR lacks 2025 estimates but provides the following ones for the Walloon region: 32 hydrogen vehicles in 2020 and 23,719 vehicles in 2030.

The 2018 ***attainment*** of future hydrogen vehicles estimates is 84.38% for 2020 and 0.11% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Belgium from 2016 until 2018 for hydrogen vehicles deployment is 0.07% of the overall planned deployment during the period 2016-2030.

Infrastructure

The NIR does not provide information on the state of play at end of 2018, but reports that two publicly accessible hydrogen refuelling points were available in Belgium in 2019, both in Flanders. According to EAFO there were 2 publicly accessible hydrogen refuelling points in use in 2018. Concerning the 2020 target, the only value reported in the NIR is for Walloon, with two points, thereby remaining well below the target of 22 points indicated in the NPF for 2020. The NIR also reports two private refuelling points for this region. Whereas the NPF lacked targets for 2025 and 2030, the NIR provides only the following two targets for Walloon: 10 refuelling points in 2025 and 20 in 2030.

Because there are no national hydrogen refuelling points estimates in the Belgian NIR, , the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the BE NIR, the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road could be computed only on a regional basis. The sufficiency index was equal to 5.00 in 2016 in Flanders, and is expected to be equal to of 16.00 in 2020 in Walloon and equal to 1,185.95 in 2030 again in Walloon.

5.1.3.1.5 Biofuels

Vehicles

Information is not available in the Belgian NIR.

Infrastructure

Information is not available in the Belgian NIR.

5.1.3.1.6 LPG

Vehicles

Based on the limited information provided in the NIR, Belgium recorded at least 10,219 LPG vehicles in use in 2018, all of them being cars. See also Section 5.1.4.1.1 for a relevant regional measure related to LPG vehicles. According to EAFO, Belgium recorded 26,690 LPG vehicles in 2016 and 25,686 in 2018.

Because there are no LPG vehicles estimates in the Belgian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Information is not available in the Belgian NIR. According to EAFO, in 2016 Belgium recorded 509 LPG refuelling points in 2016 and 520 in 2018.

Ratio

The following table shows the ratio between vehicles and publicly accessible LPG refuelling points (i.e. sufficiency index) for the pair LPG/road. The sufficiency index could only be computed for 2016 and 2018 by using data from EAFO.

Sufficiency Index		2016*	2017	2018*	2020	2025	2030
Road	LPG	52.44		49.40			

* data from EAFO

5.1.3.2 Rail transport

5.1.3.2.1 Electricity

Vehicles

The Belgian NIR indicates that the stock of electric railway vehicles was 1,036 in 2018, compared to 1,090 in 2016. The NIR provides the following estimates: 982 in 2020, 937 in 2025 and 950 in 2030.

Infrastructure

Information is not available in the Belgian NIR.

5.1.3.2.2 Hydrogen

Vehicles

The Belgian NIR indicates that "there are no plans to purchase any hydrogen locomotives".

Infrastructure

Information is not available in the Belgian NIR.

5.1.3.3 Waterborne transport (maritime)

5.1.3.3.1 Electricity

Vessels

Information is not available in the Belgian NIR.

Infrastructure

The Belgian NIR does not present data for 2018, but reports 11 shore-side electricity supply points in maritime ports in 2019, compared to 9 in 2016. The NIR target of 13 for 2020 is 18.18% higher than the NPF target, signalling an increase in the level of ambition. In contrast to the NPF, the NIR does not report 2025 and 2030 targets for shore-side electricity supply in maritime ports.

Because the 2018 value of shore-side electricity supply points was not provided, the 2018 ***attainment*** and ***progress*** could not be computed.

5.1.3.3.2 LNG

Vessels

The only information found in the Belgian NIR relates to the statement that LNG maritime vessels are under construction.

Infrastructure

The Belgian NIR indicates only that the availability of LNG in maritime ports went up from zero refuelling points to five between 2016 and 2019. The latter value can be compared with the NPF targets of at least four points in 2020, 2025 and 2030. The Belgian NPF reported three refuelling points in 2016.

Because the Belgian NIR does not report data on LNG refuelling points in 2018, the ***attainment*** and ***progress*** for that year could not be computed.

5.1.3.4 Waterborne transport (inland)

5.1.3.4.1 Electricity

Vessels

Information is not available in the Belgian NIR.

Infrastructure

Due to lack of data, it is not possible to report the state of play in 2018 in Belgium. The BE NIR indicates a value of 327 shore-side electricity supply in inland ports in 2016. The NIR target values of 516 for 2020 and 606 for 2025 are respectively 0.58% and 1.85% higher than the corresponding NPF targets, signalling a slight increase in the level of ambition. Both the NPF and NIR lacked 2030 targets.

Due to the lack of data, the ***attainment*** and ***progress*** figures for 2018 could not be computed.

5.1.3.4.2 LNG

Vessels

Information is not available in the Belgian NIR.

Infrastructure

The Belgian NIR indicates only that the availability of LNG in inland ports went up from zero refuelling points to two between 2016 and 2019. A regional value of one point in 2030 is also reported. These values can be compared with the NPF targets of two points in 2020 and three points in 2030.

Because the Belgian NIR does not report data on LNG refuelling points in 2018, the ***attainment*** and ***progress*** for that year could not be computed.

5.1.3.5 Air transport

5.1.3.5.1 Electricity

Airplanes

Information is not available in the BE NIR.

Infrastructure (for stationary airplanes)

Limited information on electricity supply for stationary airplanes is available in the NIR at regional level only.

5.1.3.5.2 Biofuels

Airplanes

Information is not available in the BE NIR.

Infrastructure

Information is not available in the BE NIR.

5.1.4 ***Measures assessment***

The Belgian NIR reports the information related to the measures at both federal and regional level. In some cases, the same type of measure (e.g. low-emission zones) is reported separately for more than one region. Furthermore, a few of the measures listed in the NIR as Legal and AFI deployment measures can be linked to Policy measures reported in a different section of NIR. To be in line with our assessment methodology, these are assessed only once. However, it shall be highlighted that this way of reporting increases the risk of double counting a given measure, with implications for the assessment of the measures' impacts. Finally, the Belgian NIR reports road vehicle data at regional level, thus, when possible, the assessment of the scope of a regional measure is assessed taking that into account. It is recommended that for the next exercise the Belgian NIR is compiled at federal level only.

The Belgian NIR reports 119 measures, most of them regional ones. As in the NPF, the measures listed in the NIR continue to differ for the three regions. Almost all the measures were in place during the implementation period. It is possible to identify six assessable AF/transport mode clusters for the quantitative assessment: electricity/road, electricity/water (maritime), electricity/water (inland), CNG/road, LNG/road and hydrogen/road (Table 5.1.4-1).

5.1.4.1 Legal measures

The Belgian NIR contains 38 legal measures, which represents a strong increase compared to the 15 measures identified in the NPF. The application level of these measures is as follows: 13% are federal (i.e. apply to the three regions), 34% to Flanders, 18% to Walloon and 34% to Brussels-Capital. Electricity for road features prominently, but other alternative fuels and transport modes are also considered.

5.1.4.1.1 Legislative & Regulatory

Of all the legal measures described in the Belgian NIR, 19 can be categorised as legislative and regulatory measures and include among others:

- Norms & requirements: the three federal measures identified deal with standards and fuel labelling and one in Walloon facilitates the development of renewable energy communities.
- Permits: Gradual tightening-up of the environmental criteria for licensed taxis in Flanders.
- Other: Brussels-Capital Region proposes the phasing-out of diesel vehicles in 2030, and petrol and LPG vehicles in 2035 at the latest as well as increased EV quotas for public authorities from 2020.

5.1.4.1.2 Administrative

Of all the legal measures described in the Belgian NIR, 19 can be categorised as administrative measures and include among others:

- AFV classification on environmental performance: Environmental criteria for car-sharing in Brussels-Capital.

- EU & international standards implementation: Decree establishing the electrical standards for shore-side recharging of vessels in Walloon.
- Other: Green Deal for Sustainable Urban Logistics in Flanders.

5.1.4.2 Policy measures

The Belgian NIR contains 35 policy measures, which also represents a strong increase compared to the 16 measures identified in the NPF. All the measures listed in the NIR, with one exception, were in place during the implementation period. The application level of these measures is as follows: 17% are federal (i.e. apply to the three regions), 34% to Flanders, 14% to Walloon and 34% to Brussels-Capital. Almost half of the policy measures target a combination of alternative fuels. Among the measures targeting a single AF, electricity features again prominently. Most of the measures focus on road transport. The majority of these measures have a financial nature (though information on the budget is very limited).

5.1.4.2.1 Measures to ensure national targets and objectives

Of all the national policy measures described in the Belgian NIR, 27 can be categorised as measures to ensure national targets and objectives. Among these, the following can be highlighted:

- Financial incentives: road tax exemption, zero-emission premium and ecology premium in Flanders; investment premium for new or converted LNG HCV in Walloon as well as for the replacement of polluting N1 vehicles in Brussels-Capital.
- Low-emission zones in Walloon and Brussels-Capital.
- Ecological investments, including shore-side electricity supply for seagoing vessels.

5.1.4.2.2 Measures that can promote AFI in public transport services

Of all the policy measures described in the Belgian NIR, six can be categorised as measures that can promote AFI in public transport services, of which four were present already in the NPF. Only one of them is a national measure. They tend to focus on the greening of the fleet, including procurement for buses and incentives for taxis fleets. None of them targets rail transport.

5.1.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Of all the policy measures described in the Belgian NIR, two can be categorised as measures that can promote the deployment of private electro-mobility infrastructure.

5.1.4.3 Deployment and manufacturing support

The NIR provides information on deployment and manufacturing support only at regional level.

5.1.4.3.1 AFI deployment

The Belgian NIR lists 17 AFI deployment measures, of which 6 were found also in the NPF. With one exception, all the AFI deployment measures target road transport. Almost 60% of the measures target electricity and 29% a combination of AFs. There is also one measure targeting LNG only and another one CNG only. Several measures related to the CEF project known as BENEFIC are listed by different regions. All the AFI deployment measures were in place during the implementation period. Their total budget, with one exception for which the budget is not reported, is about 37.5 million € for the period 2014-2022 (though most of it refers to 2016-2020). A significant proportion of this budget (17 million €) comes from loan support for electricity, CNG and LNG infrastructure in Walloon. Most of the rest of the budget is sourced from Flanders.

5.1.4.3.2 Support of manufacturing plants for AF technologies

The Belgian NIR reports four measures to support manufacturing plants for AF technologies, all of which related to MIVB-STIB (Maatschappij voor het Intercommunaal Vervoer te Brussel - Société des Transports Intercommunaux Bruxellois) and focusing on electricity for road in the Brussels-Capital region. For one of them, which was identified in the NPF, budget data is reported. For the rest, no information on budget is provided.

5.1.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

The Belgian government not only highlights cooperation with neighbouring countries but also reiterates in its NIR the need for interoperability and common standards for alternative fuels infrastructures.

5.1.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Bearing in mind the fact that most of the measures reported in the NIR are of a regional nature, Table 5.1.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, six[8] assessable clusters of measures on electricity, CNG, LNG and hydrogen for road transport and electricity for waterborne transport could be identified in the Belgian NIR. The measures for the pairs LNG/water maritime and LNG/water inland were not assessable.

None of the clusters have a high score. The cluster with the best rank, and the only one considered to be comprehensive, is electricity/road. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the partial or total lack of future targets and estimates and the regional nature of most of the measures does not allow a proper assessment. With this caveat, using the available information and applying the same criteria used for the other MS assessments, it can be suggested that the measures for the pair electricity/road might have a medium impact, while all the others appear to have a low impact.

Concerning the level of ambition, it has increased for the four clusters related to road transport.

Table 5.1.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

[8] In contrast to the NPF assessment, the clusters for LNG/water (maritime) and LNG/water (inland) can no longer be clearly identified, as measures relevant to these clusters tend to target a combination of AFs and/or modes.

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	M	N	**L**	+
LNG	Road	L	N	**L**	+
	Water - maritime	X			
	Water - inland	X			
H2	Road	L	N	**L**	+
Electricity	Water - maritime	L	N	**L**	=
	Water - inland	L	N	**L**	=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.1.4.5 Research, Technological Development & Demonstration

The NIR provides information on RTD&D at regional level, with the exception of the federal energy transition fund which has an annual budget of 25 million € and covers, among others, batteries and EVs (the total budget and duration are however not detailed).

The Belgian NIR contains 25 RTD&D projects, which represents a significant increase compared to the 6 RTD&D projects identified in the NPF. All the RTD&D projects were in place during the implementation period, with one-third of them having expired by 2019. The vast majority of these projects target road transport. Electricity dominates the list, hydrogen is also well-represented and combinations of AFs are also reported. Among the list of regional RTD&D projects, the following can be highlighted:

- Implementation of Ship Hybridisation project in Flanders, targeting hydrogen and with a total budget of ca. 6.8 million € for the period 2019-2022.
- Hydrogen call for Power-to-X projects targeting road transport in Walloon, with an indicative budget of 15 million € in 2019.
- Green approaches towards full solid-state batteries for EVs in Brussels-Capital, with a total budget of 0.8 million € for the period 2019-2022.

Budget information is provided for all the RTD&D projects listed in the NIR, often with information on annual values. In total, the budget of these projects exceeds 55 million € for the period 2016-2022. Information on the type of funding is not always provided.

5.1.5 *Additional information on alternative fuels infrastructure developments*

AFI developments (i.e. demand/supply) are available in the BE NIR at regional level. In addition, changes in fuel use between 2016 and 2018 are reported only for Walloon as follows: gasoline, diesel, electricity and CNG respectively accounted for 45.34%, 54.41%, 0.30% and 0.05% of fuel use in road transport in 2018. This can be correspondingly compared with 39.61%, 59.51%, 0.11% and 0.02% in 2016.

5.1.6 *Summary of the assessment*

Tabular overview

Table 5.1.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road
AF Vehicles / Vessels		Past situation (2016)	16,283	4,389	NA	NA	NA	10
		Situation (2018)	43,599	11,721	NA	NA	NA	27
		Estimate (2030)	1,446,286	644,393	NA	NA	NA	23,719
		Future share (2030) [%]	18.81%	8.38%				0.31%
		Estimate attainment (2018 vs 2030) [%]	3.01%	1.82%				0.11%
		Progress (2018)	adequate	adequate				
Publicly accessible AF Infrastructure		Past situation (2016)	665	73	2[1]	3[1]	NA	2
		Situation (2018)	3,530	126	4[2]	NA[3]	NA[3]	2[2]
		Target (2030)	**94,500**	**593**	≥25	NA	NA	≥20
		Target attainment (2018 vs 2030) [%]	3.74%	21.25%				
		Progress (2018)	adequate	adequate				
Sufficiency Index[4]		2016	24.49	60.12				5.00
		2018	12.35	93.02				
		2020	11.46					16.00
		2025	10.15					
		2030	15.30	1,086.67				1,185.95
Measures	Legal measures	Ambition (NIR vs NPF)	+	=	=			+
	Policy measures + Deployment & manufacturing	Score	M	M	L	X	X	L
		Comprehensiveness	C	N	N			N
		Impact	M	L	L			L
		Ambition (NIR vs NPF)	+	+	+			+
	RTD&D	Ambition (NIR vs NPF)	+	+	+			+

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

(1) Value taken from the NPF; (2) Value taken from EAFO; (3) See sections 5.1.3.3.2 and 5.1.3.4.2; (4) Values not necessarily representative at national level.

Note: The **bold** values reflect the fact that the information was available in the NIR for all the regions.

The Directive stresses the need for coordinated policy frameworks and the Belgian NIR highlights Benelux cooperation (examples of this includes the Benelux Talanoa Declaration adopted in 2018, the Benelux study on freight transport and the BENEFIC project) and policy coordination within Belgium. It is thus somewhat paradoxical that the Belgian NIR does not report the relevant AFV estimates and AFI targets at Member State level (Table 3 of the NIR provides figures only for 2019, of limited usefulness both as historical data and as future targets/estimates). As a result, the lack of aggregated input data has seriously jeopardised the assessment of the Belgian NIR. According to the NIR, "*the implementation of alternative fuels infrastructure is a regional competence*". However, by not aggregating the regional values reported in the NIR, the Belgian government delivered an inconsistent NIR and placed the burden of aggregation (and the assumptions that underpin such process) onto the Commission. The Belgian government is strongly encouraged to improve on this by notifying to the Commission in future implementation reports the information required in the Directive in an aggregated manner (i.e. at Member State level).

A clear statement of commitment to alternative fuels deployment in transport is found in the NIR for one region: "*the Flemish Region remains firmly committed to alternative fuels for transport*". Interoperability of recharging infrastructure is also mentioned as an important criterion in one of the reported measures (a map of recharging stations in Flanders was also included in the NIR). In the case of Walloon, infrastructure targets for publicly accessible LNG and hydrogen refuelling points are provided. Brussels-Capital continues to support alternative fuels in public transport.

Compared to the Belgian NPF that fulfilled all of the requirements of Article 3 of the Directive, the NIR addresses almost all the requirements of Annex I of the Directive. However, it cannot be stated that the Belgian NIR covers the whole AFID period (2016-2030), for it lacks infrastructure targets and vehicle estimates at Member State level for several years.

The main outcomes of the technical assessment of the Belgian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – It is estimated that Belgium recorded around 43,599 battery-electric and plug-in hybrid electric vehicles in use in 2018, of which 43,181 were passenger cars (75% were plug-in hybrids). The NIR reports an estimated value of 1,446,286 EVs in 2030. Specific data on the heavy-duty sector were not available. With reference to the objectives of the BE NPF as updated by the NIR, Belgium is progressing adequately. Concerning infrastructure, it is estimated that Belgium recorded around 3,530 publicly accessible recharging points in 2018. The NIR reports a target of 94,500 points in 2030. The 2018 progress is adequate also in this case, as the sufficiency index for the whole next decade.
- **CNG** – It is estimated that Belgium recorded around 11,721 CNG vehicles in use in 2018, of which 11,184 were passenger cars. The NIR reports an estimated value of 644,393 CNG vehicles in 2030. Also in this case it was not possible to extract specific information on the heavy-duty sector. The 2018 progress is adequate. It is estimated that Belgium recorded in 2018 around 126 publicly accessible CNG refuelling points. The NIR reports a target of 593 points in 2030. Belgium is progressing adequately also concerning the infrastructure uptake, however it has to be signalled a quite high sufficiency index (i.e. potentially inadequate) in 2030.
- **LNG** – The NIR does not report federal level data on LNG vehicles. Both the NPF and NIR lacked future LNG vehicle estimates. The BE NIR also lacks information on public LNG refuelling points. EAFO provides a value of four refuelling points in 2018. The expected number of publicly accessible LNG refuelling points in 2030 is at least 25.
- **Hydrogen** – It is estimated that Belgium recorded around 27 hydrogen vehicles in use in 2018 (all of them being passenger cars) and 2 publicly accessible hydrogen refuelling points in 2019. The NPF lacked future estimates but the NIR indicates at least 23,719 vehicles in 2030. The expected number of publicly accessible hydrogen refuelling points in 2030 is at least 20.
- **Biofuels** – Information is not available in the NIR.
- **LPG** – LPG plays a minor role in the NIR.

Rail transport

- **Electricity** – The number of electric railway vehicles in use in Belgium is expected to slightly decrease from 1,036 locomotives in 2018 to 950 in 2030.

- **Hydrogen** – The deployment of locomotives powered by hydrogen is currently not a priority.

Waterborne transport (maritime)

- **Electricity** – While no vessel estimates were found, the NIR expects shore-side electricity supply in maritime ports to increase from 11 units in 2019 to 13 in 2020. In contrast to the NPF, the NIR does not report 2025 and 2030 targets for shore-side electricity supply in maritime ports.
- **LNG** – The NIR signals future deployment of LNG maritime vessels. As of July 2019, Belgium recorded availability of LNG in five maritime ports, a value that exceeds the future targets (not reported in the NIR) indicated in the NPF.

Waterborne transport (inland)

- **Electricity** – While no vessel estimates were found, the NIR expects shore-side electricity supply in inland ports to increase from 327 units in 2016 to 516 in 2020 and 606 in 2025. Both the NPF and NIR lacked 2030 targets.
- **LNG** – While no vessel estimates were found, LNG was available in two inland ports in 2019. No federal level targets are provided in the NIR. As a reference, the NPF had indicated targets of two points in 2020 and three points in 2030.

Air transport

Information on alternative fuels related to air transport is very scarce in the NIR (see Section 5.1.3.5).

Concerning the **measures**, the Belgian NIR reports a long list of mainly regional measures. As in the NPF, the Belgian government continues to put a lot of emphasis on electric cars. Contrariwise, biofuels, LPG and synthetic and paraffinic fuels receive virtually no support. Between these two extremes lie various clusters of AFs for road and waterborne transport. Measures to support greater AF use in the Belgian railways and aviation sector are not reported. Considering all the legal measures, they appear to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR, provided that the ones not yet in place are fully implemented. Concerning the Policy and Deployment & Manufacturing measures, in none of the identified clusters is the score high (this might in part be due to the regional nature of most of the reported measures, which might prevent the exploitation of synergies for certain clusters) and only the electricity/road pair results comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the partial or total lack of future targets and estimates and the regional nature of most of the measures does not allow a proper assessment. With this caveat, using the available information and applying the same criteria used for the other NIR assessments, it can be suggested that the measures for the pair electricity/road might have a medium impact, while all the others appear to have a low impact.

On the basis of the available information, it can be considered that, compared to the NPF, the level of ambition for RTD&D projects in the NIR has increased for most of the clusters.

5.1.7 *Final remarks*

The Belgium NIR is generally in line with the provisions of Annex I to that Directive with the main exception that the NIR does not include estimates for future numbers of LNG vehicles and vessels and related targets for LNG infrastructures for inland and maritime transport. The NIR estimates that a significant number of inland and maritime ports are already equipped with shore-side electricity supply facilities. A significant number of measures are being implemented to promote alternative fuels at federal and regional level, but with a special focus on electro-mobility and CNG for road transport. The Belgium NIR consists of three regional reports on the efforts to implement the Directive, however, accessibility of data of future reporting will improve by aggregation of data in one overall NIR.

With regard to electricity, the NIR plans for approximately 1.5 million electric vehicles on the roads by 2030, representing about 19% of the fleet at that point in time as well as 35,400 recharging points by 2025 and 94,500 recharging points by 2030. Taking into account the current situation and expected trends, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles that is considered necessary for the transition to carbon neutrality by 2050. The only information provided on charging efficiency relates to a project on data collection methodology. The number of shore-side electricity supply facilities in inland ports is expected to rise to 516 by end of 2020 and to 606 by 2025. There were 11 shore-side electricity supply facilities in maritime ports in 2018. This figure will increase to 13 in 2020. Only limited information is provided on electricity supply for stationary aircraft. More information should be provided for the further development of electricity supply for stationary aircraft in the two Belgian airports in the TEN-T Core Network as well regards the further electrification of the rail network.

Regarding hydrogen for transport, the NIR estimates around 24,000 FCHVs by 2030. However, no targets are provided for H2 infrastructure. Further information on both light- and heavy-duty vehicles and related infrastructure developments should be provided in future reporting.

In terms of natural gas for road transport, the Belgium vehicle fleet comprised about 11,700 CNG vehicles, which were served by 126 refuelling points in 2018. The NIR presents a target of 644,393 CNG vehicles and 593 CNG refuelling points until 2030. The NIR does not provide estimates of the future growth of LNG vehicles and vessels nor for LNG infrastructures for inland and maritime ports by 2025 and 2030. The NIR only provides the target of 25 refuelling points for LNG vehicles by 2030, whereas no targets are reported for 2025.

Information is not available on the LPG vehicles and infrastructure in the NIR.

The NIR does not provide information on the consumption of biofuels, neither with regard to road transport nor to aviation. Belgium should provide more information on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.1.8 *ANNEX - Description of the Member State*

On a surface area of 30,500 km², Belgium has a population of 11.399 million people in 2018, which makes up for a population density of 374 inhabitants/km².

Number of main urban agglomerations

- 11 urban agglomerations > 50,000 inhabitants

In 2018, Belgium achieves a per capita gross domestic product at market prices of €40,240, which represents a per capita gross domestic product in purchasing power standards of 117 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Belgium is 828 km. The total road network length is 16,341 km, of which 1,763 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Belgium: 5% (214 km) of the North Sea - Baltic Corridor, 18% (253 km) of the Rhine - Alpine Corridor and 12% (508 km) of the North Sea - Mediterranean Corridor.

Through the TEN-T Road Corridors, Belgium is connected with the following Member States:
- Germany (through the North Sea - Baltic and the Rhine - Alpine Corridor)
- the Netherlands (through the North Sea - Baltic and the North Sea - Mediterranean Corridor)
- Luxembourg (through the North Sea - Mediterranean Corridor)
- France (through the North Sea - Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Belgium accounts for 7,406,933 registered road vehicles of which 5,853,782 are categorized as passenger cars, 759,406 as light goods vehicles, 146,920 as heavy goods vehicles and 16,125 as buses and coaches. The motorisation rate is 514 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 4 maritime ports in the TEN-T Core Network (Antwerpen, Gent, Oosende, Zeebrugge)
- No maritime ports in the TEN-T Comprehensive Network
- 8 inland ports in the TEN-T Core Network (Albertkanaal, Antwerpen, Brussels, Gent, Kortrijk-Bossuit, Liege-Can. Albert, Liege-Meuse, Namur-Meuse)
- 10 inland ports in the TEN-T Comprehensive Network

Through the 1,071 km inland waterways TEN-T Core Network, Belgium is connected with France through the North Sea - Mediterranean Corridor, and with the Netherlands through the North Sea - Baltic and the North - Sea Mediterranean Corridor.

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Brussels, Liège)
- 2 airports in the TEN-T Comprehensive Network

5.2 Bulgaria (BG)

5.2.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Bulgarian NPF the Commission concluded:

The Bulgarian NPF addresses only part of the requirements of Article 3 of the Directive. It contains an extensive discussion of the current state and future scenarios for alternative fuels in the transport sector. However the NPF does not contain any designation of urban/suburban agglomerations to be equipped with recharging points and with CNG refuelling points. In the Bulgarian NPF the number of refuelling points for CNG and for LNG to be put in place along the TEN-T Core Network is not defined.

In the Bulgarian NPF estimates for deployment of alternative fuel vehicles are only provided for electric and for hydrogen fuel cell cars. No estimate has been provided for LNG heavy duty vehicles or vessels.

The Bulgarian NPF recognises that electrification of the propulsion of vehicles could contribute to the development of environmentally friendly road transport in Bulgaria however in a long term perspective. Bulgaria expects a rather rapid deployment of electric vehicles, mainly PHEV. Moreover Bulgaria considers hydrogen technologies as a way of integrating renewable energy sources in transport and has included hydrogen in its national policy framework. Accordingly, Bulgaria intends to develop an alternative fuel infrastructure network that it is considerate of the Bulgarian economic conditions with lower initial investments and minimised risks in the first years.

For electric recharging infrastructure the current situation, with 22 publicly accessible recharging points, is sufficient. The Bulgarian targets for the recharging network in 2020, 2025 and 2030 might not be enough if the estimates for electric vehicles in Bulgaria are met. It may be important to closely monitor this development and correct infrastructure targets in line with the market developments.

Bulgaria has already today a relatively dense network of CNG refuelling stations in parts of the country and the NPF foresees that this will further grow to cover the complete Bulgarian territory and the Bulgarian part of the TEN-T corridors. It has a target of 4 LNG refuelling points for heavy duty motor vehicles.

The Bulgarian NPF contains some targets for LNG bunkering infrastructure for inland and sea going vessels. Building of the bunkering infrastructure is to a certain extent dependent on the availability of European funds.

The Bulgarian NPF is based on a well-defined legislative framework and on investment support that to some extent relies on European Union co-funding instruments and Cohesion Funds. The NPF contains large number of possible initiatives to enhance the deployment of electro mobility, hydrogen and natural gas vehicles and alternative infrastructure which, if implemented, could help overcome deployment barriers. Since most of these measures are still *only under consideration, there is a certain risk that the national targets and objectives of the NPF may not be reached.*

The Republic of Bulgaria, in its NPF, declares interest to cooperate with the neighbouring countries to ensure EU wide circulation of vehicles and vessels, especially for natural gas. It may be advisable to extend this cooperation also for the other fuels and modes.

5.2.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.2.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne / electricity, CNG, LNG, H2, biofuels		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, other transport modes (in general) / electricity, CNG, H2, biofuels		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, waterborne / electricity, H2		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			No
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, waterborne / electricity, H2		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / electricity, H2		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / electricity, CNG, H2, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, waterborne, air / electricity, CNG, H2, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points			No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)			No

The checklist shows the requirements of Annex I from the Directive that are covered in the BG NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, hydrogen and LPG are partially covered for road transport; all the other combinations are either absent or not applicable.

The Bulgarian NIR reports more than 30 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify four AF/transport mode clusters of measures, of which three were assessable.

5.2.3 ***Quantitative assessment: Vehicles and infrastructure***

Table 5.2.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	7,034	145	7,629	300	25,550	2,000	66,200	5,000
	Change NIR vs NPF [%]			-78.20%	-88.00%	-63.50%	-66.67%	-49.08%	-44.44%
	Attainment [%]			92.20%	48.33%	27.53%	7.25%	10.63%	2.90%
CNG / road	NIR	21,823	102*	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / road	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Shore-side electricity supply / water (maritime)	NIR		172		NA		NA		NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Shore-side electricity supply / water (inland)	NIR		90		NA		NA		NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Electricity supply / air (stationary airplanes)	NIR		6		6		7		7
	Change NIR vs NPF [%]								
	Attainment [%]				100.00%		85.71%		85.71%
H2 / road	NIR	0	0	0	0	110	2 (5**)	555	4 (14**)
	Change NIR vs NPF [%]					-72.50%	-80.00%	-38.33%	-92.00%
	Attainment [%]								
LPG / road	NIR	164,077	2,800*	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

* Value taken from EAFO 2018 (absent in NIR)
** For Hydrogen, total number of AFI (public + private)

5.2.3.1 Road transport

5.2.3.1.1 Electricity

Vehicles

Bulgaria recorded 7,034 electric vehicles in 2018 (of which 6,288 were passenger cars, 721 LCVs and 25 buses and coaches). In addition, the number of electric PTW recorded in 2018 was 788. Even if the growth rate of battery electric and plug-in hybrid electric vehicles is slow in Bulgaria, the numbers are rising. For the period 2012-2018, the NIR outlines a 4.4 times increase in the number of BEVs and nearly 10 times increase for the number of PHEV.

As Table 5.2.3-1 shows, the NIR provides revised estimates for EVs expected to be registered in 2020, 2025 and 2030. The EV estimates in the NIR are 7,629 for 2020, 25,550 for 2025 and 66,200 for 2030, which are respectively 78.20%, 63.50% and 49.08% lower than in the NPF.

The 2018 ***attainment*** of future EV estimates is 92.20% for 2020 and 10.63% for 2030. According to the assessment methodology described in Section 2.1, the 2018 state of play corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Bulgaria is equal to 23%.

Infrastructure

As it can be seen in Table 5.2.3-1, there were 145 publicly accessible recharging points in Bulgaria in 2018. The Bulgarian NIR mentions the positive trend in building-up the infrastructure for electric vehicle charging, which is implemented mainly at municipality level by private investors. High power (>22kW) recharging points have been built, at key locations, along the international routes from Sofia to the borders with Greece and Turkey.

The Bulgarian NIR presents revised targets for publicly accessible recharging points for 2020, 2025 and 2030 with respective values 88.00%, 66.67% and 44.44% lower than those provided in the NPF. The target number of publicly accessible recharging points in Bulgaria is 300 for 2020, 2,000 for 2025 and 5,000 for 2030. The NIR does not provide estimates for private recharging points.

The Bulgarian NIR states that "*having regard to the differences in functionality and price levels, the electric vehicles charging infrastructure to be deployed will include fast charging (of minimum capacity of 50 kW DC) stations along the TEN-T Core Network and a massive number of standard charging points (of at least 22 kW AC per point) at publicly accessible locations as shopping malls, entertainment and recreation centres, office buildings, industrial plants, hotels and restaurants.*"

The 2018 ***attainment*** of future public recharging infrastructure targets is 48.33% for 2020 and 2.90% for 2030. According to the assessment methodology described in Section 2.1, the 2018 state of play corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Bulgaria is equal to 43%.

Ratio

Based on the BG NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that current values are quite high, but in 2025 and 2030 the foreseen sufficiency index decreases towards values slightly above 10. Considering that in 2030 the share of high power charging points is planned to be 40%, the sufficiency index can be regarded as becoming adequate, although currently it is not.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	116.50	50.09	48.51	25.43	12.78	13.24

Information on charging efficiency

Information is not available in the Bulgarian NIR.

5.2.3.1.2 CNG

Vehicles

Bulgaria reported 21,823 CNG vehicles in 2018, mostly dual engines, (of which 17,829 were passenger cars, 3,376 LCVs, 116 HCVs and 502 buses and coaches). The Government of Bulgaria did not provide CNG vehicles estimates in the NPF for the years 2020, 2025 and 2030 and, likewise, the NIR does not contain any estimate for these vehicles.

Since there are no CNG vehicle estimates, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The BG NIR does not provide the state of play in the period 2016-2018, but the NPF had indicated 108 publicly accessible CNG refuelling points in 2016 and for 2018 EAFO has reported a number of 102. The Bulgarian NIR does not contain targets for CNG refuelling points, similarly to the NPF, which presented only the statement that in the period 2020-2025 emphasis should be placed on building infrastructure in regions with lower coverage of the distribution network.

Since there are no CNG refuelling points targets, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the BG NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index (where computable) is well below the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	160.02		213.95*			

* Values of CNG AFI taken from EAFO (absent in NIR)

5.2.3.1.3 LNG

Vehicles

Information is not available in the Bulgarian NIR.

Infrastructure

The Bulgarian NIR does not provides information on LNG refuelling points for road vehicles. Since the NPF declared that in the period 2025-2030 activities should be aimed at increasing the density of the distribution network for LNG refuelling points, it can only be assumed that the assessment of the NPF continues to apply here.

Since there are no LNG refuelling points targets, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

The lack of information on vehicles and infrastructure precluded the calculation of the sufficiency index.

5.2.3.1.4 Hydrogen

Vehicles

While there are no hydrogen fuelled vehicles recorded in Bulgaria in 2018, the NIR estimates the registration of 110 vehicles in 2025 and 555 in 2030. These values are, respectively, 72.5% and 38.33% smaller than the estimates provided in the NPF.

Notably, according to the BG NIR, the majority of the hydrogen vehicles will be hybrid electric/fuel cell buses and coaches. Bulgaria expects to have 80 of them in 2025 and 400 in 2030.

Since at the end of 2018 there was no deployment of hydrogen vehicles, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Bulgaria included hydrogen in its NPF and presented two scenarios regarding hydrogen refuelling stations deployment. The NIR provides a revision of the NPF projections and envisages 2 and 4 public refuelling points by 2025 and 2030, respectively, which correspond to the less ambitious NPF scenario. Compared with the most optimistic NPF scenario, this represents an 80% decrease for 2025 and a 92% for 2030 targets. It should be also mentioned that the BG NIR foresees 3 and 10 private fuelling stations by 2025 and 2030, respectively.

Since at the end of 2018 there was no deployment of hydrogen refuelling points, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the BG NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road. Due to the lack of data, only the 2025 and 2030 sufficiency indexes could be computed.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**H2**					55.00	138.75

5.2.3.1.5 Biofuels

Vehicles

Information is not available in the BG NIR.

Infrastructure

Information is not available in the BG NIR.

5.2.3.1.6 LPG

Vehicles

The BG NIR reported 164,077 LPG vehicles in 2018. The majority of those are passenger cars (157,440), but 6,603 LCVs and 34 buses and coaches were also recorded. This represents a 17% increase compared to the data provided in the NPF for 2016. The NIR does not contain any future estimates for LPG vehicles.

Since there are no LPG vehicle estimates, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The BG NIR does not provide any past or future information concerning LPG infrastructure, thus the past total numbers of LPG refuelling points have been taken from EAFO.

Since there are no LPG refuelling points targets, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the BG NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		2016*	2017	2018*	2020	2025	2030
Road	**LPG**	50.41		58.60			

* Values of LPG AFI taken from EAFO (absent in NIR)

5.2.3.2 Rail transport

Information is not available in the Bulgarian NIR.

5.2.3.3 Waterborne transport (maritime)

5.2.3.3.1 Electricity

Vessels

Information is not available in the Bulgarian NIR.

Infrastructure

According to the BG NIR, shore-side electricity supply and the relevant infrastructure are available for public transport in the maritime ports that are part of the TEN-T Core and Comprehensive Networks. A slight increase in the provision of service is observed in maritime ports in the period 2016-2018.

Table 5.2.3-1 shows that the number of recharging points providing shore-side electricity supply at the Bulgarian maritime ports is 172 in 2018 albeit it is not evident from the NIR which kind of ships can be supplied with these supply points. Neither the NIR nor the NPF provided targets for the period 2020-2030.

The Bulgarian NIR mentions that Bulgarian ports have an obsolete infrastructure for shore-side electricity supply that needs modernising. The state-owned Bulgarian Ports Infrastructure Company has taken steps to examine the condition of the electricity supply network for seagoing vessels at the ports of Varna and Burgas.

Since there are no targets for shore-side electricity supply for seagoing ships in maritime ports, the 2018 ***attainment*** and ***progress*** could not be computed.

5.2.3.3.2 LNG

Vessels

Information is not available in the BG NIR.

Infrastructure

Information is not available in the BG NIR.

5.2.3.3.3 Hydrogen

Vessels

Information is not available in the BG NIR.

Infrastructure

The NIR mentions that the state-owned company "*Bulgarian Ports Infrastructure*" continues to explore possibilities for securing funding, using various EU programmes, for the construction of a hydrogen refuelling station at the port of Burgas.

5.2.3.4 Waterborne transport (inland)

5.2.3.4.1 Electricity

Vessels

The Bulgarian NIR does not provide any details on this matter.

Infrastructure

According to the NIR, shore-side electricity supply and the relevant infrastructure are available in inland waterway ports that are part of the TEN-T Core and Comprehensive Networks.

As Table 5.2.3-1 shows, the number of recharging points providing shore-side electricity supply at the Bulgarian inland ports is 90 albeit it is not evident from the NIR which kind of ships can be supplied with these supply points. Neither the NIR nor in the NPF provided targets.

Since there are no targets for shore-side electricity supply for inland waterway vessels in inland ports, the 2018 ***attainment*** and ***progress*** could not be computed.

5.2.3.4.2 LNG

Vessels

Information is not available in the BG NIR.

Infrastructure

The Bulgarian NPF reported one LNG refuelling point in 2016.

5.2.3.5 Air transport

5.2.3.5.1 Electricity

Airplanes

The Bulgarian NIR does not provide any details on the deployment of hybrid-electric or fully-electric airplanes.

Infrastructure (for stationary airplanes)

In the period 2016-2018, Sofia airport in the TEN-T Core Network provided power supply and air-conditioned from stationary facilities installed at 6 passenger sleeves at Terminal 2. The NIR mentions that a new boarding sleeve will be delivered in 2021. For airplanes serviced at Terminal 1 and for those not using Fixed Ground Power supply at Terminal 2, ground service operators provide upon request diesel-powered Ground Power Units. Sofia Airport has three recharging stations for electric vehicles (<22 kW) near Terminal 2.

The Bulgarian NIR provides information about electric vehicles and recharging infrastructure in the airports in the TEN-T Comprehensive Network (Plovdiv, Varna and Burgas), although it does not contain information about electricity supply for stationary airplanes in these airports.

5.2.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is unavailable in the Bulgarian NIR.

Infrastructure

There is no reference to the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network in the Bulgarian NIR.

5.2.4 ***Measures assessment***

The Bulgarian NIR presents the measures put in place, adopted and under consideration in the period 2016 – 2018. The majority of these measures focus on electro-mobility and hydrogen for road transport.

5.2.4.1 Legal measures

The Bulgarian NIR contains seven[9] legal measures, which have been implemented at national level during the reporting period. These measures are required for the transposition of European Directives to the Bulgarian legislation. The level of ambition of the legal measures remains constant between NPF and the implementation report.

5.2.4.1.1 Legislative & Regulatory

The NIR shows that Bulgaria has progressed with the transposition of Directive 2014/94/EU, regarding the legal framework for electric vehicles recharging points. The requirement that shore-side electricity supply for maritime transport, deployed or updated after 18 November 2017, should comply with the technical specifications laid out in the Directive 2014/94/EU is transposed in Bulgarian law by its inclusion in "*Ordinance No 9 on the requirements for operability of ports and specialised port facilities*". In addition, an "*Ordinance on the conditions and procedures for designing, construction and commissioning into operation of hydrogen refuelling stations*" was in the process of being adopted.

The Bulgarian NIR does not contain any information on legislative and regulatory measures for LNG.

5.2.4.1.2 Administrative

In 2019, the Bulgarian "*Ordinance on sustainability criteria for biofuels and bio liquids*" was amended and a calculation methodology for greenhouse gas emission reduction throughout the whole life cycle of biofuels was set out, transposing Directive 2015/1513/EU.

[9] One additional measure referring to the Ordinance for determining the rate of product charges for motor vehicles was included by Bulgaria as legal measure, but this is assessed here as a policy measure for consistency with our previous assessment and the Guidance Support document.

5.2.4.2 Policy measures

The policy measures listed in the Bulgarian national implementation report comprise both strategic plans in support of the implementation of the NPF and supporting measures for development of electro-mobility. Although the level of ambition of AF vehicle estimates and infrastructure targets has decreased between NPF and NIR, in terms of measures it has instead increased in the NIR compared to the NPF, in particular for electricity and hydrogen.

5.2.4.2.1 Measures to ensure national targets and objectives

The Bulgarian NIR mentions two strategic documents, supporting the use of alternative fuels in transport. The first one is the "*Integrated Transport Strategy until 2030*", approved in 2017, which includes a measure on the '*Promotion of the use of biofuels and other renewable fuels in transport*' in order to achieve the strategic priority '*Reduction of the fuel consumption and increasing the energy efficiency of transport*'. The second document is the "*draft Integrated National Energy and Climate Plan of the Republic of Bulgaria until 2030*", developed in 2019.

Although not specifically mentioned in the NIR, it is understood that these documents are generally applicable to all transport modes.

Road transport

For electric vehicles, the "*draft Integrated National Energy and Climate Plan of the Republic of Bulgaria*" envisages that: '*in view of promoting the development and deployment of electric mobility, obligations will be imposed on the local authorities to introduce within their programmes measured to make the use of electric transport mode more attractive. Good practices, as tax reliefs, simplified access, reserved parking spaces for electric vehicles, will be promoted in view of their widespread implementation*.'

In 2018, the "*Ordinance setting out the procedure and the rate of product charges for motor vehicles*" was amended, including a reduction of the product charge for new hybrid motor vehicles as well as for plug-in hybrid electric and fully electric cars and light commercial vehicles. The product charge for the latter shall be payable from 1 January 2022.

The "*Climate Investment Programme of the National Trust Eco Fund*" started in 2016 and provides funding support to public institutions in purchasing electric and plug-in hybrid vehicles. This measure was also present in the NPF. The programme runs on annual calls for project proposals and the BG NIR declares that, as of 2018, 16 projects have been completed, 10 are being implemented and another three have signed the contract.

Other transport modes

There are no measures concerning other transport modes (water, air and railway) in the Bulgarian implementation report.

5.2.4.2.2 Measures that can promote AFI in public transport services

Of all the policy measures described in the Bulgarian NIR, two can be categorised as measures aimed at promoting AFI in public transport services.

Within the Priority Axis "*Improvement of Ambient Air Quality of the Operational Programme Environment 2014 – 2020*", also described in the NPF, a new procedure on '*Measures for* *addressing transport as a source of ambient air pollution*' was announced in 2019. The procedure comprises two components: electric road buses and trolleybuses and electric rail tramways. With a budget of 500 million BGN, 11 Bulgarian municipalities were selected as beneficiaries of grant-projects for the provision of vehicles and infrastructure.

The other measure deals with the procurement of hydrogen buses for public transport. An overall budget of 150 million € is planned for the purchase of 50 hydrogen buses by three municipalities between 2020 and 2030.

The Bulgarian NIR also reports about the investment programme of the '*Sofia Public Electrical Transport Company EAD*' that envisages the acquisition of 30 fast-charging standard low-floor buses, out of which 20 buses are already into operation. Moreover, in the period August 2017-August 2018 Sofia airport used a -leased from manufacturer- electric bus for passenger's transfer between terminals and one electric bus is expected to be purchased and delivered at the airport at the end of 2020.

5.2.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The Bulgarian NIR does not contain information on this matter

5.2.4.3 Deployment and manufacturing support

The Bulgarian NIR contains six AFI deployment support measures, which represents an increase compared to the four measures identified in the NPF. Three of the six measures are exiting, two are adopted and one is under consideration. The measures cover recharging points, shore-side electricity supply and hydrogen infrastructure.

5.2.4.3.1 AFI deployment

In 2017, the "*Central European Ultra Charging project*" was funded under the CEF[10]. In Bulgaria, four ultra-fast recharging points are planned to ensure cross-border connection to the main urban nodes of the TEN-T Core road Network.

At the end of 2017, Sofia's public electrical transport company "*Stolichen Electrotransport EAD*" adopted a plan for setting up six new electric bus lines, using fast charging technologies. Its investment programme envisages the installation of 12 recharging points at depots as well as at the start and end stops of the bus lines.

According to the Bulgarian NIR, deployment and manufacturing support is planned to help the take up of hydrogen technologies in transport. The implementation, between 2020 and 2030, will start by the purchase of buses (see above) and the construction of the related infrastructure for hydrogen production and dispensing. The NIR contains the planned budget for the construction in Sofia of one hydrogen refuelling station amounting 9.5 million € and €800,000 for one mobile refuelling station.

[10] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/2017-eu-tm-0065-w

The state-owned "*Bulgarian Ports Infrastructure Company*" is considering the need of modernising the shore-side electricity supply to waterborne vessels and has taken steps to examine the condition of the electricity supply network at Varna and Burgas ports.

The NIR indicates that the "*Bulgarian Ports Infrastructure*" company continues to explore possibilities for securing funding, under various EU programmes, for the construction of a hydrogen refuelling station at Burgas Port.

5.2.4.3.2 Support of manufacturing plants for AF technologies

One measure that can support the manufacturing plants for alternative fuel technologies could be identified in the NIR, namely for the production of green hydrogen from renewables. At present, the total cost of ownership is being evaluated in order to determine the most suitable locations and to prepare funding mechanisms, which are counting on EIB support. The overall planned budget for the production of green hydrogen, reported in the NIR, amounts to 35 million €.

5.2.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Bulgarian NIR.

5.2.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.2.4-1**Error! Reference source not found.** presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, only four clusters have been identified, of which one is not assessable. The assessable clusters have all a medium score, but only electricity/road and hydrogen/road result to be comprehensive. For all other combinations of AF and transport mode, there are no measures. In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, those for the pairs electricity/road and hydrogen/road result to have a medium impact, while those for biofuels/road have a low impact.

Concerning the level of ambition, this has increased for the pairs electricity/road and hydrogen/road.

Table 5.2.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	M	C		**M**		+
CNG	Road	X					
LNG	Road						
	Water - maritime						
	Water - inland						
H2	Road	M	C		**M**		+
Biofuel	Road	M	N		**L**		

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.2.4.5 Research, Technological Development & Demonstration

The Bulgarian NIR contains a list of 12 RTD&D programmes, which represents a significant increase compared to the six RTD&D actions identified in the NPF. The majority of these RTD&D programmes focus on electric vehicles and notably on hydrogen.

The continuation of the "*Operational Programme Innovation and Competitiveness 2014-2020*" for the period 2021-2027 will speed up the development of alternative fuels and the deployment of the relevant infrastructure. Funds are mainly channelled through the ESF+, the ERDF and the Cohesion Fund.

The "*National Research Programme Low Carbon and Energy for Transport and Households (EPLUS)*", approved in 2018, contains a component on '*Electric Vehicles and Hydrogen Mobility'*. The NIR report showcases the activities towards Bulgaria's specialisation in battery/fuel cell based hybrid electric mobility: namely a cyber-physical platform for development and demonstration of battery/fuel cell hybrid vehicles and the retrofitting of trolleybuses with a battery/fuel cell range extender. The total budgets for these projects are €450,000 and €650,000 respectively.

In addition, the "*Energy Storage and Hydrogen Energy project*", funded by the Bulgarian Ministry of Education and Science, foresees 1.5 million € to be used for the development of the relevant hydrogen infrastructure for transport application and the "*Clean Energy Production Storage and Application Technologies Competence Centre – HITMOBIL*" has allocated 2 million €, out of 8 million € total budget, to transport. Highlighted in the Bulgarian NIR report are the €750,000 for the demonstration of a mobile hydrogen refuelling station and €700,000 for an electrolysis system for hydrogen production from RES.

5.2.5 ***Additional information on alternative fuels infrastructure developments***

The Bulgarian NIR does not provide information on the changes in fuel use.

5.2.6 *Summary of the assessment*

Tabular overview

Table 5.2.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road
AF Vehicles / Vessels		Past situation (2016)	3,728	17,282	NA	0	0	0
		Situation (2018)	7,034	21,823	NA	NA	NA	0
		Estimate (2030)	66,200	NA	NA	NA	NA	555
		Future share (2030) [%]	1.80%					0.02%
		Estimate attainment (2018 vs 2030) [%]	10.63%					
		Progress (2018)	adequate					
Publicly accessible AF Infrastructure		Past situation (2016)	32	108*	NA	NA	1*	0
		Situation (2018)	145	102**	NA	NA	NA	0
		Target (2030)	5,000	NA	NA	NA	NA	4
		Target attainment (2018 vs 2030) [%]	2.90%					
		Progress (2018)	adequate					
Sufficiency Index		2016	116.50	160.02				
		2018	48.51	213.95				
		2020	25.43					
		2025	12.78					55.00
		2030	13.24					138.75
Measures	Legal measures	Ambition (NIR vs NPF)	=	=				=
	Policy measures + Deployment & manufacturing	Score	M	X				M
		Comprehensiveness	C					C
		Impact	M					M
		Ambition (NIR vs NPF)	+					+
	RTD&D	Ambition (NIR vs NPF)	+	=				+

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken from BG NPF
** Value taken from EAFO (absent in NIR)

In its NPF, the Republic of Bulgaria indicated that their long-term goal, after 2030, was to deploy electro-mobility, use natural gas widely as a standard fuel and advance hydrogen technology out of the research and development phase. The Bulgarian NIR is fully consistent with the NPF and focuses on road transport electrification and on the potential for the use of hydrogen in transport. The Bulgarian NIR covers mostly the 1st part of the AFID period (2016-2020).

The Bulgarian NIR almost fully addresses the requirements of Annex I of the Directive, but limitedly to electro-mobility and, to a lesser extent, hydrogen/road. To have fully complied with the requirements of Annex I of the Directive, the Bulgarian government should have considered the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network and it should have provided information on the methodology applied to take account of the charging efficiency of high power recharging points.

The main outcomes of the technical assessment of the Bulgarian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Concerning EVs, Bulgaria recorded a total of 7,034 electric vehicles in 2018 (of which 6,288 were passenger cars, 721 LCVs and 25 buses and coaches). The Bulgarian NIR reports a revised set of vehicle estimates for 2020, 2025 and 2030, which are respectively 78.2%, 63.5% and 49.08% lower than in the NPF. Passenger cars have the highest share, but in 2030, 10,000 LCVs, 200 HCVs and 1,000 buses and coaches are also foreseen. Similarly, the infrastructure targets in the BG NIR have been reduced compared to the NPF by 88%, 66.67% and 44.44% respectively for 2020, 2025 and 2030. The 2018 progress towards the significantly reduced objectives is considered to be adequate both for the vehicles and for infrastructure, but the sufficiency index becomes adequate only in 2025 and 2030 while until then infrastructure deployment cannot be considered sufficient with respect to the expected vehicle uptake.
- **CNG** – The Bulgarian NIR shows only the state of play of CNG vehicles in 2018 (21,823 vehicles, mostly dual engines, of which 17,829 were passenger cars, 3,376 LCVs, 116 HCVs and 502 buses and coaches), but does not report any vehicle estimate or infrastructure target for 2020, 2025 and 2030.
- **LNG** – Information is not available in the Bulgarian NIR.
- **Hydrogen** – The Republic of Bulgaria had included hydrogen in its NPF. Accordingly, the Bulgarian NIR shows that emphasis is put on hydrogen road transport, however it presents reduced ambition for vehicles and infrastructure. Although there are no hydrogen vehicles on the Bulgarian roads as of 2018, 110 vehicles are expected to be deployed by 2025 and 555 in 2030, mainly buses. Two publicly accessible hydrogen refuelling points will be deployed by 2025 and four refuelling points are foreseen for 2030. These will be accompanied by three and ten private refuelling points in 2025 and 2030 respectively.
- **Biofuels** – Information is not available in the Bulgarian NIR.
- **LPG** – Other than reporting a total number of 164,077 LPG vehicles in 2018 (of which 157,440 passenger cars, 6,603 LCVs and 34 buses and coaches), the BG NIR does not show any further information or objectives for vehicles and infrastructure.

Rail transport

Information is not available in the Bulgarian NIR.

Waterborne transport (maritime)

- **Electricity** – The number of shore-side electricity supply points at the Bulgarian maritime ports was 172 in 2018. There are no targets for the period 2020-2030 in either the NIR or the NPF.
- **LNG** – Information is not available in the Bulgarian NIR.
- **Hydrogen** – The BG NIR mentions that the state-owned company "*Bulgarian Ports Infrastructure*" continues to explore possibilities for the construction of a hydrogen refuelling station at the port of Burgas.

Waterborne transport (inland)

- **Electricity** – The number of shore-side electricity supply points at the Bulgarian inland ports was 90 in 2018. There are no targets for the period 2020-2030 in either the NIR or the NPF.
- **LNG** –Information is not available in the Bulgarian NIR. The Bulgarian NPF reported one LNG refuelling point in 2016.

Air transport

- **Electricity** (for stationary airplanes) - In the period 2016-2018, Sofia airport in the TEN-T Core Network provided power supply and air-conditioning from stationary facilities installed at six passenger sleeves at the Terminal 2. The NIR mentions that a new boarding sleeve will be delivered in 2021.

The **measures** presented in the Bulgarian Implementation Report mainly focus on electro-mobility and hydrogen. The legal, regulatory and administrative measures detailed in the NIR mainly concern the requirements for the transposition of European Directives to the Bulgarian legislation. In the period 2016-2018, most legal measures were in place or in the process of being adopted. Based on the available information, the level of ambition can be considered to remain constant between NPF and NIR.

As for the policy measures, the BG NIR contains measures oriented to enhance the deployment of electro-mobility, with particular reference to electrification of urban public transport and the acquisition of hydrogen buses. The number of deployment and manufacturing support initiatives portrayed in the Bulgarian NIR has increased in comparison to the NPF. Measures in the NIR target recharging points for electricity supply and hydrogen refuelling infrastructure. Bulgaria relies on the European Union co-funding instruments and Cohesion Funds to finance support initiatives for the production of alternative fuels, as for example the 35 million € foreseen for the production of green hydrogen.
In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, those for the pairs electricity/road and hydrogen/road result to have a medium impact, those for the pair biofuels/road have a low impact, while all the others are not assessable.

With regard to RTD&D measures, the Bulgarian implementation report shows an increased effort to channel financial resources, counting on the European Union co-funding instruments and Cohesion funds. Research, development and demonstration activities mainly concern electro-mobility and hydrogen related projects. From the information provided in the NIR for RTD&D, the level of support, compared to the NPF, can be considered to have increased for electro-mobility and hydrogen road transport.

5.2.7 *Final remarks*

The Bulgarian NIR reports on a range of efforts to implement the Directive but with a focus on electro-mobility and, to a lesser extent, on hydrogen for road transport. In particular, it does not provide future estimates for CNG and LNG vehicles and vessels for the years 2020, 2025 and 2030. It also lacks information, for the same years, on the targets for CNG refuelling points for vehicles and LNG refuelling points for vehicles and vessels. There are no estimates on the future shore-side electricity supply in ports. Most of the measures referenced in the NIR focus on electro-mobility and hydrogen for road transport.

Regarding electricity, the NIR estimates for 2030 a fleet of 66,200 electric vehicles, representing about 1.8% of the future vehicle fleet. Taking into account the current situation and expected trends, this level of ambition appears quite low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. The targets for publicly accessible recharging infrastructure correspond to those low vehicle estimates. An increase in ambition would contribute to better meeting the needs for a dense, wide-spread and easy to use network of recharging and refuelling infrastructure in the EU. No information on charging efficiency is provided. The NIR states that shore-side electricity supply is available in a significant number of maritime and inland ports. However, it remains unclear which vessels can actually connect to the infrastructure and whether this infrastructure is suitable for all seagoing ships and inland waterway vessels as requested by the Directive. The NIR notes the intention to develop measures to modernise the existing infrastructure for shore-side electricity supply in ports and ensure that seagoing ships and inland waterway vessels can be connected. Electricity to stationary aircraft is supplied at the TEN-T Core airport of Sofia. Future reporting could usefully include more information as regards the current and planned electrification of railways.

Concerning hydrogen for road transport, the NIR expresses Bulgaria's interest in developing hydrogen as a fuel for road transport. It estimates 555 FCHVs by 2030. The NIR envisages four public refuelling points by 2030. Further detail on infrastructure needs and planning should be provided, particularly for buses and heavy-duty vehicles.

Regarding natural gas for transport, there was already a limited fleet of 21,823 CNG vehicles in Bulgaria in 2018. The NIR does not provide information on estimates and targets for CNG vehicles and refuelling points for 2020, 2025 and 2030. It further does not provide information on LNG for road and inland and maritime waterway transport.

As regards LPG in road transport, there was already a fleet of 164,077 LPG vehicles in 2018, but the Bulgarian NIR does not bring any further information or objectives for vehicles and infrastructure.

As far as biofuels are concerned, no quantitative information on the use of biofuels in road transport is provided. However, the measure “Promotion of the use of biofuels and other renewable fuels in transport” has been included in the NIR. Bulgaria should provide more information on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.2.8 *ANNEX - Description of the Member State*

On a surface area of 111,000 km², Bulgaria has a population of 7.050 million people in 2018, which makes up for a population density of 64 inhabitants/km².

Number of main urban agglomerations

- 17 urban agglomerations > 50,000 inhabitants

In 2018, Bulgaria achieves a per capita gross domestic product at market prices of €7,980, which represents a per capita gross domestic product in purchasing power standards of 51 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Bulgaria is 1,507 km. The total road network length is 7,690 km, of which 757 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Bulgaria: 18% (960 km) of the Orient – East Mediterranean Corridor.

Through the TEN-T Road Corridors, Bulgaria is connected with the following Member States:
- Greece (through the Orient – East Mediterranean Corridor),
- Romania (through the Orient – East Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Bulgaria accounts for 3,413,371 registered road vehicles[11] of which 2,773,325 are categorized as passenger cars, 438,328 as heavy goods vehicles and 20,818 as buses and coaches. The motorisation rate is 393 passenger cars per 1,000 inhabitants. The Bulgarian NIR describes the age distribution of the vehicle fleet: in 2017 around 86% of vehicles were over 10 years old (with 69% of passenger cars being over 15 years old), while only 5% of the vehicles have less than 5 years and 9% are in the range of 60 to 10 years. The matter of the renewal of the country's vehicle is regarded by Bulgaria as needing to be considered.

Number of ports in the TEN-T Core Network

- 1 maritime port in the TEN-T Core Network (Burgas)
- 1 maritime port in the TEN-T Comprehensive Network (Varna)
- 2 inland ports in the TEN-T Core Network (Ruse, Vidin)
- 4 inland ports in the TEN-T Comprehensive Network

[11] No data available for light goods vehicles.

Through the 478 km inland waterways TEN-T Core Network, Bulgaria is connected with Romania through the Rhine-Danube Corridor.

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Sofia)
- 4 airports in the TEN-T Comprehensive Network

5.3 Czechia (CZ)

5.3.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Czech NPF the Commission concluded:

The Czech NPF broadly addresses the requirements of Article 3. It contains an extensive discussion of the current state and future scenarios for alternative fuels in the transport sector. For most fuels and modes, it establishes sufficient targets as required by Article 3 of the Directive. It does not contain a target for LNG refuelling points at inland ports.

The Czech NPF puts a comparably low emphasis on electric vehicles and estimates only 0.35% electric vehicles on the road in 2020. Today, the spatial distribution of recharging points and specifically high power recharging infrastructure seems to appropriately cover the needs of electric vehicles in terms of distance requirements in the Czech Republic. For the future, the targeted ratio of only one public recharging point per 13 electric vehicles estimated for 2020 could evolve to become a barrier for the further market deployment of electric vehicles. This could also lead to market fragmentation within the EU, especially in the context of the rather low estimated EV shares in the Czech NPF. It will be important to closely monitor this development and correct infrastructure targets in line with the market developments. Regarding electricity supply for stationary airplanes, the NPF only mentions that further installations for the Prague airport are under consideration. The NPF does not provide any targets for shore-side electricity.

The Czech Republic already today has a relatively dense network of CNG refuelling points and the NPF foresees that this will further grow in line with the expected market needs, which are comparably high in the NPF, with estimates of 1% CNG cars on the road in 2020.

The NPF has established targets for LNG refuelling points for heavy-duty vehicles that will likely ensure appropriate coverage of the road TEN-T Core Network on Czech territory.

The Czech NPF does not contain targets for LNG refuelling at inland ports. This omission could have a negative impact on the circulation of LNG inland waterway vessels throughout the TEN-T Core Network. The decision not to include LNG refuelling at inland ports in the Czech NPF would have merited a more detailed discussion of market needs. This may need to be revisited also in light of estimated market needs from other Member States.

The NPF establishes targets for hydrogen refuelling points.

The Czech NPF contains a very comprehensive list of measures, which, if implemented, could help overcome deployment barriers. Since the adoption status of most of these measures is low, there is a certain risk that the national targets and objectives of the NPF may not be reached. The NPF also contains a list of considered support measures to promote the deployment of alternative fuels infrastructure in public transport services.

The Czech Republic, in its NPF, declares interest to cooperate with the neighbouring countries to ensure EU-wide circulation, especially for LNG and hydrogen for road transport. It may be advisable to extend this cooperation also for the other fuels and modes.

5.3.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.3.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport/Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne (inland) / Electricity, CNG, LNG, H2		Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne (inland) / Electricity, CNG, LNG, H2		Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / Electricity, LNG, H2		Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road / Electricity, LNG, H2		Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, waterborne (inland) / Electricity, CNG, LNG, H2, LPG		Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)			Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes			Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	All	All	Y

The checklist shows the requirements of Annex I from the Directive that are covered in the CZ NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for road transport; CNG, LNG, hydrogen and LPG are also covered for road transport; inland water transport is just mentioned; all the other combinations are either absent or not applicable.

The Czech NIR reports around 30 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify four AF/transport mode clusters of measures, all assessable.

5.3.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.3.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	3,169 (1)	749	9,877	1,300 (2)	76,833	6,200	217,179	19,000
	Change NIR vs NPF [%]			-41.90%	0.00%	-23.93%		-13.13%	
	Attainment [%]			32.08%	57.62%	4.12%	12.08%	1.46%	3.94%
CNG / road	NIR	22,109	185	25,670	186	36,965	300	46,340	600
	Change NIR vs NPF [%]			-48.66%	-7.00%	-71.57%	0.00%	-76.83%	76.47%
	Attainment [%]			86.13%	99.46%	59.81%	61.67%	47.71%	30.83%
LNG / road	NIR	2	1	80	3	2,300	14	6,900	30
	Change NIR vs NPF [%]			-55.56%	100.00%	360.00%	180.00%	430.77%	114.29%
	Attainment [%]			2.50%	33.33%	0.09%	7.14%	0.03%	3.33%
LNG / water (inland)	NIR	0	0	0	0	20	0	40	2
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	1	0	3	4	13,380	20	62,559	95
	Change NIR vs NPF [%]						400.00%		
	Attainment [%]			33.33%		0.01%		0.00%	
H2 / water (inland)	NIR	0	NA	0	NA	5	NA	20	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	170,300	950	190,300	995	256,050	995	256,650	1,005
	Change NIR vs NPF [%]								
	Attainment [%]			89.49%	95.48%	66.51%	95.48%	66.35%	94.53%

(1) value taken from EAFO (absent in both NIR and NPF)

(2) this value is mentioned in the CZ NIR but not officially reported in the accompanying excel file

5.3.3.1 Road transport

5.3.3.1.1 Electricity

Vehicles

Czechia recorded 44 LCVs and 55 buses and coaches in 2018 (all battery-electric) but did not provide the number of electric passenger cars. As the NPF also did not have this detail, the total number of EVs in 2018 has been taken from EAFO. For the period 2020-2030 the CZ NIR presents a new curve related to the estimated growth of electric vehicles up to 2030 compared to the NPF. While for 2020 and 2025 there is a sensible decrease in the estimated numbers (-41.90% and -23.93% respectively, compared to the NPF values), for 2030 the NPF estimate is substantially confirmed in the NIR and some expectations to overpass such number are also expressed. In fact, the CZ NIR report says: "*even though the uptake of electro-mobility in the Czech Republic has not been as fast as originally expected or in line with developments in certain western European countries in particular, the Czech Republic is still on course for just over 200,000 vehicles by 2030, as predicted in the National Action Plan for Clean Mobility. If the optimistic scenario worked out, this number could be more than doubled*". The current estimate for 2030 is 217,179 EVs, of which 200,647 are passenger cars, 15,949 LCVs and 583 buses and coaches. The CZ NIR reveals also the presence of 756 trolleybuses in 2018, which are expected to remain in the same number until 2030.

The 2018 ***attainment*** of future EV estimates is 32.08% for 2020 and 1.46% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Czechia is equal to 44%.

Infrastructure

Czechia recorded 749 publicly accessible recharging points in 2018, of which 253 were normal power (≤22kW) and 496 high power (>22kW) recharging points. Concerning the next decade, the CZ NIR confirms the NPF targets for 2020. For 2025 and 2030 there are new targets, not present in the NPF, that appear to be coherently designed to maintain a constant ratio with respect to the estimated EVs for the target years. It is worth mentioning that the share of high power recharging infrastructure decreases from 67% in 2018 to 18% in 2025 and 11% in 2030.

The 2018 ***attainment*** of future public recharging infrastructure targets is 57.62% for 2020 and 3.94% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Czechia is equal to 31%.

Ratio

Based on the CZ NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that the foreseen sufficiency index remains below 10 until 2020, raising slightly above 10 in 2025 and 2030. Overall the sufficiency index can be considered adequate for the next decade.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	3.07		4.23	7.60	12.39	11.43

Information on charging efficiency

Information is not available in the Czech NIR.

5.3.3.1.2 *CNG*

Vehicles

Czechia recorded 22,109 CNG vehicles in 2018, of which 20,660 were passenger cars, 215 HCVs and 1,234 buses and coaches. For the next decade, the CZ NIR presents an important revision of the CNG vehicles estimate compared to the NPF, with a decrease in the total number of CNG vehicles going down from 50,000 to 25,670 vehicles in 2020 and from 200,000 to 46,340 vehicles in 2030. This is justified in the NIR as: "*mainly due to the reduced offering of these vehicles resulting from the transition to the new Worldwide Harmonized Light Vehicle Test cycles*". On the other hand, a partial compensation in terms of AF vehicles is foreseen by the increased estimates of LNG and mostly of hydrogen vehicles in the CZ NIR compared to the NPF (see next sections).

The 2018 ***attainment*** of the significantly reduced future CNG vehicles estimates is 86.13% for 2020 and 47.71% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Czechia is equal to 8%.

Infrastructure

In 2018, Czechia recorded 185 CNG refuelling points. Table 5.3.3-1 shows a confirmation of the NPF targets for publicly accessible CNG refuelling points over the period 2020-2025, and a remarkable increase for 2030 (+76.47%), which however seems in contrast with the corresponding decrease in CNG vehicle estimate for 2030 (-76.83%) compared to the NPF estimate. This is not explained in the CZ NIR.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 99.46% for 2020 and 30.83% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible CNG refuelling infrastructure evolution planned by Czechia is equal to 12%.

Ratio

Based on the CZ NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the whole period.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	129.40	123.96	119.51	138.01	123.22	77.23

5.3.3.1.3 *LNG*

Vehicles

Czechia recorded two LNG HCVs in 2018. For the next decade, the CZ NIR presents a revised plan compared to the NPF. Although for 2020 there is a lower estimate of LNG vehicles than in the NPF, the CZ NIR presents overall a considerably more ambitious plan for 2025 and 2030, with respectively 2,300 and 6,900 heavy commercial LNG vehicles on the market.

The 2018 ***attainment*** of future LNG vehicles estimates is 2.50% for 2020 and 0.03% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Czechia from 2016 until 2018 for LNG vehicles deployment is 0.03% of the overall planned deployment during the period 2016-2030.

Infrastructure

With only one LNG refuelling point recorded on 2018, the CZ NIR presents a new and more ambitious set of targets for LNG infrastructures in 2020, 2025 and 2030 (30 in the NIR versus 14 in the NPF), which is in line with the corresponding increased estimation of LNG vehicles compared to the NPF for the next decade.

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 33.33% for 2020 and 3.33% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Czechia from 2016 until 2018 for public LNG refuelling infrastructure deployment is 3.33% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the CZ NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LNG**			2.00	26.67	164.29	230.00

5.3.3.1.4 *Hydrogen*

Vehicles

While in 2018 there was just one hydrogen vehicle recorded in Czechia, the CZ NIR presents quite an ambitious estimate of hydrogen vehicles for 2025 and 2030, with a total number of 62,559 in 2030. The vast majority of these vehicles is foreseen to be light-duty vehicles (i.e. passenger cars and light commercial vehicles) but 100 heavy commercial vehicles and 870 buses and coaches are also foreseen in 2030.

The 2018 ***attainment*** of future hydrogen vehicles estimates is 33.33% for 2020 and less than 0.01% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Czechia obtained from 2016 until 2018 for hydrogen vehicles deployment is 0% of the overall planned deployment during the period 2016-2030 since the situation remained the same.

Infrastructure

The new set of targets for hydrogen infrastructures (and vehicles) reported in the CZ NIR represents the most relevant change with respect to the NPF. In the latter, there was only one target for 2025 of four hydrogen publicly accessible refuelling stations. In the CZ NIR, these targets are: four for 2020 (the construction of which has already been contracted), 20 for 2025 and 95 for 2030.

Since at the end of 2018 there are no hydrogen refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the CZ NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	H2				0.75	669.00	658.52

5.3.3.1.5 *Biofuels*

Vehicles

Information is not available in the Czech NIR.

Infrastructure

Information is not available in the Czech NIR.

5.3.3.1.6 *LPG*

Vehicles

Czechia recorded 170,300 LPG vehicles in 2018 (of which 170,000 were passenger cars and 300 LCVs). In the CZ NPF, there was no mention of LPG vehicle estimates for 2020, 2025 and 2030, while in the NIR (see Table 5.3.3-1) such estimate appears, with an increase from 190,300 vehicles in 2020 to 256,650 vehicles in 2030.

The 2018 ***attainment*** of future LPG vehicles estimates is 89.49% for 2020 and 66.35% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Czechia obtained from 2016 until 2018 for LPG vehicles deployment is 0.00% of the overall planned deployment during the period 2016-2030 because the CZ NIR shows a constant value of 170,300 LPG vehicles for the period 2016-2018.

Infrastructure

As for LPG vehicles, the CZ NIR presents a strategy for LPG infrastructures, which was not present in the NPF. However this cannot be considered as a real novelty or a change of ambition on this fuel, as a substantial network of LPG refuelling points (and corresponding LPG vehicles) was already present in Czechia even before the AFI Directive. Furthermore, looking at the infrastructure target for 2030 it can be seen that the level of attainment in 2018 is already around 95%, meaning a very limited growth compared to the current situation.

The 2018 ***attainment*** of future public LPG refuelling infrastructure targets is 95.48% for 2020 and 94.53% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Czechia obtained from 2016 until 2018 for LPG refuelling infrastructure deployment is 42.71% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the CZ NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	187.35	185.51	179.26	191.26	257.34	255.37

5.3.3.2 Rail transport

5.3.3.2.1 *Electricity*

Vehicles

The CZ NIR recorded 814 locomotives/railcars and 317 passenger vehicles in 2018. A slight increase in these numbers is expected until 2030 (900 locomotives/railcars and 370 passenger vehicles).

Infrastructure

Information is not available in the Czech NIR.

5.3.3.3 Waterborne transport (maritime)

Not applicable since Czechia has no maritime ports in the TEN-T Core Network.

5.3.3.4 Waterborne transport (inland)

5.3.3.4.1 LNG

Vessels

The CZ NIR provides an estimate of 20 and 40 LNG vessels for inland waterborne transport, respectively by 2025 and 2030 (NOTE: these estimates have been presented as CNG vessels in the CZ NIR but it is considered that in reality the numbers refer to LNG vessels and as such they have been treated).

Since at the end of 2018 there are no LNG vessels deployed in the inland ports, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Following the Commission assessment of the CZ NPF, the CZ NIR shows a change of strategy, with a target of two LNG refuelling stations for 2030. In fact, in relation to Article 6(3) of the Directive, the CZ NPF had not set any target for the construction of LNG fillings stations at inland ports. The justification had been that the construction of filling stations for LNG-powered vessels in public ports in Czechia did not look effective for the immediate future.

Since at the end of 2018 there are no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

5.3.3.4.2 *Hydrogen*

Vessels

The CZ NIR also presents an estimate of hydrogen-fuelled vessels for 2025 and 2030 (5 and 20 vessels, respectively), however this is not accompanied by any announced plan of corresponding hydrogen infrastructures at the Czech inland ports. The CZ NIR provides no explanation.

Since at the end of 2018 there are no hydrogen vessels deployed in the inland ports, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Information is not available in the Czech NIR.

5.3.3.5 Air transport

5.3.3.5.1 Electricity

Airplanes

Information is not available in the Czech NIR.

Infrastructure (for stationary airplanes)

CZ NIR reports the following: "*At present, the (Prague's Václav Havel) airport is equipped with power connections (400 Hz) at all 31 contact stands (stands served by boarding bridges), and every new contact stand will also be fitted with one. Remote stands are not provided with permanent connections and there are no plans to fit these. However, the handling companies have mobile ground power units (GPUs), which can be used for aircraft at remote stands…. Within five minutes of an aircraft stopping at a stand, it must be connected to an external power source and the auxiliary power unit must be disconnected. Auxiliary power units cannot be started up until 20 minutes prior to the expected time of departure (ETD). The other international airports included in the TEN-T core or global network, i.e. Ostrava/Mošnov airport and Brno/Tuřany airport, and equipped with permanent power connections do not have contact stands, but even here the same requirement applies concerning restrictions on auxiliary power units and the use of mobile ground power units instead.*"

5.3.4 *Measures assessment*

Concerning the measures to support the uptake of AF vehicles and infrastructures, the CZ NPF had listed a large number (around 70 overall) that was presented as a collection of the most common measures also taken into consideration by other Member States. Of this large list of measures, the NPF reported that only a limited number was actually implemented, while the majority was still at discussion stage. In the CZ NIR, the situation has evolved as to include a selection of measures that have been either confirmed/modified (if already in place), or implemented/dropped (if under discussion).

5.3.4.1 Legal measures

The CZ NIR presents a list of six Legislative & Regulatory measures and seven Administrative measures. Ten of these measures are in place and three are in the process of being adopted. This compares with a list of 24 Legal measures presented in the NPF, of which seven were adopted and 17 were under discussion. In this case it was not possible to provide an assessment of the change of ambition level between NIR and NPF.

5.3.4.1.1 Legislative & Regulatory

The six Legislative & Regulatory measures are quite differentiated and cover a series of elements:

- allowing public contracting authorities to apply a methodology to calculate operating costs using lifetime costs when purchasing vehicles;
- setting specification of the requirements for electrical engineering qualifications for staff working on electric vehicles;
- updating the legislation dealing with LNG-powered vehicles;
- addressing the issue of removing barriers to the garaging of gas-powered vehicles;
- no payment of motorway vignettes/tolls for vehicles powered by alternative fuels;
- introduction of special registration plate for electric vehicles.

5.3.4.1.2 Administrative

Similarly, the seven Administrative measures address different aspects (both of financial and non-financial nature) like, for example:

- maintaining the reduced rate on excise duty for CNG and LNG;
- allowing free parking for vehicles powered by alternative fuels;
- promoting targeted specialised teaching in the area of clean mobility both at secondary schools and at university level;
- strengthening cooperation between universities, research organisations and industry in the development of alternative fuels in Czechia.

Overall, the list of Legal measures presented in the CZ NIR shows the development of a strategy that was not evident in the NPF.

5.3.4.2 Policy measures

In terms the Policy measures, the first considerations relate to the comparison between NPF and NIR.

The NPF contained 26 measures that could be considered as Policy measures. Of these, only four were implemented, while the other 22 were under discussion. The NIR only addresses eight Policy measures, but all are in place. Six measures are related to ensure national targets and objectives, one measure can be associated to the promotion of AFI in public transport services and one measure to the promotion of deployment of private electro-mobility infrastructure.

5.3.4.2.1 Measures to ensure national targets and objectives

Road transport

Two out of the six measures in this section concern incentives to support the purchase of AF vehicles. The first has supported the purchase of 69 electric buses, 98 trolleybuses and 100 CNG buses. The second measure has supported the purchase of 508 electric vehicles by private business. It is noted here that, contrary to several other MSs, no incentives are foreseen for the purchase of EV by private citizens.

The remaining four measures are related to providing financial support to the construction of recharging stations (375 fast recharging points and 444 normal recharging points), CNG refuelling stations (2 CNG refuelling stations are already supported, others are planned), LNG refuelling stations (13 LNG refuelling stations are supported, others are planned), and hydrogen refuelling stations (4 hydrogen refuelling stations are supported, others are planned).

Other transport modes

The CZ NIR does not present measures for other transport modes (rail, water, air).

5.3.4.2.2 Measures that can promote AFI in public transport services

The above-mentioned measure, concerning the purchase of 69 electric buses, 98 trolley-buses and 100 CNG buses, can be considered as an indirect measure to promote AFI in public transport service and as such it has been assessed.

5.3.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The CZ NIR also presents a Policy measure to promote the deployment of private electro-mobility infrastructure. According to the NIR, this measure has supported 256 recharging stations within premises of private companies.

5.3.4.3 Deployment and manufacturing support

5.3.4.3.1 AFI deployment

Considering, that in the CZ NPF there were four Deployment measures mentioned, all under discussion, it is evident that actions have been taken and some progress has been made towards the uptake of AF infrastructures in the CZ Republic. The CZ NIR reports that, in the implementation period 2017-2020, 375 rapid recharging stations, 444 normal recharging stations, 13 LNG and 4 hydrogen refuelling stations have either been built, or are under construction or have been assigned for construction.

The CZ NIR also reports that "*some businesses have also responded to the calls announced by the European Commission under the Connecting Europe Facility. In 2020, support from this source should lead to the construction of 149 rapid charging stations and 10 ultra-rapid charging stations on the corridors of the TEN-T Core Network".*

5.3.4.3.2 Support of manufacturing plants for AF technologies

The CZ NIR mentions a measure to support manufacturing plants for AF technologies in the form of investment incentive (reduced corporation tax), foreseen for the period 2021-2025 with a total budget of around 53 million €. However, no other information is given that could allow any assessment of this measure.

5.3.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Czech NIR.

5.3.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.3.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures carried out according to the assessment methodology described in Section 2.2. As it can be seen, only clusters of measures on electricity, CNG, LNG and hydrogen, all for road transport, could be identified in the Czech NIR but none resulted to be comprehensive. The electricity/road, LNG/road and hydrogen/road clusters have at least one measure that scores high, thus the overall score is H. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road, LNG/road and hydrogen/road result to have a medium impact, while those for the pair CNG/road have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for LNG/road and hydrogen/road, has remained the same for electricity/road and has decreased for CNG/road, coherently with the vehicle estimates and infrastructure targets presented in Section 5.3.3.

Table 5.3.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	H	N		**M**		=
CNG	Road	L/M	N		**L**		-
LNG	Road	H	N		**M**		+
	Waterborne inland						
H2	Road	H	N		**M**		+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.3.4.5 Research, Technological Development & Demonstration

In terms of RTD&D measures, the CZ NIR shows a substantial continuity in the approach taken in the NPF, with the participation in several EU RTD&D projects (Alpha, Beta, Gamma, Delta, etc.). In particular, the CZ NIR reports a project on electro-mobility and links with the distribution system/Smart Grids. Two projects focus on the development of hydrogen for road transport. A fourth project is dedicated to the analysis of the potential for the use of CNG/LNG in inland water transport. Overall, the approach shown in the CZ NIR appears to have a similar level of ambition to that of the NPF.

5.3.5 *Additional information on alternative fuels infrastructure developments*

The CZ NIR provides information on the changes in fuel use (see Table 5.3.5-1). As it can be seen, CNG is expected to remain the dominating alternative fuel in road transport throughout the period (despite the important downward revision of the CNG vehicle estimate for next decade), followed by LPG and electricity. Hydrogen is also expected to start playing a little role in 2030. No increase in AF use in inland waterway transport is expected.

Table 5.3.5-1 Changes in fuels use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuel use (%)			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	27.14%	27.61%	27.51%	27.13%	25.40%	23.46%
	Diesel	70.42%	69.81%	69.82%	69.88%	69.53%	68.08%
	Electricity	0.00%	0.01%	0.02%	0.05%	0.26%	0.73%
	CNG	0.75%	0.83%	0.92%	1.22%	3.11%	5.52%
	Hydrogen				0.00%	0.06%	0.64%
	LPG	1.69%	1.73%	1.73%	1.71%	1.64%	1.57%
	Other AF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Total Road	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
Inland waterway	Marine diesel oil	100%	100%	100%	100%	100%	100%

5.3.6 *Summary of the assessment*

Tabular overview

Table 5.3.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode						
			Electricity / road	**CNG / road**	**LNG / road**	**LNG / water (inland)**	**H2 / road**	**H2 / water (inland)**	**LPG / road**
AF Vehicles / Vessels		Past situation (2016)	1,386*	15,140	0	0	1	0	170,300
		Situation (2018)	3,169*	22,109	2	0	1	0	170,300
		Estimate (2030)	217,179	46,340	6,900	40	62,559	20	256,650
		Future share (2030) [%]	4.09%	0.87%	2.96%		1.18%		4.83%
		Estimate attainment (2018 vs 2030) [%]	1.46%	47.71%	0.03%		<0.01%		66.35%
		Progress (2018)	adequate	fast	0.03%		0.00%		0.00%
Publicly accessible AF Infrastructure		Past situation (2016)	451	117	0	0	0	NA	909
		Situation (2018)	749	185	1	0	0	NA	950
		Target (2030)	19,000	600	30	2	95	NA	1,005
		Target attainment (2018 vs 2030) [%]	3.94%	30.83%	3.33%				94.53%
		Progress (2018)	slow	adequate	3.33%				42.71%
Sufficiency Index		2016	3.07	129.40					187.35
		2018	4.23	119.51	2.00				179.26
		2020	7.60	138.01	26.67		0.75		191.26
		2025	12.39	123.22	164.29		669.00		257.34
		2030	11.43	77.23	230.00		658.52		255.37
Measures	**Legal measures**	Ambition (NIR vs NPF)							
	Policy measures + Deployment & manufacturing support	Score	H	L/M	H		H		
		Comprehensiveness	N	N	N		N		
		Impact	M	L	M		M		
		Ambition (NIR vs NPF)	=	-	+		+		
	RTD&D	Ambition (NIR vs NPF)	=				=		

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken from EAFO (absent in both NIR and NPF).

The CZ NIR addresses all the requirements of Annex I from the Directive, although not with the same level of detail.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is well covered for road transport; CNG, LNG and hydrogen are also covered for road transport; inland water transport is just mentioned (refuelling infrastructures are foreseen in 2025 and 2030 for LNG, while inland waterway vessels are estimated for CNG and hydrogen. In this assessment the CNG vessels have been considered instead as LNG vessels, while for hydrogen the discrepancy remains that no infrastructure is foreseen up to 2030); all the other combinations are either absent or not applicable. As for LPG, Czechia has already quite a developed combination of refuelling infrastructure and vehicles.

The main outcomes of the technical assessment of the Czech NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – With 749 recharging points recorded in 2018, the CZ NIR confirms the infrastructure target for the end of 2020, thus showing the same level of ambition of the NPF. Targets have been introduced for the years 2025 and 2030 that were not included in the NPF. These appear to be coherently designed to maintain a constant and adequate ratio with the estimated EV for the target years. Concerning EV vehicles, the CZ NIR presents a new growth curve, with a lower number of vehicles in 2020 and 2025 compared to the NPF, but a similar number of vehicles in 2030 (i.e. > 200,000). According to our methodology, the progress between 2016 and 2018 to achieve their objectives in 2030 is considered adequate for EV vehicles and slow for EV infrastructure. As for heavy-duty vehicles, the CZ NIR estimates 583 battery-electric buses and coaches on the road by 2030 but no HCV.
- **CNG** – In 2018, Czechia recorded 185 CNG refuelling points and 22,109 vehicles. For the next decade, the CZ NIR shows a substantial reduction in CNG vehicle estimate for 2030, from 200,000 to less than 50,000 (-76.83%), coupled to an increase for the CNG infrastructure. This discrepancy is not explained in the NIR. It should be noted that the decrease in vehicle estimates for CNG/road is partially compensated by an increase of LNG/road and hydrogen/road vehicles, however this does not seem sufficient compared to the NPF plan. Thus, it can be considered that on non-EV vehicles there is an overall decrease of ambition compared to the NPF. According to our methodology, the progress between 2016 and 2018 to achieve their objectives in 2030 is considered adequate for CNG infrastructure and fast for CNG vehicles. Obviously, the substantial reduction in vehicle estimates for 2030 plays a role here. In the heavy-duty sector, the CZ NIR estimates 600 HCVs and 1,740 buses and coaches on the road by 2030.
- **LNG** – The CZ NIR presents a plan to double the number of LNG refuelling infrastructure in 2030 compared to the NPF (30 in the NIR versus 14 in the NPF) and to have 6,900 LNG heavy commercial vehicles on the road by 2030.
- **Hydrogen** – The CZ NIR provides objectives that were not present in the NPF (with the exception of the hydrogen infrastructure target for 2025). In the CZ NIR, 62,559 hydrogen vehicles and 95 hydrogen publicly accessible refuelling stations are foreseen by 2030. Most of these hydrogen vehicles should be light-duty vehicles (>60,000) but 100 heavy commercial vehicles and 870 buses and coaches are estimated too.
- **Biofuels** – Information is not available in the CZ NIR.
- **LPG** – The CZ NIR also presents a plan for the pair LPG/road, which was not included in the NPF. However, this cannot be considered as a consequence of the AFI Directive, because the LPG vehicles and infrastructure were already present on the Czech territory before 2016 and the outlook presented in the NIR until 2030 only shows a moderate increase compared to the current situation.

Rail transport

- **Electricity** – The CZ NIR recorded 814 locomotives/railcars and 317 passenger transport vehicles in 2018 and these numbers are expected to slightly increase until 2030 (900 locomotives/railcars and 370 passenger vehicles).

Waterborne transport (inland)

- **LNG** – The CZ NIR presents the intention to have 40 LNG waterborne vessels and 2 LNG inland port refuelling stations by 2030.
- **Hydrogen** – The CZ NIR also estimates 20 hydrogen-fuelled waterborne vessels for 2030, but no infrastructure is planned at the moment.

Air transport

Information is not available in the Czech NIR.

Concerning the **measures** to support the uptake of AF vehicles and infrastructures, the CZ NIR shows an effort to move from the wide list of measures under discussion in the NPF, to a more limited but focussed set of measures. As a general statement, such effort seems to have been more successful for what concerns the deployment of infrastructure (in particular charging points), less for the AF vehicles.

The Legislative & Regulatory measures are quite differentiated and cover a series of elements: from allowing public contracting authorities to apply a methodology to calculate operating costs using lifetime costs when purchasing vehicles, to setting specification of the requirements for electrical engineering qualifications for staff working on electric vehicles; from updating the legislation dealing with LNG-powered vehicles, to addressing the issue of removing barriers to the garaging of gas-powered vehicles. Similarly, the Administrative measures address different aspects (both of financial and non-financial nature) like, for example, maintaining the reduced rate on excise duty for CNG and LNG; allowing free parking for vehicles powered by alternative fuels; strengthening cooperation between universities, research organisations and industry in the development of alternative fuels in Czechia.

With reference to Policy and Deployment & Manufacturing measures, the effort to focus on implementing a few initiatives is evident. The NPF contained 26 measures that could be considered as Policy measures. Of these, only four were implemented, while the other 22 were under discussion. In the NIR, only eight Policy measures have been counted, but all are in place. Six measures are related to ensure national targets and objectives, one measure can be associated to the promotion of AFI in public transport services and one measure is related to the promotion of deployment of private electro-mobility infrastructure. All of them are only related to road transport. The implementation of these measures has produced some tangible results in terms of deployment of recharging points and refuelling infrastructures in the implementation period 2016-2018. In terms of the expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR for the next decade, the measures for the pairs electricity/road, LNG/road and hydrogen/road result to have a medium impact, while those for the pair CNG/road have a low impact.

With RTD&D measures, the CZ NIR shows continuity with the approach taken in the NPF, i.e. participation in several EU RTD&D projects (Alpha, Beta, Gamma, Delta, etc.). In particular, the CZ NIR reports a project on electro-mobility and links with the distribution system/Smart Grids. Two projects focus on the development of hydrogen for road transport. A fourth project is dedicated to the analysis of the potential use of CNG/LNG in inland water transport. Overall, the approach shown in the CZ NIR appears to have a similar level of ambition to that of the NPF.

5.3.7 *Final remarks*

The Czech NIR presents a quite comprehensive report on the efforts to implement the Directive. It largely complies with the provisions of Annex I to the Directive, with only a few exceptions. The NIR provides estimates for vehicles and vessels, and targets for recharging and refuelling points for all alternative fuels with the exception of shore-side electricity supply in inland ports. The report also sets targets for hydrogen, which is not mandatory under the Directive. The NIR presents a large array of measures, in particular in the field of road transport. However, its level of ambition falls short regarding zero emission vehicles and their infrastructure needs. Range and ambition of measures could also be increased as regards the use of alternative fuels in modes of transport other than road.

With regard to electricity, the NIR estimates a fleet of 217,179 electric vehicles on the roads by 2030, representing about 4% of the fleet by that time. Taking into account the current situation and expected trend development, this level of ambition appears quite low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. The targets for publicly accessible recharging infrastructure correspond to the estimated number of vehicles. Because of the low vehicles estimate, infrastructure planning is likely to not result in a necessary comprehensive network of recharging points throughout the country. An increase in ambition would contribute to better meeting the needs of a dense, wide-spread and easy to use network of recharging and refuelling infrastructure throughout the EU. No information on charging efficiency is provided. Further, there is no information on shore-side electricity supply in inland ports. Only Prague's Václav Havel airport is equipped with power connections for stationary aircraft. The NIR does not provide information on the share of electrification of the rail network. However, the use of electricity in rail is expected to slightly increase until 2030.

Regarding hydrogen for transport, the NIR shows Czechia's interest in promoting hydrogen in road and inland waterway transport. The NIR estimates a number of 62,559 FCHVs and around 95 refuelling stations by 2030. The number of hydrogen refuelling points for 2030 seems sufficient taking into account the length of Czechia's TEN-T Core Network, provided that the refuelling points are widely distributed along the network.

Concerning natural gas for transport, the estimates for vehicle uptake have been significantly reduced compared to those presented in the NPF. The NIR accounts for a share of CNG vehicles in 2030 below 1% of the fleet. In comparison to the fleet estimate, the deployment targets for CNG refuelling infrastructure remain rather high. A significant increase in LNG heavy-duty vehicles is expected in the coming years. In addition, the number of 30 LNG refuelling points planned for 2030 seems sufficient taking into account the length of Czechia's TEN-T Core Network, provided that the refuelling points are widely distributed along the network. Only two inland ports of the TEN-T Core Network are planned to supply LNG to ships. Czechia should ensure that the other two ports are also equipped with LNG infrastructure to ensure that LNG vessels can circulate throughout the TEN-T Core Network.

A fleet of 170,300 LPG vehicles already exists and their number is expected to increase to 256,050 vehicles until 2025. However, similarly to electric and CNG vehicles, the share in the total fleet is expected to remain very limited.

Further information should be provided on the use of biofuels in road and air transport. Czechia should provide more information on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.3.8 *ANNEX - Description of the Member State*

On a surface area of 78,900 km², Czechia has a population of 10.610 million people in 2010, which makes up for a population density of 134 inhabitants/km².

Number of main urban agglomerations

- 17 urban agglomerations > 50,000 inhabitants

In 2018, Czechia achieves a per capita gross domestic product at market prices of €19,530, which represents a per capita gross domestic product in purchasing power standards of 92 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Czechia is 1,017 km. The total road network length is 55,740 km, of which 1,252 km are motorways.

The following lengths of TEN-T Road Corridors are present in Czechia: 6% (230 km) of the Baltic - Adriatic Corridor, 9% (473 km) of the Orient/East - Mediterranean Corridor and 11 % (495 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, Czechia is connected with the following Member States:
- Austria (through the Baltic - Adriatic and the Orient/East - Mediterranean Corridor)
- Poland (through the Baltic - Adriatic Corridor)
- Germany (through the Orient/East Mediterranean Corridor and the Rhine - Danube Corridor)
- Slovakia (through the Orient/East Mediterranean Corridor and the Rhine - Danube Corridor)

Number of registered road vehicles

At the end of 2018, Czechia accounts for 7,582,962 registered road vehicles of which 5,747,913 are categorized as passenger cars, 441,303 as light goods vehicles, 269,319 as heavy goods vehicles and 22,027 as buses and coaches. The motorisation rate is 542 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- No maritime ports
- 4 inland ports in the TEN-T Core Network (Děčín, Mělník, Pardubice, Praha-Holešovice)
- 5 inland ports in the TEN-T Comprehensive Network

Through the 333 km inland waterways TEN-T Core Network, Czechia is connected with Germany by the Orient – East Mediterranean Corridor.

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Ostrava, Praha-Václav Havel)

- 1 airport in the TEN-T Comprehensive Network

5.4 Denmark (DK)

5.4.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Danish NPF, the Commission concluded:

The Danish NPF addresses most of the requirements of Article 3. It presents the current state of alternative vehicle uptake and infrastructure and derives targets for future recharging points and CNG refuelling points (road). It discusses LNG refuelling in maritime ports and H2 refuelling points (road). It does not establish targets for LNG refuelling points for heavy-duty vehicles. The government in Denmark is committed to achieve the goal of becoming a low-emission society, independent of fossil fuels by 2050. The Danish government seeks to promote a market-driven (i.e. determined by market players) development of infrastructure deployment and to limit public financial aid, so that greater pressure on public finances can be avoided. Technology neutrality is emphasised in the NPF.

For electricity, the Danish NPF is relatively well-balanced in terms of future targets and the description of policy measures. Notwithstanding, the latter is fundamentally based on current rather than planned measures. The NPF estimates that the EV share (of all vehicles on the road) will remain below 1% until 2020. The prospects of shore-side electricity supply in Danish maritime ports are not good. The only policy measure mentioned in the NPF is tax relief for electricity. However, this incentive was not sufficient to make the investment in shore-side electricity supply attractive in the context of the Nordhavn expansion of the Port of Copenhagen. At the opposite extreme lies the status of electricity supply for stationary airplanes. Denmark considers itself a leader in this matter. Notwithstanding, communication f the number of ground power units installed in the three largest airports would facilitate the assessment.

For other alternative fuels, the NPF is not comprehensive.

The NPF highlights the lack of market momentum for private ownership of CNG cars. The NPF does not contain any future estimates for CNG vehicles. Although the sufficiency index for CNG refuelling points is adequate, it seems that Aarhus, in particular, could benefit from CNG infrastructure deployment for two reasons: it is the second-largest city in the country and it is located along the TEN-T Network between Aalborg and Vejle.

In terms of LNG for road transport, no infrastructure targets are given.

There appears to be a lack of policy measures targeting LNG in the Danish maritime ports.

At present, Denmark foresees insignificant market uptake for hydrogen vehicles before 2025.

The support measures defined in the Danish NPF are unlikely to have a high impact on removing market barriers.

The NPF does not provide any information on stakeholder engagement and cooperation with other Member States.

5.4.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.4.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road / Electricity, CNG, hydrogen		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	All / All		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air / Biofuels		Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, rail, combination / All		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Road / CNG		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, combination / Hydrogen, AFs in general		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, water maritime, rail / All		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, water maritime, rail / All		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, water maritime / All		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, water maritime / All		Yes

The checklist shows that almost all the requirements of Annex I from the Directive are covered.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, hydrogen and LPG for road transport; LNG for road and maritime transport; biofuels for air transport; all the other combinations are either absent or not applicable.

The Danish NIR reports around 50 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify six AF/transport mode clusters of measures, of which five were assessable.

5.4.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.4.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018 AFV	2018 AFI public	2020 AFV	2020 AFI public	2025 AFV	2025 AFI public	2030 AFV	2030 AFI public
Electricity / road	NIR	16,118	3,648	35,675	5,419	109,805	9,848	331,749	29,437
	Change NIR vs NPF [%]			16.50%	80.65%	67.33%			
	Attainment [%]			45.18%	67.31%	14.68%	37.04%	4.86%	12.39%
CNG / road	NIR	578	17	862	17	1,522	17	2,153	17
	Change NIR vs NPF [%]				-15.00%				
	Attainment [%]			67.05%	100.00%	37.98%	100.00%	26.85%	100.00%
LNG / road	NIR	0	0	0	0	0	3	0	3
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	3	2	3	2	4	2	4	2
	Change NIR vs NPF [%]								
	Attainment [%]			100.00%	100.00%	75.00%	100.00%	75.00%	100.00%
H2 / road*	NIR	85	8	316	7	889	7	954	7
	Change NIR vs NPF [%]								
	Attainment [%]			26.90%		9.56%		8.91%	
LPG / road	NIR	12	4	8	4	3	2	0	0
	Change NIR vs NPF [%]								
	Attainment [%]								
Shore-side electricity supply / water (maritime)	NIR		2		4		11		11
	Change NIR vs NPF [%]								
	Attainment [%]				50.00%		18.18%		18.18%

Legend:

(grey)	not applicable
(white)	the value could not be computed
NA	no value/information provided/available in the NIR

*The values for hydrogen refuelling points are shown for informational purposes only and should not be interpreted as Denmark's targets, for the Danish government officially excluded hydrogen from its NPF and NIR.

5.4.3.1 Road transport

5.4.3.1.1 Electricity

Vehicles

Denmark recorded 16,118 battery-electric and plug-in hybrid electric vehicles in use in 2018 (of which 15,205 were passenger cars, 905 were LCVs and 8 were buses and coaches) (see Table 5.4.3-1). The Danish NIR EV estimates are 35,675 for 2020 and 109,805 for 2025, which are respectively 16.50% and 67.33% higher than in the NPF. This reflects a higher policy ambition. Denmark had not provided 2030 EV estimates in the NPF but the NIR presents estimates: by 2030, the Danish NIR expects that 88.7% of the 331,749 EVs in use will be passenger cars, 10.7% LCVs, 0.1% HCVs and 0.5% buses and coaches. In addition, the Danish NIR provides an estimate of 2,510 electric PTW in 2030, compared to 1,386 in 2018.

The 2018 ***attainment*** of future EV estimates is 45.18% for 2020 and 4.86% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Denmark is equal to 27%.

Infrastructure

Denmark recorded 3,648 publicly accessible recharging points in 2018 (Table 5.4.3-1). The NIR target for the publicly accessible recharging points for 2020 is 5,419. This is 80.65% higher than the target in the NPF. Denmark had not provided targets for publicly accessible recharging points for 2025 and 2030 in its NPF. This has now been modified in the NIR: 9,848 and 29,437 points respectively in 2025 and in 2030. Over the period 2020-2030, the share of publicly accessible high power (>22kW) recharging infrastructure is targeted to remain constant at a value of 62%.

The Danish NIR indicates that information on the number of private recharging points is unavailable.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 67.31% for 2020 and 12.39% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Denmark is equal to 21%.

Ratio

Based on the DK NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that in 2030 the foreseen sufficiency index is not far from a value of 10 that, considering the planned 62% high power share, can be regarded as adequate.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	6.05	4.17	4.42	6.58	11.15	11.27

Information on charging efficiency

Information is not available in the Danish NIR.

5.4.3.1.2 CNG

Vehicles

Denmark recorded 578 CNG vehicles in use in 2018, of which 130 were passenger cars, 138 LCVs, 156 HCVs (including refuse collection vehicles in many cities) and 154 buses and coaches (Table 5.4.3-1). By 2030, the Danish NIR expects that 37% of the 2,153 CNG vehicles in use will be passenger cars, 17% LCVs, 4% HCVs and 42% buses and coaches.

The 2018 ***attainment*** of future CNG vehicles estimates is 67.05% for 2020 and 26.85% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Denmark is equal to 13%.

Infrastructure

As Table 5.4.3-1 shows, the Danish government plans that the 17 publicly accessible CNG refuelling points in 2018 remain in use until 2030. The AFI (CNG/road) public target for 2020 provided in the NIR is 15.00% lower than in the NPF.

The 2018 ***attainment*** of future publicly accessible CNG refuelling infrastructure targets is constant and equal to 100% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Denmark is equal to 1%.

Ratio

Based on the DK NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the whole implementation period.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**CNG**	25.93	32.00	34.00	50.71	89.53	126.65

5.4.3.1.3 LNG

Vehicles

Three years after the notification of the Danish NPF, LNG road vehicles had not been deployed in Denmark yet. The Danish NIR provides a value of zero for the future estimates of LNG road vehicles. However, since the notification of its NPF, Denmark has been observing LNG developments in neighbouring countries and expects future transit traffic of LNG vehicles.

Infrastructure

The Danish NIR notes that refuelling a LNG vehicle on Denmark's part of the TEN-T network is currently not possible. As it can be seen in Table 5.4.3-1, Denmark plans for the possibility of three LNG refuelling points to be deployed by 2025 (probably around Aalborg, the Triangle Region and Copenhagen). According to the NIR, such deployment will be facilitated by market-driven developments.

Because there were no LNG refuelling points in Denmark at the end of 2018, this assessment did not compute 2018 ***attainment*** and ***progress*** values.

Ratio

Since there are no LNG vehicle estimates in the DK NIR it is not possible to compute the sufficiency index.

5.4.3.1.4 Hydrogen

Vehicles

The Danish NIR indicates that 85 hydrogen-powered vehicles (all of them passenger cars) were in use in 2018. This number is expected to reach almost 1,000 units by 2030, of which 21 would be HCVs, 276 buses and coaches and the rest passenger cars.

The 2018 ***attainment*** of future hydrogen vehicle estimates is 26.90% for 2020 and 8.91% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Denmark from 2016 until 2018 for hydrogen vehicles deployment is 1.81% of the overall planned deployment during the period 2016-2030.

Infrastructure

The Danish NPF did not include hydrogen infrastructure provisions. Data reported on hydrogen in the NPF and the NIR are presented here for informational purposes though.

The Danish NIR indicates that eight hydrogen refuelling points (all of them 700 bar and publicly accessible) were available in 2018, of which seven remained at the time the NIR was notified.

Because the Danish government officially excluded hydrogen for its NPF and NIR, no ***attainment*** and ***progress*** values have been computed.

Ratio

Because the Danish government officially excluded hydrogen for its NPF and NIR, no sufficiency index has been computed.

5.4.3.1.5 Biofuels

Vehicles

Information is not available in the Danish NIR.

Infrastructure

As in the Danish NPF, the Danish NIR does not provide further information on infrastructure requirements for biofuels, as these are expected to be distributed through existing conventional fuels infrastructure.

5.4.3.1.6 LPG

Vehicles

The Danish government expects that LPG for transport is fully phased out by 2030. Thus, the future number of LPG vehicles in use declines and is expected to reach zero by 2030.

Because the Danish government expects the phase-out of LPG, no ***attainment*** and ***progress*** values have been computed.

Infrastructure

Given the expectation of an LPG phase-out by 2030, the number of publicly accessible LPG refuelling points halves by 2025 and further reduces to zero by 2030, according to the NIR.

Because the Danish government expects the phase-out of LPG, no ***attainment*** and ***progress*** values have been computed.

Ratio

Based on the DK NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road (see Section 2.1.5). The 2030 value could not be computed since LPG will be phased out.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	4.50	3.50	3.00	2.00	1.50	

5.4.3.2 Rail transport

5.4.3.2.1 Electricity

Vehicles

The Danish NIR expects the number of electric locomotives to increase from 253 units in 2018 to 353 by 2030. This number is however similar to the 345 figure reported for 2016.

Infrastructure

According to the NIR, the full electrification of the 57 km Esbjerg-Lunderskov route in 2017 and the 45 km Køge-Næstved route in 2019 allows electric trains to circulate on these electrified routes. In addition, the 60 km high-speed Copenhagen–Ringsted line inaugurated in 2019 was also built as an electrified railway.

5.4.3.3 Waterborne transport (maritime)

5.4.3.3.1 Electricity

Vessels

The Danish NIR expects the number of electric seagoing ships to increase from 3 units in 2018 to 5 by 2030.

Infrastructure

According to the NIR, shore-side electricity supply installations are available for use in all the Danish ports by vessels requiring a rather limited power supply. However, the availability of shore-side electricity supply installations for use by vessels requiring substantial power supply is uncertain and remains, on economic grounds, not widespread yet. The Danish NIR does not provide specific information on the threshold between 'limited and substantial' power supply. The NIR mentions that shore-side electricity supply will become available in the ports of Skagen, Hirtshals and Frederikshavn in next three years. As it can be seen in Table 5.4.3-1, the number of recharging points providing shore-side electricity supply in the Danish maritime ports is expected to increase from two in 2018 to eleven by 2030. Denmark is likely to reach its 2020 target given that shore-side electricity supply became available also in the Port of Faaborg and the Port of Grenå in 2019 (in the latter, with a 2 MW capacity).

The 2018 ***attainment*** of future targets for shore-side electricity supply for seagoing ships in maritime ports is 50% for 2020 and 18.18% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Denmark obtained from 2016 until 2018 for shore-side electricity supply deployment in maritime ports is 60% of the overall planned deployment during the period 2016-2030.

5.4.3.3.2 LNG

Vessels

The Danish NIR expects the number of LNG seagoing ships to increase from three units in 2018 to four by 2030.

The 2018 ***attainment*** of future LNG seagoing ships estimates is 100% in 2020 and 75% in 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Denmark from 2016 until 2018 for LNG seagoing ships deployment is 0% of the overall planned deployment during the period 2016-2030.

Infrastructure

As it can be seen in Table 5.4.3-1, there were two LNG refuelling points in Danish maritime ports in 2018. This entails that Denmark's second LNG facility has become operational in the port of Hou since the notification of the NPF (and while Frederikshavn was mentioned in the NPF, no update on LNG availability in this port is provided in the NIR). According to the NIR, the future number of LNG refuelling points in Danish maritime ports is expected to remain unchanged. Accordingly, no LNG supply targets before 2030 are given for the two maritime ports that are part of the TEN-T Core Network (Aarhus and Copenhagen). Notwithstanding this, the Danish NIR reports the expectation that the Directive's minimum requirements will either be met by market-based developments or by regulatory initiatives, if necessary.

The 2018 ***attainment*** of future LNG refuelling infrastructure targets in maritime ports is 100% in 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Denmark from 2016 until 2018 for LNG refuelling infrastructure deployment in maritime ports is 100% of the overall planned deployment during the period 2016-2030.

5.4.3.4 Waterborne transport (inland)

Not applicable since Denmark has no inland ports in the TEN-T Core Network.

5.4.3.5 Air transport

5.4.3.5.1 Electricity

Airplanes

The Danish NIR considers that the deployment of hybrid-electric or fully-electric airplanes by 2030 remains highly uncertain.

Infrastructure (for stationary airplanes)

As in the NPF, the Danish NIR indicates that the airports that account for more than 97% of passenger flights are equipped with devices that enable electricity supply for stationary airplanes.

5.4.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is not provided in the Danish NIR.

Infrastructure

The Danish NIR gives some consideration to the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network. In Denmark, there was no sustainable aviation fuel production in late 2019. The NIR does not quantify sustainable aviation fuel production by 2030, though it expects it to increase towards 2030.

5.4.4 ***Measures assessment***

As in the NPF, a relevant series of measures is mentioned in the Danish NIR. For the Policy and Deployment & Manufacturing support measures, this results in five assessable AF/transport mode clusters.

5.4.4.1 Legal measures

The Danish NPF had only mentioned one legal measure on advanced biofuels blending, which is no longer mentioned in the NIR. The Danish NIR contains now seven legal measures, representing a significant increase.

Whereas two of the legal measures described in the NIR have already expired, another one refers to the presentation of a proposal for an Act amendment (related to the implementation of the provisions stipulated in the Energy Performance of Buildings Directive (2018/844/EU)). The rest are existing measures (all of them affecting road transport).

Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR. The level of ambition of the legal measures has generally increased in the NIR compared to the NPF.

5.4.4.1.1 Legislative & Regulatory

All the legal measures described in the Danish NIR can be categorised as legislative and regulatory measures and include the following ones:

- Norms & requirements: zero- and low-emission parking benefits and stricter energy requirements for the taxi fleet.
- Permits: quotas of permits for zero-emission taxis and access to bus lanes for low-emission vehicles.

5.4.4.1.2 Administrative

The Danish NIR does not provide specific information on administrative measures.

5.4.4.2 Policy measures

In its NPF, the Danish government had signalled the willingness to re-examine public support if conditions varied considerably on various policy issues. The Danish NIR contains nine policy measures, which represents no change in the number of measures compared to the ones identified in the NPF (adopted or existing at the time). In contrast to the NPF, the abolition of the public service obligation tax and public procurement for alternative fuel vehicles are no longer mentioned.

5.4.4.2.1 Measures to ensure national targets and objectives

Road transport

Of all the policy measures described in the Danish NIR, six can be categorised as measures to ensure national targets and objectives. None of these target AFI. All of them, with one exception, involve taxation: tax reductions or exemptions for alternative fuels or for vehicle registration. Although most of them were present also in the NPF, changes on two relevant acts have taken place since then: Act No. 687 in 2017 and Act No. 1730 in 2018. According to the Danish NIR, the energy tax benefits electricity and hydrogen while the CO_2 tax favours in addition biofuels and natural gas (including biogas). Moreover, reductions in the ordinary electricity tax can be expected until 2025 from the 89.2 øre/kWh level in 2020.

Regarding taxation for vehicle registration, the Danish NIR distinguishes between the registration and the motor vehicle tax. Fuel cell-powered vehicles will be exempted from both until 2021, fully subject to the motor vehicle tax from 2022 and gradually subject to the registration tax between 2022 and 2025. For BEVs[12], the NIR further distinguishes between a special battery allowance and a tax-free allowance. The Danish NIR considers that in practice BEVs valued at DKK 400,000 (around €60,000), or less, paid no registration taxes in 2019 and 2020. The registration tax will be gradually phased in for BEVs, PHEVs and CNG vehicles. Under current policy, BEVs will be subject to the full registration tax in 2023 (and not in 2020 as the NPF had stated).

Waterborne transport

The Danish NPF mentioned the reduction of the electricity tax for shore-side electricity supply. Although a few of the policy measures target alternative fuels and can be considered to potentially affect water transport, no concrete policy measures targeting water transport are listed in the Danish NIR.

5.4.4.2.2 Measures that can promote AFI in public transport services

Of all the policy measures described in the Annex of the Danish NIR, two can be categorised as measures that can promote AFI in public transport services. Both of them are existing measures: one dealing with electric buses at local level and the other with electric railway vehicles at regional level.

Buses

The Danish NIR mentions that electric buses have been trialled in many routes in Copenhagen and Frederiksberg since 2016. Moreover, over 40 new electric buses were expected to be introduced in Denmark in the year in which the NIR was notified (2019).

Rail transport

According to the Danish NIR, further electrification of the railways is pursued, including the Fredericia-Aarhus, Aarhus-Lindholm and Roskilde-Kalundborg routes. To this end, the Banedanmark's Electrification Programme is being implemented with the objective of electrifying much of the country's railway network, according to the NIR.

5.4.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The NIR lists a measure to support the deployment of private electro-mobility infrastructure, namely the low rate of industry process electricity tax (0.4 øre/kWh) for commercially recharged EVs. It seems that this measure was expected to expire at the end of 2019 but has been extended until 2021.

5.4.4.3 Deployment and manufacturing support

5.4.4.3.1 AFI deployment

[12] We deduce that the NIR uses 'EVs' to refer to BEVs only, in contrast to PHEVs, and 'gas vehicles' to refer to CNG vehicles.

The Danish NIR contains 11 AFI deployment support measures[13], which represents a significant increase compared to the four measures identified in the NPF. Nine of the eleven can be considered measures that have already expired. The measures cover various alternative fuels and transport modes, including for instance funds to support e-bike use and to supply harbour buses with green biodiesel. The total estimated budget for AFI deployment reported in the NIR amounts to 140 million € for the period 2016-2025.

5.4.4.3.2 Support of manufacturing plants for AF technologies

The Danish NIR contains one measure that had been mentioned in the NPF to support manufacturing plants for AF technologies. The measure, to be implemented between 2021 and 2030, is backed by a ca. 286 million € fund with the aim of supporting the use of biogas in transport and industrial processes.

5.4.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Danish NIR.

5.4.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.4.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, the electricity/road cluster is the only having a high score. None of the clusters identified can be considered comprehensive. Support measures continue to be irrelevant or not assessable for LNG/road and for LNG/water (maritime) (for instance, it seems that the Danish NIR does not consider LNG retrofit for vessels to be an option).

In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road have a medium impact, those for the pairs CNG/road, biofuels/road, hydrogen/road and electricity/rail result to have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing measures has increased for all the assessable pairs.

[13] In terms of railway electrification, if a distinction is made between vehicles (which is included in the part on policy measures) and infrastructure, then a 12th measure can be identified, though information on budget is not available.

Table 5.4.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	H	N		**M**		+
CNG	Road	M	N		**L**		+
LNG	Road						
	Water - maritime	X					=
Biofuel	Road	M	N		**L**		+
H2	Road	M	N		**L**		+
Electricity	Rail	M	N		**L**		+

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.4.4.5 Research, Technological Development & Demonstration

The Danish NIR contains 19 RTD&D projects of relevance: 3 supported in 2019, 8 in 2018, 4 in 2017 and 4 in 2016. This represents a significant increase compared to the six RTD&D projects identified in the NPF. The NIR does not provide specific details[14] about each of these projects, which does not allows us to either make direct comparisons with the projects listed in the NPF or to cluster them. The NIR states that the vast majority of these projects focus on hydrogen, with a couple of them dealing with electricity for maritime transport and bioethanol. The total estimated budget for RTD&D projects reported in the NIR amounts to 36 million € for the period 2016-2019, mainly channelled through the Energy Technology Development and Demonstration Programme, the Innovation Fund and the EU framework schemes.

5.4.5 *Additional information on alternative fuels infrastructure developments*

The Danish NIR provides information on the changes in fuel use (see Table 5.4.5-1[15]). As it can be seen, biofuels are expected to remain the dominating alternative fuel in road transport throughout the period, followed by electricity. No real increase in LNG use in maritime transport is expected.

[14] These can presumably be searched via the website Energiforskning.dk.
[15] Adapted from the original table notified by Denmark.

Table 5.4.5-1 Changes in fuels use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	35%	35%	34%	33%	33%	35%
	Diesel	59%	59%	60%	61%	60%	57%
	Electricity	0%	0%	0%	0%	1%	2%
	Biofuels	6%	6%	6%	6%	6%	6%
	Other AF	0%	0%	0%	0%	0%	0%
	Total Road	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Maritime	Marine gas oil	0%	0%	0%	0%	1%	1%
	Marine diesel oil	100%	100%	100%	100%	99%	99%
	LNG	0%	0%	0%	0%	0%	0%

*Note: Since the values for 'other AF' provided in the NIR are zero and CNG use in Denmark is dominated by biomethane, it is unclear whether the biofuels figures include biomethane.

5.4.6 *Summary of the assessment*

Tabular overview

Table 5.4.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	H2 / road*	LPG / road
AF Vehicles / Vessels		Past situation (2016)	10,573	363	0	3	69	18
		Situation (2018)	16,118	578	0	3	85	12
		Estimate (2030)	331,749	2,153	0	4	954	0
		Future share (2030) [%]	8.97%	0.06%	0.00%		0.03%	0.00%
		Estimate attainment (2018 vs 2030) [%]	4.86%	26.85%		75.00%	8.91%	
		Progress (2018)	slow	adequate		0.00%	1.81%	
Publicly accessible AF Infrastructure		Past situation (2016)	1,749	14	0	1	10	4
		Situation (2018)	3,648	17	0	2	8	4
		Target (2030)	29,437	17	3	2	7	0
		Target attainment (2018 vs 2030) [%]	12.39%	100.00%		100.00%		
		Progress (2018)	adequate	fast		100.00%		
Sufficiency Index		2016	6.05	25.93			6.90	4.50
		2018	4.42	34.00			10.63	3.00
		2020	6.58	50.71			45.14	2.00
		2025	11.15	89.53			127.00	1.50
		2030	11.27	126.65			136.29	
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	=		
	Policy measures + Deployment & manufacturing support	Score	H	M		X	M	
		Comprehensiveness	N	N			N	
		Impact	M	L			L	
		Ambition (NIR vs NPF)	+	+		=	+	
	RTD&D	Ambition (NIR vs NPF)						

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

*The values for hydrogen are shown for informational purposes only and should not be interpreted as Denmark's policy goals, for the Danish government officially excluded hydrogen for her NPF and NIR. For this reason, we do not report our assessment on the measures for hydrogen.

The Danish NIR covers the whole AFID period (2016-2030). Compared to the NPF that did not meet several of the requirements of Article 3 of the Directive, the Danish NIR almost fully addresses the requirements of Annex I of the Directive, with the exception of: a) information on the methodology applied to take account of the charging efficiency of high power recharging points; b) information on any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Danish NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Denmark recorded 16,118 electric vehicles and 3,648 publicly accessible recharging points in 2018. With reference to the objectives of the DK NPF as updated by the NIR, Denmark is progressing adequately in terms of infrastructure and slowly in terms of EV deployment. The NIR increases the level of ambition compared to the existing objectives in the NPF and provides a new set of vehicle estimates and infrastructure targets until 2030. The calculated Danish sufficiency index deteriorates slightly over time but is considered still adequate[16]. The Danish NIR expects that, by 2030, the stock of electric HCVs will reach 208 units and two-thirds of the electric buses in use will be fully electric.
- **CNG** –The Danish NIR does not foresee a further expansion of the 17 CNG refuelling infrastructure recorded in 2018, while CNG vehicle stock is expected to grow from 578 units in 2018 to 2,153 units in 2030 (an increasing stock of CNG passenger cars, LCVs and buses/coaches and a declining number of HCVs), which would lead to greater utilisation of the existing CNG refuelling points. By 2025, the Danish NIR expects the stock of CNG buses to be overtaken by electric buses. With regards to CNG road vehicle deployment, Denmark is progressing adequately. Concerning the progress of infrastructure deployment, this is obviously fast, as the new 2030 target declared in the DK NIR has been already achieved in 2018.
- **LNG** – In contrast to the NPF, the Danish NIR provides future targets for LNG refuelling infrastructure deployment (three by 2025). The NIR does not foresee deployment of road vehicles powered by LNG.
- **Hydrogen** –The NIR reports future values for the stock of vehicles but does not include official hydrogen infrastructure provisions. Furthermore, the NIR mentions measures for supporting the market and expects some market-driven uptake of vehicles and refuelling points.
- **Biofuels** – The Danish NIR expects the share of biofuels use in road transport to remain constant at 6% until 2030.
- **LPG** –The NIR notes that LPG will essentially play no role in the future Danish transport system.

[16] The DK NIR expresses doubts about the appropriateness of maintaining the ‘ten-to-one ratio’ assumption.

Rail transport

- **Electricity** – The Danish NIR reports recent railway electrification. It also expects the strong decline in electric locomotive stock that took place between 2016 and 2017 to be reversed by 2030.

Waterborne transport (maritime)

- **Electricity** – The Danish NIR expects the number of battery-powered seagoing vessels to increase from three units in 2018 and 2020 to five in 2025 and 2030. The number of maritime ports providing access to shore-side electricity supply is expected to grow from two in 2018 to eleven in 2025 and 2030.
- **LNG** – Concerning LNG vessels, no real uptake is expected in the Danish NIR. The number of maritime ports providing access to LNG is reported by the NIR as remaining stable with two ports, making it uncertain whether LNG will be available in the two ports that are part of the TEN-T Core Network.

Air transport

- **Biofuels** – The Danish NIR expects sustainable aviation fuel production to start in the future.

As in the NPF, the Danish NIR continues to provide a reasonable amount of **measures** to support the uptake of alternative fuels for transport. The number of legal measures and deployment & manufacturing support measures has increased in the NIR compared to those reported in the NPF, while the number of policy measures has not. Regarding the combination of Policy and Deployment & Manufacturing measures, six clusters were identified for as many AF/transport mode pairs. Five clusters were assessable, with the pair electricity/road obtaining a high score and the other four a low score. No cluster could be considered comprehensive. Support measures continue to be irrelevant or not assessable for LNG/road and for LNG/water (maritime). In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road have a medium impact, those for the pairs CNG/road, biofuels/road, hydrogen/road and electricity/rail result to have a low impact. The level of ambition of Policy and Deployment & Manufacturing support measures has increased in the NIR for all the assessable pairs, however the NIR does not report support measures for publicly accessible recharging infrastructure, increasing the uncertainty on how the future targets will be attained. In the absence of LNG support measures, the Danish NIR seems to rely on developments in the private sector and other neighbouring markets. Although the government of Denmark officially excluded hydrogen from its plans, the prominence of this alternative fuel in support measures, particularly RTD&D funding, is noteworthy.

5.4.7 *Final remarks*

The Danish NIR provides a comprehensive report on the efforts to implement the Directive. These efforts are mostly in line with the provisions of Annex I to the Directive. All alternative fuels are addressed in the Danish NIR. Denmark has a clear ambition to foster the large-scale electrification of road transport, railways, maritime transport and airports. The estimated extension of shore-side electricity supply in ports should support the greening of the waterborne sector. The Danish NIR includes a significant amount of measures to promote the uptake of zero- and low-emission vehicles, including a significant number of R&I projects on hydrogen and fuel cell technologies. Denmark should provide further information on some of those measures in future reporting to be able to fully assess their impact.

With regard to electricity for road transport, the NIR estimates approximately 332,000 electric vehicles on the road in 2030, representing about 9% of the fleet by that time. However, taking into account the current situation and expected trend development, this level of ambition does not appear to be fully compatible with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. Moreover, attention needs to be paid also to infrastructure deployment. No information on charging efficiency is provided. The NIR estimates around 11 shore-side electricity supply facilities by 2030. Five electric seagoing ships are estimated to be in operation by 2030. The NIR indicates that the airports accounting for more than 97% of passenger traffic provide electricity supply for stationary airplanes. The NIR lacks sufficient information on the share of the electrified rail network.

Regarding hydrogen for road transport, there was already a small fleet of FCHVs and eight hydrogen-refuelling stations in Denmark in 2018. No targets are set for future deployment by 2025 and 2030. More information in future reporting on further development of vehicles and infrastructure uptake would be beneficial.

Regarding natural gas for transport, Denmark plans to keep the number of CNG refuelling points at a constant number of 17 until 2030. It estimates 1,522 CNG vehicles by 2025 and 2,153 CNG vehicles by 2030. The NIR does not provide estimates for LNG vehicles. However, the number of three LNG refuelling points planned for 2025 and 2030 seems sufficient taking into account the extensiveness of the Danish TEN-T Core road Network, provided that the refuelling points are widely distributed along the network. On the other hand, LNG refuelling points are already installed in the two Danish ports, although they are not part of the TEN-T Core Network.

As regards LPG, there were 12 LPG vehicles in 2018. The number is to decrease to zero by 2030.

Denmark should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.4.8 *ANNEX - Description of the Member State*

On a surface area of 43,100 km², Denmark has a population of 5.781 million people in 2018, which makes up for a population density of 134 inhabitants/km².

Number of main urban agglomerations

- 4 urban agglomerations > 50,000 inhabitants

In 2018, Denmark achieves a per capita gross domestic product at market prices of €52,010, which represents a per capita gross domestic product in purchasing power standards of 128 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Denmark is 813 km. The total road network length is 74,674 km, of which 1,329 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Denmark: 7% (456 km) of the Scandinavian – Mediterranean Corridor.

Through the TEN-T Road Corridors, Denmark is connected with the following Member States:
- Germany (through the Scandinavian – Mediterranean Corridor),
- Sweden (through the Scandinavian – Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Denmark accounts for 3,237,751 registered road vehicles of which 2,594,469 are categorized as passenger cars, 389,461 as light goods vehicles, 42,663 as heavy goods vehicles and 13,158 as buses and coaches. The motorisation rate is 449 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 2 maritime ports in the TEN-T Core Network (Aarhus, Copenhagen)
- No maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Copenhagen – Kastrup)
- 3 airports in the TEN-T Comprehensive Network

5.5 Germany (DE)

5.5.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the German NPF the Commission concluded:

The German NPF addresses most of the requirements of Article 3. It presents the current state of alternative vehicle uptake and infrastructure and derives targets for future recharging points, LNG refuelling points (road), and H2 refuelling points (road). It does not establish targets for LNG refuelling points in ports beyond the already existing facilities.

A main focus of the German NPF is on electric vehicles. It estimates a share of roughly 2% electric vehicles on the road in 2020. This is a comparably high estimate and will require a rapid growth of EV deployment in Germany in the coming years. While the targeted number of recharging points seems adequate to cover the needs of electric vehicles in terms of distance requirements in Germany, the ratio of only one public recharging point per 23 electric vehicles estimated for 2020 could evolve to become a barrier for the further market deployment of electric vehicles. This could also lead to market fragmentation within the EU. It will be important to closely monitor this development and correct infrastructure targets in line with the market developments. The NPF does not provide any targets for further deployment of electricity supply for stationary airplanes. For shore-side electricity, it does not contain targets. Instead, it refers to pilot projects with a focus on inland ports.

The NPF enables for potentially significant further market uptake of CNG vehicles. Germany has already today a relatively dense network of CNG refuelling points, offering a good coverage in most regions and in all urban agglomerations. Available infrastructure could probably support more than five times the CNG vehicles on the road in Germany today. No CNG infrastructure build-up beyond present levels is intended.

The German NPF defines a network of nine road LNG refuelling points that could guarantee fulfilment of the maximum distance requirement for LNG refuelling points for heavy-duty vehicles along the TEN-T Core Network on German territory. However, LNG propelled heavy-duty vehicles may have to deviate from the shortest route in order to refuel when travelling on the TEN-T Core Network.

The NPF does not establish target numbers for LNG refuelling points for ports, nor does it define an LNG distribution system as required by the Directive. According to the NPF, LNG infrastructure build-up will be pursued depending on market needs.

The German plan allows for potentially ambitious market uptake of H2 vehicles, where infrastructure sufficiency is planned to be achieved in the near future.

The German NPF contains a comprehensive list of measures which are already existing or adopted. Measures are focussed on electric vehicles and infrastructure for road, but measures are proposed also for other road AFI/AFV types as well as for waterborne transport. Most of them can be considered having a medium or low impact on market actor's decisions. Some measures attain a low overall measure score due to scarce information on planned budget and boundaries which allows for qualitative evaluation only. Measures presented seem sufficient to contribute to the achievement of the targets set in the NPF. The NPF also contains several *support measures to promote the deployment of alternative fuels infrastructure in public transport services.*

Interests of regional and local authorities as well as stakeholders have been considered during the drafting of the German NPF. Germany is actively involved in coordinating its plans on alternative fuels infrastructure with other Member States as well as collaborating with them in this field.

5.5.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.5.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / Electricity, CNG, LNG, hydrogen	Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, rail, water / Electricity, CNG, LNG, hydrogen, LPG	Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air Biofuels	Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, rail, water / Electricity, CNG, LNG, hydrogen	Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	All / Electricity, LNG, hydrogen	Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.	All / All	Yes
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	All / Electricity, LNG, hydrogen, biofuel, synthetic fuels	Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity	Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	All / Electricity, CNG, LNG, Hydrogen, LPG, Methanol	Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	All / Electricity, CNG, LNG, Hydrogen, LPG	Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road Electricity	Yes
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)		No

The checklist shows that almost all the requirements of Annex I from the Directive are covered.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; all the other pairs are partially covered, in particular: CNG and LPG for road transport; LNG for road and waterborne transport; hydrogen for road and rail transport; biofuels for air transport; synthetic and paraffinic fuels for road, inland waterway transport and air transport. All the other combinations are either absent or not applicable.

The German NIR reports a list of 180 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify 12 AF/transport mode clusters of measures, all assessable.

5.5.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.5.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	164,566	17,245	1,000,000*	43,000	NA	NA	8,500,000	1,000,000
	Change NIR vs NPF [%]			0.00%*	0.00%				
	Attainment [%]			16.46%	40.10%			1.94%	1.72%
CNG / road	NIR	78,251	862	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / road	NIR	7	4	NA	NA	NA	≥ 9	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]						44.44%		
LNG / water (maritime)	NIR	2	0**	NA***	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (inland)	NIR	0	0**	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	378	66	NA	100	NA	400	NA	NA
	Change NIR vs NPF [%]				0.00%		0.00%		
	Attainment [%]				66.00%		16.50%		
LPG / road	NIR	213,718	7,128	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

*In this particular case, the value includes L-category vehicles. **The values refer to stationary shore-to-ship facilities (i.e. bunkering stations) (see Section 5.5.3.3.2). ***The NIR states that two new LNG vessels are planned but no indicative year of deployment is provided.

5.5.3.1 Road transport

5.5.3.1.1 Electricity

Vehicles

Germany recorded 164,566 battery-electric and plug-in hybrid electric vehicles in use in 2018 (Table 5.5.3-1). Of these, 148,845 were passenger cars (55% were battery-electric), 15,423 were LCVs (almost all of them battery-electric), 165 were HCVs (all battery-electric) and 133 were buses and coaches (all battery-electric). In addition, the NIR reported a stock of 62 trolleybuses (operating in the municipalities of Eberswalde, Esslingen and Solingen) and 9,684 L-category vehicles. Although not sufficiently explicitly, the NIR seems to retain the 2020 target of 1 million EVs. Both the NPF and NIR lack estimates for the EV fleet in 2025. The NIR expects that, by 2030, between 7 and 10 million electric passenger cars will be in use; electric buses will account for up to 50% of the city bus stock and around 33% of vehicle mileage in heavy road haulage will be undertaken by means of electricity.

The 2018 ***attainment*** of future EV estimates is 16.46% in 2020 and 1.94% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Germany is equal to 39%.

Infrastructure

Germany recorded 17,245 publicly accessible recharging points in 2018 (Table 5.5.3-1), of which 2,562 were high power (>22kW) points (of these 40.1% were AC fast charging, 53.6% DC fast and 6.3% DC ultrafast). The NIR seems to endorse the 2020 targets reported in the NPF and indicates that one million recharging points can be expected by 2030 (without details on the share of high power recharging points). Both the NPF and NIR lacked 2025 targets. The DE NIR provides no information on private recharging points on the grounds that the available information is not robust.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 40.10% for 2020 and 1.72% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Germany is 42%.

Ratio

Based on the DE NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that the sufficiency index fluctuated around the value of 10 between 2016 and 2018 and was thus adequate to support EV uptake. The foreseen sufficiency index is 23.26 for 2020 (potentially not adequate) and 8.50 for 2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	9.28	10.22	9.54	23.26*		8.50

*In this particular case, the vehicle estimate includes L-category vehicles.

Information on charging efficiency

The German NIR fulfils the requirements on charging efficiency reporting by providing comprehensive information, based on representative samples, on actual capacity usage by type of recharging point. For instance, for high power recharging points (43 < P < 100 kW): a) the average number of charging processes/day/point is 0.5; b) the average energy delivered/day/point is 6.8 kWh; c) the average occupancy time/point/day is 18 minutes. Additional data related to the charging process, the sample and for other types of recharging points are reported in Table 12 of the German NIR.

5.5.3.1.2 CNG

Vehicles

Germany recorded 78,251 CNG vehicles in use in 2018 (Table 5.5.3-1). Of these, 71,122 were passenger cars, 6,316 LCVs, 369 HCVs and 444 buses and coaches. Both the NPF and NIR lack estimates on future CNG vehicles, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The German NIR indicates that 862 publicly accessible CNG refuelling points were available in 2018 (Table 5.5.3-1), a decline compared to the 913 points available in 2016. Both the NPF and NIR lack targets for future publicly accessible CNG refuelling points.

Because there were no future CNG road refuelling infrastructure targets provided in the German NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the DE NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index was well below the indicative value of 600 (see Section 2.1.5) between 2016 and 2018. However, the foreseen sufficiency index cannot be computed.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**CNG**	76.03	79.73	90.78			

5.5.3.1.3 LNG

Vehicles

Germany recorded seven LNG vehicles in use in 2018: one LCV and six HCVs (Table 5.5.3-1)[17]. Both the NPF and NIR lacked future LNG vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

[17] Registrations of only vehicles with bivalent diesel-LNG propulsion are reported in the NIR, which however acknowledges that it is not possible to determine the number of past LNG vehicles and regards the reported figures as a very likely underestimation. Since 2019, vehicles with the more common monovalent LNG propulsion are being recorded under a specific category.

Infrastructure

The German NIR indicates that four publicly accessible LNG refuelling points were available in 2018 (Table 5.5.3-1), of which three are on the TEN-T Core Network. The NIR states that "*at least 9 LNG refuelling points for heavy goods vehicles are to be in operation on the TEN-T Core Network by 2025*", which is in line with the target provided in the NPF.

The 2018 ***attainment*** of future publicly accessible LNG refuelling infrastructure targets is 44.44% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Germany for publicly accessible LNG refuelling infrastructure deployment from 2016 until 2018 versus the period 2016-2030 could not be computed because the 2030 target is not provided.

Ratio

Based on the DE NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road, computable only for 2018.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LNG			1.75			

5.5.3.1.4 Hydrogen

Vehicles

The German NIR indicates that 378 hydrogen-powered vehicles[18] were in use in 2018 (Table 5.5.3-1), of which 367 were passenger cars and 11 were buses and coaches. In addition, the NIR reports one L-category vehicle powered by hydrogen. Both the NPF and NIR lacked future hydrogen vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The German NIR indicates that 66 publicly accessible hydrogen refuelling points were available in 2018 (Table 5.5.3-1), of which 4 were 350-bar points and the rest 700-bar. This represents a strong increase compared to the 23 points available in 2016. According to the NIR, "the Federal Government is supporting the objective of 100 public refuelling stations in 2020 which was formulated by the industry and – subject to the condition of an appropriate vehicle ramp-up – the objective of 400 public refuelling stations in 2025". No infrastructure target for 2030 is provided.

The 2018 ***attainment*** of future publicly accessible hydrogen refuelling infrastructure targets is 66.00% for 2020 and 16.50% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Germany for publicly accessible hydrogen refuelling infrastructure deployment from 2016 until 2018 versus the period 2016-2030 could not be computed because the 2030 target is not provided.

Ratio

[18] Including plug-in vehicles with hydrogen fuel cell and vehicles with hydrogen-powered internal combustion engines, as reported in the NIR.

Based on the DE NIR, the following table shows the ratio between vehicles and infrastructure (i.e. sufficiency index) for the pair hydrogen/road (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Hydrogen	9.65	6.74	5.73			

5.5.3.1.5 Biofuels

Information is not available in the German NIR.

5.5.3.1.6 LPG

Vehicles

The German NIR indicates that 213,718 LPG vehicles were in use in 2018 (Table 5.5.3-1), which represents a 3% decline compared to 2016. Of these, 206,786 were passenger cars, 6,907 were LCVs, 20 were HCVs and 5 were buses and coaches. In addition, the NIR reports 34 L-category vehicles powered by LPG. Both the NPF and NIR lacked future LPG vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The German NIR indicates that 7,128 publicly accessible LPG refuelling points were available in 2018 (Table 5.5.3-1), compared to 7,061 points in 2016 (no data is provided for 2017). Both the NPF and NIR lacked future targets for publicly accessible LPG refuelling points, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the DE NIR, the following table shows the ratio between vehicles and infrastructure (i.e. sufficiency index) for the pair LPG/road (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LPG	31.07		29.98			

5.5.3.1.7 Synthetic and paraffinic fuels

Vehicles

The NIR mentions two passenger cars powered by methanol.

Infrastructure

Information is not available in the DE NIR.

5.5.3.2 Rail transport

5.5.3.2.1 Electricity

Vehicles

The German NIR indicates that the stock of electric railway vehicles in use was 6,173 in March 2019, compared to 5,572 in 2016 (no disaggregation between locomotives and railcars is reported). The NIR also mentions that diesel-electric hybrid locomotives have been deployed for shunting operations and have been presented for long-distance freight transport (see also Section 5.5.4).

Infrastructure

According to the DE NIR, overhead contact lines are presently not available in around 40% of the rail network, most of it affecting low traffic passenger services. Germany's ambition is to deploy alternative fuels or, when economically feasible, to pursue further electrification of those lines.

5.5.3.2.2 Hydrogen

Vehicles

The German NIR indicates that two hydrogen-powered railway vehicles were in use in March 2019. It is expected that by 2022 there will be 26 hydrogen trains in regular operation in Hessen and 14 hydrogen trains in Niedersachsen.

Infrastructure

The German NIR indicates that one hydrogen refuelling point (350-bar) was available for rail services in 2018.

5.5.3.3 Waterborne transport (maritime)

5.5.3.3.1 Electricity

Vessels

The German NIR indicates that there were no electric maritime vessels in use in 2018 and it does not provide future estimates.

Infrastructure

The German NIR indicates that there were three maritime ports providing shore-side electricity supply in 2018. Both the NPF and NIR lack targets for future deployment of shore-side electricity supply in maritime ports, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

5.5.3.3.2 LNG

Vessels

The German NIR indicates that two LNG maritime vessels were in use in 2018. Both the NPF and NIR lacked future LNG maritime vessel estimates, therefore the 2018 ***attainment*** and

progress could not be computed. The NIR, however, states that two new state-owned LNG maritime vessels are planned, though no tentative year of deployment is indicated.

Infrastructure

The German NIR reports that there were no maritime ports supplying LNG in stationary bunkering stations in 2018. Both the NPF and NIR lacked future targets for publicly accessible LNG refuelling points in maritime ports, therefore the 2018 ***attainment*** and ***progress*** could not be computed. The NIR, however, mentions that "truck-to-ship" supply is available and that "ship-to-ship" supply will be available in the future. Four ports (Brunsbüttel, Rostock, Stade and Wilhelmshaven) are being considered by private investors as suitable locations for the deployment of LNG import/distribution terminals.

5.5.3.4 Waterborne transport (inland)

5.5.3.4.1 Electricity

Vessels

The German NIR indicates the use of 14 inland vessels powered by electricity in 2018, including two plug-in hybrid vessels. Both the NPF and NIR lacked future electric inland vessel estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The German NIR indicates that there were 128 inland ports providing shore-side electricity supply in 2018[19]. In addition, the NIR specifies that there were 279 facilities providing electricity along inland waterways, thus the total number of 'shore-side electricity facilities' for inland vessels amounted to 407 in 2018. Both the NPF and NIR lacked future targets for shore-side electricity supply in inland ports, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

5.5.3.4.2 LNG

Vessels

The German NIR indicates that there were no LNG inland vessels in use in 2018. Both the NPF and NIR lacked future LNG inland vessel estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The German NIR reports that there were no inland ports supplying LNG in stationary bunkering in 2018. Both the NPF and NIR lacked future targets for publicly accessible LNG refuelling points in inland ports and the 2018 ***attainment*** and ***progress*** could not be computed. The NIR, however, indicates that "truck-to-ship" supply is available and that "ship-to-ship" supply will be available in the future. The NIR mentions plans to deploy 14 stations and the interest from the private sector to set up an LNG distribution network along the German section of the Rhine River.

[19] Data unavailable for Brandenburg, Niedersachsen, Nordrhein-Westfalen and Schleswig-Holstein.

5.5.3.4.3 Synthetic and paraffinic

Vessels

The NIR indicates that one passenger vessel, powered by renewable methanol, is operating on the Baldeneysee.

Infrastructure

Information is not available in the DE NIR.

5.5.3.5 Air transport

5.5.3.5.1 Electricity

Airplanes

The NIR indicates that all-electric and hybrid-electric engines for commercial air taxis as well as hybrid-electric propulsion for small commercial aircraft are being developed. The NIR considers that electric engines are still at an early stage of development for use in air transport.

Infrastructure (for stationary airplanes)

The German NIR provides information on two sources of electricity supply to stationary airplanes at airports (at the terminal and on the tarmac) based on the responses to a 2016 survey covering fourteen airports (all part of the *Flughafenverband ADV*). With regards to supply at the terminal, almost all of the 270 terminal positions are equipped with stationary ground power connections. In contrast, the NIR acknowledges that supply on the tarmac is less developed: around 40% of ca. 580 positions on the tarmac are equipped.

5.5.3.5.2 Hydrogen

Airplanes

The NIR indicates that hydrogen-powered fuel cell engines are being developed for commercial air taxis, but are still at an early stage.

Infrastructure

The NIR mentions an existing research project focusing on on-board power supply via hydrogen fuel cell auxiliary power units (see Section 5.5.4).

5.5.3.5.3 Biofuels

Airplanes

Information is not available in the DE NIR.

Infrastructure

The NIR considers that there is no need for renewable jet fuel refuelling points in German airports within the TEN-T Core Network.

5.5.3.5.4 Synthetic and paraffinic

Airplanes

Information is not available in the DE NIR.

Infrastructure

The NIR mentions that research and demonstrations projects targeting synthetic kerosene production for use in aviation have been initiated (see Section 5.5.4) however, no further information is provided on the expected growth path.

5.5.4 ***Measures assessment***

The German NIR assigns each measure to one or more of the following categories: strategies and framework programmes, legislative measures, administrative measures, R&D, procurement of vehicles, establishment of infrastructure, public transport, funding of production facilities and other policy measures. For the purpose of this assessment, the following two preliminary steps were executed: (i) each category appearing in the NIR was mapped into a category used for the assessment (refer to the Guidance document provided to the Member States); (ii) for those measures listed by the NIR as belonging to more than one category, the most appropriate category used for the assessment was chosen. Due to the limited information on budget provided and to the large number of measures listed, the clustering of the measures was performed only for the national ones. However, the most salient regional measures (typically those with a reported budget exceeding 10 million €) were taken into account in the final assessment. Finally, the NIR indicates when a given measure is reported twice (in separate sections) and when an individual measure is part of a package / programme listed separately. In these cases and for the purpose of assigning the overall cluster score and to avoid double counting, the measure in question was considered once.

The German NIR reports a long list of 180 measures. A few of the measures reported in the NIR can be considered packages or programmes consisting of individual measures that are also listed separately with specific budgets. An example of this is the "*Marktanreizpaket Elektromobilität*" (Market Incentive Programme for Electric Mobility). The German NIR reports the measures in two lists: national and regional measures[20]. Although the budget for the regional measures is incomplete, the indicated sum amounts to at least 1 billion €. The following regional measures can be highlighted (with the figure within the square brackets indicating the number of measures listed in the NIR for each region):

- Baden-Württemberg [15]: Electro-mobility federal state initiatives II and III, with a budget of 50 million € and 83.7 million € respectively;
- Bayern [4]: public transport grants;
- Berlin [6]: taxi programme;
- Brandenburg [10]: public transport grants, including for procurement and for tram and trolleybus infrastructure, with a budget of 65 million €;
- Bremen [3]: public transport electrification;

[20] For the measure denominated "ExcellentBattery", the NIR lists it as a national measure but it indicates that the measure is implemented at regional level.

- Hamburg [10]: public recharging infrastructure deployment and ‘ELectrify Buildings for EVs’ (ELBE) project, with respectively a budget of 27 million € and 16 million €;
- Hessen [7]: two electro-mobility support programmes, with a combined budget of 24.3 million €, and electric bus procurement with a budget of 15 million €;
- Mecklenburg-Vorpommern [2]: municipal and business climate support guidelines, including for electricity and hydrogen in road transport, with a budget of 47 million €;
- Niedersachsen [11]: 125 million € for local public transport bus procurement, ca. 278.4 million € for electric railway vehicle procurement and 89 million € for fuel cell railway vehicle procurement and the provision of related refuelling infrastructure;
- Nordrhein-Westfalen [15]: two R&D projects covering fuel cell and battery technology and synthetic and biofuels, with a combined budget of 91.1 million €, and funding in the amount of 40 million € for fuel cell vehicle and EV procurement and recharging infrastructure;
- Rheinland-Pfalz [2]: training and information measures;
- Saarland [1]: measure under preparation to convert trains to battery-electric railcars;
- Sachsen [4]: vehicle procurement and retrofitting and grants for alternative fuels infrastructure at inland ports;
- Sachsen-Anhalt [5]: financial support amounting to 35.7 million € for EV procurement and deployment of recharging infrastructure;
- Schleswig-Holstein [4]: R&D projects for sustainable logistics;
- Thüringen [6]: 14 million € for the procurement of public road transport vehicles powered by electricity and the construction of recharging infrastructure.

As in the NPF, the German NIR contains a comprehensive list of measures already existing or adopted. Information on the budget implications is limited and not available on an annual basis. The reported measures tend to target a combination of alternative fuels, or of transport modes or both. For those measures listed as targeting all the alternative fuels, the NIR points out that LPG is generally excluded. Nonetheless, it is possible to identify twelve AF/transport mode clusters for the quantitative assessment: electricity/road, electricity/rail, electricity/water (maritime), electricity/water (inland), electricity/air[21], CNG/road, LNG/road, LNG/water (maritime), LNG/water (inland), hydrogen/road, hydrogen/rail and hydrogen/water (maritime)[22] (see Table 5.5.4-1).

5.5.4.1 Legal measures

The German NIR contains 15 national legal measures, which is almost twice the number of measures identified in the NPF (most of which focused on cooperation with other Member States and consideration of stakeholders’ interests). Eight of the measures target electricity, six target a combination of alternative fuels and one hydrogen. All the measures were in place during the implementation period and all the transport modes are covered.

5.5.4.1.1 Legislative & Regulatory

[21] In terms of the quantitative assessment, however, this cluster consists only of manufacturing measures that apply to other transport modes as well.
[22] Though none of the measures in this cluster is exclusively dedicated to the use of hydrogen in maritime vessels.

Of all the national legal measures described in the German NIR, six can be categorised as legislative and regulatory measures (most of them targeting road transport) and include among others:

- Norms & requirements: Charging Point Regulation with a focus on public recharging points; Product Safety Act, transposing technical standards for hydrogen refuelling; amendment to the 10th Federal Emissions Control Regulation, transposing labelling requirements; and Amendment to the Energy Industry Act, which also covers technical standards for shore-side electricity facilities.
- Other: Federal Rail Network Expansion Act, which may include measures for railway electrification.

5.5.4.1.2 Administrative

Of all the national legal measures described in the German NIR, nine can be categorised as administrative measures (sub-type "other"). Of these, four were found in the NPF. Taken together, these measures cover road, rail, waterborne transport (particularly inland) or combinations thereof. Four of these measures target electricity and the rest a combination of alternative fuels.

5.5.4.2 Policy measures

The German NIR contains 14 policy measures at national level, a similar number as identified in the NPF. Four measures no longer explicitly found in the NIR are: fast recharging for highway resting areas, tax incentive for company cars that excludes the battery price, minimum tax rate for shore-side electricity and tax exemption for electricity generated on board of vessels and airplanes. All of the measures reported in the NIR were in place during the implementation period. The majority of these measures have a financial nature (though information on the budget is rather limited) and focus on road transport. Half of the measures target a combination of alternative fuels.

5.5.4.2.1 Measures to ensure national targets and objectives

Of all the national policy measures described in the German NIR, eleven can be categorised as measures to ensure national targets and objectives (of which five were found in the NPF). Among these, the following can be highlighted:

- Purchase incentives: environmental premium with a budget of 600 million € for the period 2016-2019 to subsidise EV sales;
- Road toll exemptions: Amendment to the Federal Trunk Road Toll Act to exempt electric, fuel cell and natural gas powered HCVs from the "*LKW-Maut*" (HCV toll) scheme.
- Retrofitting: Subsidies for the use of LNG by retrofitting and equipping new seagoing vessels.
- Preferential lanes/access to restricted areas: Electro-mobility Act establishing preferential treatment for electric vehicles, including fuel cell electric vehicles. At municipal level, the NIR reports that 110 municipalities had lowered parking charges for electric road vehicles by May 2018, 3 municipalities had allowed their partial circulation on bus lanes and 2 municipalities had lifted access restrictions.

5.5.4.2.2 Measures that can promote AFI in public transport services

Of all the national policy measures described in the German NIR, three can be categorised as measures that can promote AFI in public transport services. All of them are new measures targeting electricity. The NIR lists a national measure on electric bus procurement, including public, and recharging infrastructure in the public road transport network, with a budget of 292 million €. In addition, half of the Federal States are listed to provide financial support for public transport vehicle procurement (for some examples, see the list above). The NIR also lists a national measure to support public transport by rail, to which a budget of 500 million € was allocated. At regional level, in addition to the measures listed above for several regions and information on future hydrogen train deployment in Hessen (see Section 5.5.3.2.2), the DE NIR indicates that 55 battery-powered railcars will replace diesel railcars in Schleswig-Holstein.

5.5.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

No national measure devoted to this aspect was identified in the DE NIR[23]. However, the NIR mentions in the context of the "standortTOOL" the possibility of funding in the future jointly used private and commercial recharging infrastructure. At regional level, five measures explicitly mention the deployment of private electro-mobility infrastructure in Bremen, Hamburg, Hessen and Nordrhein-Westfalen.

5.5.4.3 Deployment and manufacturing support

5.5.4.3.1 AFI deployment

The German NIR reports eight AFI deployment measures, half of which were found in the NPF. They target hydrogen, electricity for road and waterborne transport and combinations of alternative fuels and/or transport modes. All of them were in place during the implementation period. Among the measures for which budget information is provided, the following can be highlighted: 300 million € (2017-2020) to install public recharging infrastructure; 250 million € (2016-2019) to inter alia construct hydrogen refuelling infrastructure and electrolysis units (though it is unclear what fraction of the budget was devoted to AFI deployment only); and 217.5 million € (2015-2019) for investments in alternative fuels infrastructure development.

5.5.4.3.2 Support of manufacturing plants for AF technologies

The German NIR lists five measures to support manufacturing plants for AF technologies, of which one focusing on waterborne transport was found in the NPF. The remaining four deal with electricity for all modes of transport. One of them, with an estimated budget of 1 billion € for the period 2019-2022, targets battery cell production and the rest are part of the "battery research factory" support scheme, which has a total budget of 500 million € for the same period. All the measures were in place during the implementation period.

5.5.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

The German NIR indicates the following: "*The initial phase of the market introduction of alternative drivetrain technologies is a special challenge because sufficiently dense supply infrastructure is a necessary condition for alternative fuels to be broadly accepted by the users.*

[23] As a result of applying the assessment methodology (Section 2.2), not the DE NIR's own categorisation indicated above.

The objective of the measures taken by the Federal Government and the federal states is to overcome this barrier while ensuring European interoperability through uniform standards”.

5.5.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.5.4-1 presents an analysis of all the national Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, clusters of measures could be identified in the German NIR on electricity, CNG, LNG and hydrogen for road transport, electricity and hydrogen for rail transport, electricity and LNG for inland waterborne transport, electricity, LNG and hydrogen for maritime waterborne transport and electricity for air transport.

The electricity/road and hydrogen/road clusters are the only ones with a high score; the rest of the clusters involving road and rail receive a medium score; the clusters related to waterborne and air transport have a low score. All the clusters, with the exception of electricity/air and hydrogen/water (maritime), can be considered comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of future targets and estimates does not facilitate the task of putting this assessment into perspective. Based on the impact seen during the implementation period, it can be said that in the future the measures for the pairs electricity/road and hydrogen/road are expected to have a high impact, those for the pairs electricity/rail, CNG/road, LNG/road and hydrogen/rail might have a medium impact while all the other measures should have a low impact. However, a caveat is due: because most of these clusters are the result of adding measures that target a combination of alternative fuels and/or transport modes and information on budget is limited, the possibility cannot be ruled out that budget competition in practice might constrain the overall impact of certain clusters.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all the identified clusters.

Table 5.5.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	H	C		H		+
CNG	Road	M	C		M		+
LNG	Road	M	C		M		+
	Water - maritime	L	C		L		+
	Water - inland	L	C		L		+
Hydrogen	Road	H	C		H		+
	Rail	M	C		M		+
	Water - maritime	L	N		L		+
Electricity	Rail	M	C		M		+
	Water - maritime	L	C		L		+
	Water - inland	L	C		L		+
	Air	L	N		L		+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: ‘+’ means ‘higher’; ‘=’ means ‘comparable’; ‘-‘ means ‘lower’.

5.5.4.5 Research, Technological Development & Demonstration

The German NIR contains 67 RTD&D projects, which represents a significant increase compared to the 17 RTD&D projects identified in the NPF. Of those, 33 are national RTD&D projects and 34 regional ones. All the national RTD&D projects were in place during the implementation period, with 15% of them having expired by 2019. Over half of the national RTD&D projects described in the NIR are applicable to more than one transport mode. Almost 40% of the national RTD&D projects refer to road transport only, with the vast majority of these targeting electricity. The NIR also lists national projects dedicated to waterborne and air transport, targeting a combination of fuels. RTD&D projects are also reported for biofuels and synthetic and paraffinic fuels, including synthetic kerosene.

Among the list of national RTD&D projects, the National Hydrogen and Fuel Cell Technology Innovation Programme (NIP; phases I and II), with a budget of over 1 billion €, and funding for R&D in the field of electro-mobility, with a budget of up to 380.5 million € (2017-2020), can be singled out. For the "battery research factory", see Section 5.5.4.3.2.

The NIR acknowledges that annual budget values could not be reported on the ground that some projects go beyond alternative fuels, so total budget figures are provided in their stead, though not for all the projects listed (in fact, budget information is not available for 27% of the reported national RTD&D projects). For projects where budget is reported, the total estimated budget amounts to 2.8 billion € for the period 2006-2023 (for those projects that started in 2017 or later, the estimated value is 1 billion €). Information on the type of funding and, for some projects, the length of the project, is not provided.

5.5.5 *Additional information on alternative fuels infrastructure developments*

Information is not available in the DE NIR.

5.5.6 *Summary of the assessment*

Tabular overview

Table 5.5.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road
AF Vehicles / Vessels		Past situation (2016)	58,477	69,266	0	2	0	222
		Situation (2018)	164,566	78,251	7	2	0	378
		Estimate (2030)	8,500,000*	NA	NA	NA	NA	NA
		Future share (2030) [%]	17.17%					
		Estimate attainment (2018 vs 2030) [%]	1.94%					
		Progress (2018)	adequate					
Publicly accessible AF Infrastructure		Past situation (2016)	6,300	911	1	0**	0**	23
		Situation (2018)	17,245	862	4	0**	0**	66
		Target (2030)	1,000,000	NA	NA	NA	NA	NA
		Target attainment (2018 vs 2030) [%]	1.72%					
		Progress (2018)	adequate					
Sufficiency Index		2016	9.28	76.03				9.65
		2018	9.54	90.78	1.75			5.73
		2020	23.26					
		2025						
		2030	8.50					
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	=	+	+
	Policy measures + Deployment & manufacturing	Score	H	M	M	L	L	H
		Comprehensiveness	C	C	C	C	C	C
		Impact	H	M	M	L	L	H
		Ambition (NIR vs NPF)	+	+	+	+	+	+
	RTD&D	Ambition (NIR vs NPF)	+	X	X	=	X	+

Legend:

(grey)	not applicable
(blank)	the value could not be computed
NA	no value/information provided/available in the NIR

*The NIR expects that between 7 and 10 million electric passenger cars will be in use by 2030 (see Section 5.5.3.1.1 for information on other vehicle types). **The values refer to stationary shore-to-ship facilities (i.e. bunkering stations) (see Section 5.5.3.3.2).

After the adoption of the "*Klimaschutzgesetz*" (Climate Change Act), the German government is committed to reducing 95 million tonnes of CO_2 transport emissions by 2030 and achieving GHG neutrality by 2050. The government of Germany stresses that it is pursuing a technology-neutral approach for the uptake of alternative fuel technology, while it considers that the most energy-efficient and climate-friendly option should prevail. Furthermore, the German government has introduced the following initiatives in recent years: "*Klimaschutzprogramm 2030*" (2030 Climate Change Programme), "*Mobilitäts- und Kraftstoffstrategie* (MKS)" (Mobility and Fuels Strategy), "*Marktanreizpaket Elektromobilität*" (Market Incentive Programme for Electric Mobility), "*Sofortprogramm Saubere Luft 2017-2020*" (2017-2020 Immediate Action Programme for Clean Air) and the research agenda "Sustainable urban mobility".

Compared to the German NPF that fulfilled many but not all of the requirements of Article 3 of the Directive, the NIR fully addresses the requirements of Annex I of the Directive. However, it cannot be stated that the German NIR covers the whole AFID period (2016-2030), for it lacks infrastructure targets and vehicle estimates for several alternative fuels.

The main outcomes of the technical assessment of the German NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – In 2018, Germany recorded 164,268 light-duty EVs, 298 heavy-duty vehicles and 17,245 publicly accessible recharging points. With reference to the objectives of the DE NPF as updated by the NIR, Germany is progressing adequately in both vehicles and infrastructure uptake. The NIR expects one million publicly accessible recharging points to provide electricity to 8.5 million EVs in 2030. The NIR does not provide recharging points targets / EV estimates for 2025.
- **CNG** – In 2018, Germany recorded 78,251 CNG vehicles, the majority of which were passenger cars, and 862 publicly accessible CNG refuelling points. Both the NPF and NIR lacked future targets for publicly accessible CNG refuelling points and CNG vehicle estimates. Due to this, the progress could not be computed. Notwithstanding, the DE NIR expects CNG technology to play an important role for HCVs.
- **LNG** – In 2018, Germany recorded seven LNG vehicles and four publicly accessible LNG refuelling points. Both the NPF and NIR lacked future LNG vehicle estimates. Nonetheless, the NIR expects LNG technology to play a more prominent role for HCVs. In line with the NPF, the NIR expects that a minimum of 9 LNG refuelling points will be available for HCVs by 2025.
- **Hydrogen** – In 2018, Germany recorded 378 fuel cell vehicles, of which 11 were buses and the rest passenger cars, and 66 publicly accessible hydrogen refuelling points. Both the NPF and NIR lacked future hydrogen vehicle estimates, but in terms of infrastructure the DE NIR expects that 400 publicly accessible hydrogen refuelling points will be in operation in 2025.
- **Biofuels** – There was no information on road vehicles powered by biofuels and related infrastructure in the NIR.
- **LPG** – In 2018, Germany recorded 213,718 LPG vehicles, most of which were passenger cars, and 7,128 publicly accessible LPG refuelling points. Apart from this, LPG plays a minor role in the NIR.
- **Synthetic and paraffinic** –The NIR mentions a project with two methanol-powered passenger cars.

Rail transport

- **Electricity** – In 2018, Germany recorded 6,173 electric railway locomotives. The NIR expects the deployment of alternative fuels in Germany on the non-electrified railways, or further network electrification.
- **Hydrogen** – In 2018, Germany recorded two fuel cell locomotives powered by hydrogen and one point to refuel them. The NIR expects a stock of at least 40 hydrogen trains in two Federal States in 2022.

Waterborne transport (maritime)

- **Electricity** – The NIR indicates that there were three maritime ports providing shore-side electricity supply but no German maritime vessels powered by electricity in 2018. Both the NPF and NIR lacked future targets for shore-side electricity supply in maritime ports and electric maritime vessel estimates.

- **LNG** – The NIR indicates that there were two LNG maritime vessels in operation in 2018. In the same year, LNG supply was not available in stationary bunkering stations at maritime ports but “truck-to-ship” supply was. Both the NPF and NIR lacked future targets for publicly accessible LNG refuelling points in maritime ports and estimates of maritime vessels powered by LNG. However, the NIR expects “ship-to-ship” LNG supply to become available and new LNG maritime vessels to be deployed.

Waterborne transport (inland)

- **Electricity** – In 2018, Germany recorded 14 electric inland vessels and a total of 407 facilities supplying electricity in inland ports and along waterways. Both the NPF and NIR lacked future targets for shore-side electricity supply in inland ports and electric inland vessel estimates.
- **LNG** – In 2018, there was no use of LNG in Germany’s inland waterborne transport system (i.e. no LNG supply in inland ports and no stock of LNG inland vessels). Both the NPF and NIR lacked future targets for LNG supply in inland ports and LNG inland vessel estimates. Notwithstanding, the NIR expects 14 LNG stations to become available in the future, seemingly along the German Rhine.
- **Synthetic and paraffinic** – The NIR mentions one methanol-powered passenger vessel in operation.

Air transport

- **Biofuels** – The NIR sees no need to nurture this market on the grounds that blend limits currently exist.
- **Synthetic and paraffinic** – The NIR indicates that R&D projects are targeting synthetic kerosene production and use for aviation.

As for the **measures**, the German NIR reports a long list of 75 national measures and 105 regional measures. Only two of them cover LPG. For the rest of the alternative fuels, the set of measures reported by the German government is wide-ranging, as the emergence of twelve clusters shows. Given the emphasis on electrification, the bundle of measures focusing on battery research and production can be highlighted. Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR. Compared to the NPF, the level of ambition of the legal measures has increased in the NIR, except of the cluster LNG/water (maritime). No legal measures were identified for the clusters hydrogen/rail and hydrogen/water (maritime). With reference to the Policy and Deployment & Manufacturing measures, the level of ambition has increased for all the clusters, with the ones on road for electricity and hydrogen receiving the highest score. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of future targets and estimates does not facilitate the task of putting this assessment into perspective. Based on the impact seen during the implementation period, it can be said that in the future the measures for the pairs electricity/road and hydrogen/road are expected to have a high impact, those for the pairs electricity/rail, CNG/road, LNG/road and hydrogen/rail a medium impact while all the other measures are expected to have a low impact. As for RTD&D measures, on the basis of the available information and in comparison to the NPF, the level of ambition for RTD&D projects in the NIR can be considered to have increased for the five clusters targeting electricity and the three clusters focusing on hydrogen, while it has remained similar for the pair LNG/water (maritime). No RTD&D projects were identified for the clusters CNG/road, LNG/road and LNG/water (inland).

5.5.7 *Final remarks*

The German NIR provides a comprehensive report on the efforts to implement the Directive. The NIR is largely in line with the provisions of Annex I to the Directive, with the main exception that it does not include estimates for future market uptake of natural gas vehicles and vessels and related targets for natural gas infrastructures, except for LNG vehicle refuelling points in 2025. A significant number of measures are being implemented to promote a wide range of alternative fuels, with a strong focus on electro-mobility and hydrogen for the different transport modes. A significant budget is devoted to research and innovation projects focusing mainly on the development of batteries and fuel cell technologies. Research and demonstrations projects targeting synthetic kerosene production for use in aviation are funded too.

With regard to electricity, the NIR estimates that approximately 8,500,000 vehicles could be on the roads by 2030, representing about 17% of the fleet by that time. One million charging points should serve that fleet in the same year. Taking into account the current situation and expected trend development, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. The number of shore-side electricity supply facilities for inland vessels amounted to 407 in 2018. However, only 3 out of 6 maritime ports of the TEN-T Core Network in Germany are equipped with such facilities. Germany should provide information on its plans to supply shore-side electricity supply in the remaining three maritime ports of the TEN-T Core Network. Fourteen electric inland waterways vessels are already in use in Germany. Moreover, almost all of the 270 airport terminals are equipped with stationary ground power connections. Around 60% of Germany’s rail network is electrified. Information on charging efficiency is provided.

Regarding hydrogen for transport, the NIR presents the ambitious target of 400 hydrogen refuelling stations in place by 2025, but it does not provide estimates for FCHVs. The number of refuelling stations seems sufficient taking into account the length of Germany’s TEN-T Core network, provided that the refuelling points are widely distributed along the network. Further, the NIR foresees the use of hydrogen in rail transport as well in aviation in the longer term.

In terms of natural gas for transport, Germany has the second largest network of CNG refuelling stations in the EU. It seems sufficient for serving a larger fleet of CNG vehicles compared to the current one. Germany does not provide any estimates for the future growth of such vehicles. The NIR does not provide estimates for LNG vehicles either. The NIR foresees at least nine LNG refuelling points by 2025 in the TEN-T Core Network. This number seems rather low compared to the overall extensiveness of the German TEN-T Core Network. Although the NIR reports that two LNG maritime vessels were in use in 2018, it does not provide any target for LNG refuelling points in maritime and inland ports. Germany should provide further detail in future reporting.

In 2018, there were 213,718 LPG vehicles (less than those registered in 2016) and 7,128 refuelling points registered. The NIR does not provide information on the estimated future number of LPG vehicles and refuelling points.

With regards to renewable fuels, Germany should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.5.8 *ANNEX - Description of the Member State*

On a surface area of 357,100 km², Germany has a population of 82.792 million people in 2018, which makes up for a population density of 232 inhabitants/km².

Number of main urban agglomerations

- 126 urban agglomerations > 50,000 inhabitants

In 2018, Germany achieves a per capita gross domestic product at market prices of €40,340, which represents a per capita gross domestic product in purchasing power standards of 122 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Germany is 6,363 km. The total road network length is 230,035 km, of which 13,141 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Germany: 35% (1,393 km) of the North Sea - Baltic Corridor, 26% (1,398 km) of the Orient / East - Mediterranean Corridor, 30% (1,895 km) of the Scandinavian - Mediterranean Corridor, 50% (707 km) of Rhine - Alpine Corridor and 27% (1,191 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, Germany is connected with the following Member States:
- Poland (through the North Sea - Baltic Corridor)
- the Netherlands (through the North Sea - Baltic and the Rhine - Alpine Corridor)
- Belgium (through the North Sea - Baltic and the Rhine - Alpine Corridor)
- Czechia (through the Orient/ East Mediterranean and the Rhine - Danube Corridor)
- Austria (through the Scandinavian - Mediterranean and the Rhine - Danube Corridor)
- Denmark (through the Scandinavian - Mediterranean Corridor)
- France (through the Rhine - Danube Corridor)

Number of registered road vehicles

At the end of 2018, Germany accounts for 54,915,724 registered road vehicles of which 47,095,784 are categorized as passenger cars, 2,616,118 as light goods vehicles, 750,303 as heavy goods vehicles and 80,519 as buses and coaches. The motorisation rate is 569 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 6 maritime ports in the TEN-T Core Network (Bremen, Bremerhaven, Hamburg, Lübeck, Rostock, Wilhelmshaven)
- 15 maritime ports in the TEN-T Comprehensive Network
- 21 inland ports in the TEN-T Core Network (Berlin, Braunschweig, Bremen, Bremerhaven, Dortmund, Duisburg, Düsseldorf- Neuss, Frankfurt am Main, Hamburg,

Hamm, Hannover, Karlsruhe, Koblenz, Köln, Lübeck, Magdeburg, Mainz, Mannheim-Ludwigshafen, Nürnberg, Regensburg, Stuttgart)
- 68 inland ports in the TEN-T Comprehensive Network

Through the 4,248 km inland waterways TEN-T Core Network, Germany is connected with the Netherlands through the North Sea - Baltic and Rhine - Alpine Corridors, with Austria through the Rhine - Danube Corridor, with France through the Rhine-Alpine and the North Sea - Mediterranean Corridor, with Czechia through the Orient/East-Mediterranean Corridor, with Luxembourg through the Rhine-Alpine Corridor and with Poland through the core network.

Number of airports in the TEN-T Core Network

- 11 airports in the TEN-T Core Network (Berlin-Brandenburg Intl., Bremen, Düsseldorf, Frankfurt am Main, Hamburg, Hannover, Köln-Bonn, Leipzig-Halle, München, Nürnberg, Stuttgart)
- 13 airports in the TEN-T Comprehensive Network

5.6 Estonia (EE)

5.6.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Estonian NPF the Commission concluded:

The Estonian NPF addresses partially the requirements of Directive's Article 3. For many aspects more details would have been needed for an accurate assessment. The NPF does not contain any future estimates for alternative fuels vehicles. Vague targets are provided concerning AFI for 2020 (>100 for high power recharging points and >10 for biomethane refuelling points). Spatial distribution details or references to urban areas and the TEN-T network are not presented. Estonia is focusing on increasing the proportion of alternative fuels use in road transport and is seeking to increase the use of renewable energy sources in road transport to 10% of the amount of fuel consumed. The objective is to be achieved through three types of fuel – liquid biofuels, biomethane and electricity.

The Estonian NPF lacks concrete targets for EV infrastructure and information about the future EV vehicle market development. It neither contains targets for further deployment of electricity supply for stationary airplanes nor shore-side electricity.

One of the Estonian NPF's main objectives is the introduction of methane-based fuels in transport. Longer term preference is biomethane because of its environmental and energy security benefits. Promoting the creation of a comprehensive network of natural gas refuelling points is considered to be the main challenge in the period leading up to 2020.

Regarding LNG, the NPF mentions that an LNG terminal including an LNG bunkering terminal is due to be completed in 2017, at the Harbour of Muuga (part of the Tallinn port) where a distribution system will also be developed, including loading facilities for LNG tank vehicles.

For hydrogen, a first pilot project is pointed out, in which the University of Tartu and the private sector plan to jointly create a hydrogen refuelling point, a production facility in Pärnu.

The Estonian NPF contains a reduced and vaguely described portfolio of existing and proposed measures covering road transport and shore-side electricity supply. All the measures concerning the use of electricity for road transport (private or public infrastructure) have expired and no future ones are proposed. Support measures for natural gas infrastructure and the promotion of biomethane are vaguely mentioned and lack concrete information (e.g. start year, budget). Biofuels are promoted in the short term and Estonia's energy policy regulates the blending shares of biofuels in petrol and diesel (gradually increasing up to at least 10% as of 2020). For LNG, no measures are proposed at this moment but the degree of interest and need will be further investigated after the completion of the first terminal in 2017. The NPF presents two measures regarding public transport that relate to public procurement of CNG and hydrogen public buses.

The NPF mentions cross-border cooperation focussing on shore-side electricity supply.

5.6.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.6.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / All		Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, combination / electricity, CNG		Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / electricity, CNG		Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.			N
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / combined AF		Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)			N
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes			N
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)			N

The checklist shows that the requirements of Annex I from the Directive are scarcely covered in the Estonian NIR.

The Estonian NIR does not offer any quantitative future AFI targets and provides only AFV estimates on a cumulative all-AFs level.

The EE NIR reports 13 measures in total. Under the Policy and Deployment & Manufacturing sections it was possible to identify three AF/transport mode clusters of measures, all assessable.

5.6.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.6.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
General AF / road	NIR	5,500 (8,676*)	484*	7,000	NA	14,200	NA	25,000	NA
Electricity / road	NIR	1,434*	394*	NA	NA (384***)	NA	NA (384***)	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
CNG / road	NIR	1,014*	10*	NA	19**	NA	19**	NA	19**
	Change NIR vs NPF [%]				18.75%				
	Attainment [%]				52.63%		52.63%		52.63%
LNG / road	NIR	0*	0*	NA	NA (1***)	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	NA	NA	NA (1***)	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	6,160*	80*	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
	(blank)	the value could not be computed
	NA	no value/information provided/available in the NIR

* Data from EAFO since the EE NIR did not provide detailed information, ** Values corresponding to 2019 from EAFO (the NIR mentions that the CNG infrastructure was established in 2019 and no further plans are presented), *** Targets from the EE NPF.

5.6.3.1 Road transport

NOTE: Similarly to the NPF, there are no fuel-specific AFV estimates presented in the Estonian NIR. Instead, an overall projection of AFV on Estonian roads is provided. Total AFV fleet is foreseen to develop from 5,500 vehicles in 2018 to 7,000 in 2020, 14,200 in 2025 and 25,000 in 2030.

The Estonian NIR provides no quantitative future AFI targets for any alternative fuel.

The NIR mentions that Estonia will complete its National Transport and Mobility Development Plan 2021+ by the end of 2020 in order to set new national objectives for the deployment of alternative fuels and their infrastructure.

5.6.3.1.1 Electricity

Vehicles

The Estonian NIR does not provide the 2016-2018 quantitative situation regarding electric vehicles. According to EAFO, Estonia recorded 1,434 battery-electric and plug-in hybrid electric vehicles in use in 2018, of which 1,377 were passenger cars, 31 LCVs and 26 buses and coaches (Table 5.6.3-1).

Similarly to the Estonian NPF, the NIR did not provide future electric vehicle estimates and the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Estonian NIR does not provide the 2016-2018 quantitative situation regarding publicly accessible recharging infrastructure. According to EAFO, Estonia recorded 384 publicly accessible recharging points in 2016 and 2017, and 394 in 2018 (Table 5.6.3-1).

In the Estonian NIR, no specific future targets are listed concerning the development of electric recharging points. Instead, the long-term vision is loosely described as planned to achieve recharging infrastructure that would be convenient for all users.

The Estonian NIR mentions that, during the process of privatising the national recharging infrastructure, obligations derived from the AFI Directive were put on the new owners (e.g. adding 'Combo 2' sockets to the existing/future high-power recharging points, distance between recharging points). Developing the national recharging infrastructure is considered to depend on the business plan of the new owners.

The targets for 2020 and 2025 considered in the Estonian NPF assessment were both equal to 384 publicly accessible recharging points.

Because the Estonian NIR did not provide any future targets for publicly accessible recharging points, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the EE NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. Because the Estonian NIR did not provide present values and future targets, the sufficiency index could only be computed for 2016 and 2018 by using data from EAFO. The 2016 - 2018 situation is considered adequate since the sufficiency index is inferior to the indicative value of 10.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	3.27*		3.64*			

* data from EAFO

Information on charging efficiency

The NIR mentions that, due to Estonia's privatization process of the recharging infrastructure, the specific methodology to take account of the charging efficiency of high power (>22kW) recharging points is subject to the developer's business plan.

5.6.3.1.2 CNG

Vehicles

The Estonian NIR does not provide the 2016-2018 quantitative situation regarding CNG vehicles. The report only mentions that public transport in Estonia is largely based on natural gas buses and some support vehicles at airports use biogas.

According to EAFO, Estonia recorded 1,014 CNG vehicles in use in 2018, of which 651 were passenger cars, 170 LCVs, 82 HCVs and 111 buses and coaches (Table 5.6.3-1).

There are no future CNG vehicle estimates provided in the Estonian NIR, thus the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Estonian NIR does not provide the 2016-2018 quantitative situation regarding publicly accessible CNG refuelling infrastructure. According to EAFO, Estonia recorded 6 CNG refuelling points in 2016 and 2017, 10 in 2018 (and 19 in 2019).

The Estonian NIR provides no specific quantitative future targets for publicly accessible CNG refuelling points but reports that the nationwide CNG and biogas refuelling infrastructure has already been established in 2019, funded by the government and the private sector that contributed each with 2.78 million €. In the case of biogas, it is added that the refuelling infrastructure is developing on demand.

In accordance with the statement of the EE NIR, the current assessment considers the future number of CNG refuelling points to remain the same as in 2019 (Table 5.6.3-1). This considered target for 2020 is 18.75% higher than the NPF target of 16 CNG refuelling points.

The 2018 ***attainment*** of future publicly accessible CNG refuelling infrastructure targets is constant and equal to 52.63% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Estonia is equal to 7%.

Ratio

The following table shows the ratio between vehicles and publicly accessible CNG refuelling points (i.e. sufficiency index) for the pair CNG/road. As is the case for electricity/road, the sufficiency index could only be computed for the 2016 - 2018 period by using data from the Estonian NPF and from EAFO, respectively. The 2016 - 2018 situation is considered adequate since the sufficiency index is inferior to the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		2016*	2017**	2018**	2020	2025	2030
Road	CNG	333.33	154.17	101.40			

* data from EE NPF; ** data from EAFO

5.6.3.1.3 LNG

Vehicles

Similarly to the Estonian NPF, there is no information provided about LNG vehicles in the Estonian NIR. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

There is no information provided about road LNG refuelling points in the Estonian NIR. According to EAFO, Estonia did not record any road LNG refuelling points in 2018.

The NPF target for 2020 was equal to one road LNG refuelling point.

Since there are no road LNG refuelling points targets provided in the Estonian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Since there is no current LNG infrastructure available and no targets were provided in the Estonian NIR, it is not possible to compute the sufficiency index.

5.6.3.1.4 Hydrogen

Vehicles

The Estonian NIR mentions that hydrogen vehicles are only slowly entering the Estonian market. On the basis of this observation, the Estonian NIR stipulates that no concrete actions have thus been taken.

Similarly to the Estonian NPF, there are no future hydrogen vehicle estimates provided in the Estonian NIR. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Estonian NIR provides no quantitative information for hydrogen refuelling points. According to the Estonian NIR, different ideas have been put forward on the hydrogen refuelling infrastructure, but no concrete targets or actions have yet been declared.

According to EAFO, Estonia did not record any hydrogen refuelling points in 2018.

Since there are no hydrogen refuelling points targets provided in the EE NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Since there is no current hydrogen refuelling infrastructure available and no targets were provided in the Estonian NIR, it is not possible to compute the sufficiency index.

5.6.3.1.5 Biofuels

Vehicles

Information is not available in the Estonian NIR.

Infrastructure

Information is not available in the Estonian NIR.

5.6.3.1.6 LPG

Vehicles

The Estonian NIR does not provide information on the number of LPG vehicles. According to EAFO, Estonia recorded 6,160 LPG vehicles in use in 2018, all of them being passenger cars (Table 5.6.3-1).

Infrastructure

The Estonian NIR does not provide information on the number of LPG refuelling points. According to EAFO, Estonia recorded 55 LPG refuelling points in 2016, 60 in 2017, and 80 in 2018.

Ratio

The following table shows the ratio between vehicles and publicly accessible LPG refuelling points (i.e. sufficiency index) for the pair LPG/road. The sufficiency index could only be computed for 2016 and 2018 by using data from NPF and EAFO.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LPG**	54.55*		77**			

* Calculated from NPF and EAFO values; ** Calculated from EAFO values

5.6.3.2 Rail transport

5.6.3.2.1 Electricity

Vehicles

The Estonian Cabinet of Ministers has approved the acquisition of six electric trains by the public transport company ELRON (see also Section 5.6.4.2.2).

Infrastructure

The Estonian Cabinet of Ministers decided to fully electrify Estonia's railway system by 2028. Design work begins in 2020 and construction work will commence in 2022 (see also Section 5.6.4.2.2).

5.6.3.3 Waterborne transport (maritime)

5.6.3.3.1 Electricity

Vessels

Information is not available in the Estonian NIR.

Infrastructure

According to the previously evaluated Estonian NPF, there was one maritime port equipped with shore-side electricity supply in 2016. The target set out in the NPF for 2020 and 2025 accumulated to 11 maritime ports with shore-side electricity supply available. It is not clear if this target is still meant to be achieved as the Estonian NIR does not provide any information on shore-side electricity supply.

5.6.3.3.2 LNG

Vessels

Information is not available in the Estonian NIR. However, one LNG vessel was mentioned in the Estonian NPF that began sailing the Tallinn–Helsinki line in 2017.

Infrastructure

No information was provided regarding LNG refuelling infrastructure in maritime ports along the TEN-T Core Network in the Estonian NIR. The NPF target for 2020 was one LNG terminal in the TEN-T Core maritime port of Tallinn.

5.6.3.4 Waterborne transport (inland)

Not applicable since Estonia has no inland ports in the TEN-T Core Network.

5.6.3.5 Air transport

5.6.3.5.1 Electricity

Airplanes

No specific information was found in the Estonian NIR.

Infrastructure (for stationary airplanes)

The Estonian NIR does not provide any information on electricity supply for stationary airplanes. According to the EE NPF, there was electricity supply available for stationary airplanes at the five Estonian airports with international flights in 2016. However, the NPF did not contain information on future plans.

5.6.3.5.2 *Biofuels*

Airplanes

The Estonian NIR reports that the aviation sector has signalled openness to introduce machinery powered by alternative fuels. There are, however, no big investments expected due to low volumes.

Infrastructure

The Estonian NIR does not provide information on the introduction of renewable jet fuel refuelling points.

5.6.4 ***Measures assessment***

The Estonian NIR mentions a series of measures that cumulate in three AF/transport mode clusters. Unfortunately, the Estonian NIR falls short of providing detailed information needed to perform the assessment. Many measures are vaguely defined or lack concrete information. The need to report this information has already been emphasized in the previous assessment of the Estonian NPF.

5.6.4.1 Legal measures

The Estonian NIR contains three legal measures to promote AFs. The previous NPF contained three measures as well, but different ones.

5.6.4.1.1 Legislative & Regulatory

The legislative & regulatory category of the Estonian NIR contains two measures. The planned measures are the above-mentioned National Transport and Mobility Development Plan 2021+ setting national deployment and AFI targets as well as a new regulation for 2021 requiring new building projects to install electric recharging points relative to the availability of parking spaces. Two different legislative and regulatory measures have been featured in the Estonian NPF. These concerned a memorandum of cooperation for the implementation of shore-side electricity supply in Estonia’s Baltic maritime ports as well as the Estonia-Latvia cross-border cooperation programme for a joint network of small ports. The current Estonian NIR does not indicate whether these measures have been successfully implemented or not.

5.6.4.1.2 Administrative

The Estonian NIR reports solely one administrative measure. The member state mentions the EU Clean Vehicles Directive which stipulates that 31% and 43% of public buses procured by 2025 and 2030, respectively, must be clean vehicles with half of those operating with zero emissions. The past Estonian NPF also reported only one administrative measure, which concerned biofuels blending mandates for petrol and diesel fuel. This measure was mentioned as adopted and has not been reported again in the Estonian NIR.

5.6.4.2 Policy measures

The Estonian NIR reports eight policy measures intended to foster alternative fuels in Estonia. Only one measure is featured in both NPF and NIR, seven have been newly introduced. This is an improvement compared to the NPF, which contained only three policy measures. Most policy measures in the Estonian NIR are financial incentives. The modes of transport covered are road or a combination of modes where fuels as such have been subject of the measures. The policy measures target exclusively electricity and CNG (including biomethane).

5.6.4.2.1 Measures to ensure national targets and objectives

Road transport

Six of the eight policy measures in the Estonian NIR are measures to ensure national targets and objectives. All six measures exclusively focus on electricity/road as well as CNG/combination of modes.

The three measures concerning electricity/road are all new measures that did not appear in the NPF. The most substantial among them is a purchase incentive with an allocated budget of 1.2 million € for the purchase of electric vehicles announced to begin at the end of 2019. The maximum grant per EV is €5,000. The other measures include discounts and free parking for electric vehicles in various cities as well as the possibility for EVs to use bus lanes.

As a fuel-specific measure, biomethane is exempt from excise duty in Estonia. Additionally, no excise warehouse permit is required for production and sale of biomethane. Information campaigns have been conducted to educate the population on biomethane, with a budget of €120,000 for the last two years, which included, among others, creating the Biomethane Advisory Council, advertising, launching a biomethane website and seminars.

5.6.4.2.2 Measures that can promote AFI in public transport services

The Estonian NIR lists two new measures that can promote AFI in public transport services. They are both related to rail transport (see next paragraph). The previous NPF offered a measure concerning the introduction of natural gas-powered public buses. The Estonian NIR does not refer to this past measure again.

Rail transport

The Estonian Cabinet of Ministers decided to fully electrify Estonia's railway system by 2028 for an estimated total cost of 300 million €. It is foreseen that design work begins in 2020 and construction work in 2022. The Cabinet of Ministers additionally aims to purchase six new electric trains for an estimated cost of 60 million €.

5.6.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The Estonian NIR does not list any measure that can promote the deployment of private electro-mobility infrastructure.

5.6.4.3 Deployment and manufacturing support

5.6.4.3.1 AFI deployment

The Estonian NIR lists two measures fostering the deployment and manufacturing support of alternative fuels. The first measure was due to expire at the end of 2019. It supported the maintenance of the electric recharging infrastructure for an amount of €50,000 per month. The Estonian NIR argues, however, that due to the privatisation of the recharging infrastructure no financial support is needed anymore. The second measure concerns the deployment of the nation-wide CNG refuelling infrastructure and has also been listed in the NPF but updated since. The Estonian NIR argues that no further action is needed as the complete CNG infrastructure has been established in 2019. Public and private investors contributed 2.78 million € each.

The Estonian NIR does not consider any other transport modes or other alternative fuels other than CNG and electricity in this section.

5.6.4.3.2 Support of manufacturing plants for AF technologies

No measures regarding the support of manufacturing plants for AF technologies are presented in the Estonian NIR.

5.6.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

The Estonian NIR provides no information on this subject.

5.6.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.6.4-1 presents an overview of the analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. No clusters of measures have emerged for hydrogen, LNG and LPG nor for waterborne and air transport modes.

Electricity/road is a new cluster appearing only in the NIR. While it results comprehensive since it concerns both vehicles and infrastructure (with financial and non-financial measures), it obtained a medium overall score influenced by the lack of specific details that made the assessment very difficult. Electricity/rail is also a cluster newly introduced in the NIR. It is comprehensive and has a medium overall score.

CNG/road cluster was already present in the NPF, where it was assessed with an overall medium score and as comprehensive. In the EE NIR, the result of the assessment is different (high overall score but not comprehensive).

In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of objectives and information related to budget allocations, does not allow to put this assessment into the right perspective. However, on the basis of a comparison of the Estonian measures with those provided by other Member States, it can be said that the measures for the pairs electricity/road, electricity/rail and CNG/road could have a medium impact. The three identified clusters of measures show a higher level of ambition compared to the NPF.

Table 5.6.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	H	N	**M**	+
LNG	Road				
	Water - maritime				
Electricity	Rail	M	C	**M**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.6.4.5 Research, Technological Development & Demonstration

The Estonian NIR does not list any measures that can be assessed as supporting research, technological development and demonstration (RTD&D). Two measures presented only in the NPF concerned a pilot project at the University of Tartu, which at the time of 2017 planned to acquire the first hydrogen powered public buses and to build a hydrogen refuelling point. These measures were under consideration in the NPF and their current status is unclear as the Estonian NIR does not mention them anymore.

5.6.5 *Additional information on alternative fuels infrastructure developments*

The Estonian NIR does not provide information on the changes in fuel use.

5.6.6 *Summary of the assessment*

Tabular overview

Table 5.6.6-1 Overview of the NIR assessment

		Indicators	Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LPG / road
			Alternative fuel / transport mode				
AF Vehicles / Vessels		Past situation (2016)	1,257**	2,000*	0**	1*	5,840**
		Situation (2018)	1,434**	1,014**	0**	NA	6,160**
		Estimate (2030)	NA	NA	NA	NA	NA
		Future share (2030) [%]					
		Estimate attainment (2018 vs 2030) [%]					
		Progress (2018)					
Publicly accessible AF Infrastructure		Past situation (2016)	384**	6*	0**	NA	55**
		Situation (2018)	394**	10**	0**	NA	80**
		Target (2030)	NA	19***	NA	NA	NA
		Target attainment (2018 vs 2030) [%]		52.63%			
		Progress (2018)		fast			
Sufficiency Index		2016	3.27	333.33			106.18
		2018	3.81	101.40			77.00
		2020					
		2025					
		2030					
Measures	**Legal measures**	Ambition (IR vs NPF)	+				
	Policy measures + Deployment & manufacturing	Score	M	H			
		Comprehensiveness	C	N			
		Impact	M	M			
		Ambition (IR vs NPF)	+	+			
	RTD&D	Ambition (IR vs NPF)					

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Value taken or calculated from EE NPF. ** Value taken from EAFO (absent in the NIR). *** Values corresponding to 2019 from EAFO (the NIR mentions that the CNG infrastructure was established in 2019 and no further plans are presented).

The requirements of Annex I from the Directive are only partly covered in the Estonian NIR. The NIR does not contain a sufficient description of the policy direction towards the introduction of alternative fuels in Estonia. It does not establish AFI targets nor does it present AFV estimates differentiating between the different kinds of fuels. The EE NIR only provides an overall projection of AFV on Estonian roads. However, it mentions that a National Transport and Mobility Development Plan 2021+ will be completed by the end of 2020. The plan will set new national targets for the deployment of alternative fuels and their infrastructure.

The main outcomes of the technical assessment of the Estonian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – According to EAFO, Estonia recorded 1,434 electric vehicles in 2018 (1,377 passenger cars, 31 LCVs, 0 HCVs and 26 buses and coaches). There are no quantitative infrastructure targets or vehicle estimates outlined in the Estonian NIR. It is only mentioned that their vision is to achieve recharging infrastructure that would be convenient for all users. The recharging infrastructure was privatised and its further development is considered to depend on the business plan of the new owners. Due to the lack of reported values, the sufficiency index, progress and target attainment could not be calculated.
- **CNG** – According to EAFO, Estonia recorded 1,014 CNG vehicles in use in 2018 (651 passenger cars, 170 LCVs, 82 HCVs and 111 buses and coaches). As in the NPF, the Estonian NIR does not provide estimates for CNG vehicles. The NIR signals that the CNG infrastructure was completely established in 2019 so that the value of 19 CNG refuelling points was considered as the target for the future years. With reference to the objectives of the EE NPF as updated by the NIR, in 2018 Estonia was progressing fast in terms of CNG infrastructure deployment.
- **LNG** – According to EAFO, Estonia did not record any road LNG refuelling points or vehicles in 2018. Similarly to the NPF, the EE NIR does not include quantitative estimates for road vehicles powered by LNG. Regarding LNG refuelling infrastructure, the EE NIR does not provide any future target while the NPF had presented a target of one LNG refuelling point for 2020.
- **Hydrogen** – The Estonian NIR mentions that, because hydrogen vehicles are only slowly entering the Estonian market, no concrete objectives or actions have yet been declared.
- **Biofuels** – Information is not available in the Estonian NIR.
- **LPG** – According to EAFO, Estonia recorded 6,160 LPG vehicles on the road and 80 LPG refuelling points in 2018. Similarly to the NPF, the Estonian NIR does not provide estimates for LPG vehicles or targets for LPG refuelling infrastructure.

Rail transport

- **Electricity** – The electrification process of Estonia's railway system is set to be completed by 2028.

Waterborne transport (maritime)

- **Electricity** – The Estonian NIR does not provide any information on shore-side electricity supply. The NPF had mentioned one port was equipped with shore-side electricity supply in 2016 and included a target of 11 maritime ports with shore-side electricity supply available in 2020 and 2025.
- **LNG** – Regarding LNG refuelling infrastructure in maritime ports along the TEN-T Core Network, the EE NIR does not provide any future target while the NPF had presented a target of one LNG terminal in the port of Tallinn for 2020.

Air transport

- **Biofuels** – According to the Estonian NIR, the aviation sector has signalled openness to introduce machinery powered by alternative fuels but no big investments are expected due to low volumes.

The Estonian NIR contains a modest list of **measures** to support the substitution of conventional fuels with alternative fuels. Most of the presented measures lack concrete information needed for a proper assessment. The number of legal measures remained the same in the NIR as in the NPF, but they are totally different. Concerning the Policy and Deployment & Manufacturing support measures, compared with the NPF, the level of ambition has increased for all the three existing clusters in the NIR: electricity/road, electricity/rail and CNG/road. The first two clusters are totally new in the NIR, while the CNG/road cluster was already present in the NPF.

On the basis of the assessment methodology described in Section 2.2, the new electricity/road and electricity/rail clusters were assessed to have medium impact towards reaching the electro-mobility objectives of Estonia. The CNG/road cluster was assessed as well to have a medium impact towards reaching the CNG objectives of Estonia.

The Estonian NIR does not provide information about measures that can be assessed as supporting RTD&D of AFI and AFV.

5.6.7 *Final remarks*

The Estonian NIR provides a rather limited report on the efforts to implement the Directive. It does not provide information on several requirements of Annex I to the Directive: it does not offer any quantitative targets for alternative fuels infrastructure deployment and provides generic alternative fuels vehicles estimates without differentiation per fuel. It should be noted that the information on shore-side electricity supply at ports and airports, included in the NPF, is not included in the NIR. Nor is there any mention of LNG vessels, while, according to the NPF, these should have started sailing on the Tallinn-Helsinki line in 2017. The NIR focuses on measures promoting electricity for road and rail transport and CNG for vehicles. Future reporting should include information on measures to support ramp up of other alternative fuels in other modes of transport. This could contain particularly more information on promotion of zero-emission vehicles up to 2030. Following the requirements under the Directive, targets for the coverage of publicly accessible infrastructure need to be established and the numbers of specific alternative fuel vehicles and infrastructure need to be adequately quantified and reported.

With regard to electricity, the lack of specific data prevents an assessment of the ambition for 2030. Taking into account the current situation and expected trends, which have been derived either from the NPF or from EAFO, Estonia’s level of ambition appears quite low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. In this context, increased deployment of the relevant recharging infrastructure is also crucial to meet the objective of realising a dense, wide-spread and easy to use network of recharging and refuelling infrastructure throughout the EU. No information on charging efficiency is provided. The supply of shore-side electricity supply in ports and of electricity supply to stationary aircraft in airports needs to be clarified due to discrepancies between the information given in the NPF and the lack of information in the NIR. The railway network is expected to be fully electrified by 2028.

Regarding hydrogen, the NIR does not provide any plan for the development of an infrastructure for HCEV and does not provide information on fleet development. Although hydrogen is not binding under the Directive, it would be relevant that Estonia provides information on how to ensure EU-wide connectivity for HCEV.

As to natural gas, according to the information provided in the NIR, 19 CNG refuelling points were in place in 2019. The NIR expects no additional deployment of CNG refuelling infrastructure until 2030. Furthermore, the NIR does not report estimates for LNG vehicles and vessels nor targets for the relevant infrastructure. Estonia should provide further information in future reporting..

With regard to LPG infrastructure, the NIR does not provide information. However, EAFO shows that Estonia already had fleet of 6,160 LPG vehicles and around 80 refuelling stations in 2018, with decreasing registrations, but the Estonian NIR does not provide any estimates of vehicles and infrastructure by 2020, 2025 and 2030.

Estonia should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.6.8 *ANNEX - Description of the Member State*

On a surface area of 45,200 km², Estonia has a population of 1.319 million people in 2018, which makes up for a population density of 29 inhabitants/km².

Number of main urban agglomerations

- 3 urban agglomerations > 50,000 inhabitants

In 2018, Estonia achieves a per capita gross domestic product at market prices of €19,740, which represents a per capita gross domestic product in purchasing power standards of 82 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Estonia is 481 km. The total road network length is 16,604 km, of which 154 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Estonia: 5% (192 km) of the North Sea - Baltic Corridor.

Through the TEN-T Road Corridors, Estonia is connected with the following Member States:
- Latvia (through the North Sea - Baltic Corridor)

Number of registered road vehicles

At the end of 2017, Estonia accounts for 924,802 registered road vehicles of which 746,464 are categorized as passenger cars, 83,313 as light goods vehicles, 38,229 as heavy goods vehicles and 5,026 as buses and coaches. The motorisation rate is 566 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 1 maritime port in the TEN-T Core Network (Tallinn)
- 7 maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Tallinn)
- 4 airports in the TEN-T Comprehensive Network

5.7 Ireland (IE)

5.7.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Irish NPF the Commission concluded:

The Irish NPF addresses partly the requirements of Article 3. It contains a discussion of the current state and future scenarios for alternative fuels in the transport sector. For all the mandatory fuels and modes except for LNG it establishes targets as required by Article 3 of the Directive.

The spatial distribution of the available recharging points fulfils the requirement of having chargers available every 60 km on Ireland's main intercity roads, including the TEN-T Core Network. The actual number of public recharging points is also sufficient to cover the requirement of one recharging point every 10 electric vehicles. However, the numbers of electric recharging points foreseen for 2020, 2025 and 2030 seem to be insufficient for the foreseen number of electric vehicles in Ireland if only the public recharging points are taken into account. Ireland supports the deployment of private electro-mobility infrastructure. To increase the number of electric vehicles in Ireland, vehicle purchase and registration tax incentives exist since 2011. Company tax incentives exist since 2008. The registration tax relief for battery electric vehicles will be extended until 2021 and for plug in hybrid vehicles until 2018.

The Dublin Airport in the TEN-T Core Network is currently using mobile ground power units for use by stationary airplanes. However, the Irish NPF does not include targets for electricity supply for stationary airplanes only a life-cycle cost analysis of rolling out Fixed Electrical Grown Power units at airports is considered for 2018.

The Irish NPF does not include concrete plans for shore-side electricity supply for maritime ports. The development of a feasibility study of shore-side electricity supply for seagoing ships in TEN-T ports (Dublin, Cork and Shannon Foynes) is considered for 2018. Based on the results of the study, targets for shore-side electricity supply should be established.

Regarding CNG, the current number of vehicles in Ireland is insignificant. The current number of refuelling points is also insufficient to cover the Irish territory, not fulfilling the requirement of refuelling points every 150 km. In order to improve this situation, the Ireland has established direct incentives for the installation of 5 public CNG points in 2017. For 2020, the targeted number of public refuelling points would be sufficient to have one for every 600 vehicles. For 2025 and 2030, the number of public points seems to be insufficient to cover all the foreseen CNG vehicles in Ireland. The inclusion of biomethane as transport fuel in the biofuel obligation scheme since 2010 assists the promotion of the vehicles running with natural gas.

The Irish NPF does not consider any LNG refuelling points in Ireland (neither for road nor for maritime ports). Ireland has committed to setting targets for the LNG facilities at the three TEN-T Core Network maritime ports in 2019.

The Irish NPF does not include hydrogen. It has already identified measures to be considered by 2020 and plans to analyse opportunities to further the advancement of hydrogen infrastructure.

In Ireland, since 2013 tax incentives like lower fuel excise duty for LPG vehicles exist. They are foreseen to be active at least until 2023. These measures together with the already existing infrastructure for LPG have led to substantial LPG vehicle shares in Ireland.

The Irish NPF contains a comprehensive list of financial support measures already in place for the support of electricity, CNG (biofuels included) and LPG vehicles and infrastructure. They can be considered having a medium impact on market actor's decisions. Longer periods for their validity could provide certainty for market actors and hence increase the likelihood that the national targets and objectives of the NPF can be reached. For other modes and fuels the measures in the Irish NPF seem to have a rather low impact because they are only in planning phase. The Irish NPF has included a group of measures to be implemented in the coming years 2017 and 2018 (e.g. establishment of the green bus fund and scrappage scheme for taxis) which have been considered to have a medium impact on the promotion of alternative fuels in public services. Finally, the tax incentives for the installation of free home recharging points have had an important impact on the deployment of private electro-mobility infrastructure in Ireland.

The NPF states that the development of alternative fuels use has benefitted from close cooperation between the Republic of Ireland and Northern Ireland.

5.7.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.7.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, air / Electricity, CNG, biofuels, AF (in general)		Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, rail / Electricity, CNG, H2, AF (in general)		Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	Y
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / Electricity, CNG		Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, water (maritime) / Electricity, CNG, H2, biofuels, AF (in general)		Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity, CNG (partial)		Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG		Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road / Electricity, CNG		Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	Y
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / Electricity, CNG, biofuels		Y

The checklist shows that most of the requirements of Annex I from the Directive are covered.

Regarding the combination of AF/AFV/AFI with transport mode, electricity and CNG are covered for road transport; LNG, hydrogen and biofuels are partially covered for road transport;

electricity is partially covered for rail transport; shore-side electricity supply and LNG are partially covered for maritime water transport; electricity supply for stationary airplanes is partially covered for air transport; all the other combinations are either absent or not applicable.

The Irish NIR reports more than 50 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify 11 AF/transport mode clusters of measures, all assessable.

5.7.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.7.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	7.464	806 (4,624*)	59.219	950 (18,970*)	181.266	1,100 (201,200*)	936.363	1,200 (701,400*)
	Change NIR vs NPF [%]			136.83%	0.00%	-30.97%	0.00%	13.71%	-4.00%
	Attainment [%]			12.60%	84.84%	4.12%	73.27%	0.80%	67.17%
CNG / road	NIR	2 (HCV)	1 (4*)	20 (HCV)	1 (4*)	100 (HCV)	23 (66*)	150 (HCV)	42 (168*)
	Change NIR vs NPF [%]				-92.31%		-14.81%		-14.29%
	Attainment [%]				100.00%		4.35%		2.38%
LNG / road	NIR	0	0	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	0	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	3,700**	45**	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Electricity supply / air (stationary airplanes)	NIR		46		NA		NA		NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Total number of AFI (public + private). ** Data from EAFO (absent in the IE NIR)

5.7.3.1 Road transport

5.7.3.1.1 Electricity

Vehicles

Ireland recorded 7,464 battery-electric and plug-in hybrid electric vehicles in use in 2018 (see Table 5.7.3-1), of which 7,287 were passenger cars and 177 were LCVs. The Irish NIR EV estimates are 59,219 for 2020, 181,266 for 2025 and 936,363 for 2030, reflecting a revised curve compared to the NPF related to the estimated growth of electric vehicles for the next decade. Compared to the NPF values, the IE NIR forecasts an earlier and higher EV market uptake for 2020 (+136.83%) and an increased estimated number for 2030 (+13.71%), while for 2025 the NIR estimates a decrease (-30.97%) compared to the NPF. The Irish NIR expects that of the total 936,363 EVs foreseen in use in 2030, 89.72% will be passenger cars, 10.14% LCVs and 0.13% buses and coaches. The interest in electrifying the light commercial vehicles deserves to be highlighted since a progressive increase of their number compared with NPF is foreseen (7% in 2020, 140% in 2025 and 313% in 2030).

The 2018 ***attainment*** of future EV estimates is 12.60% for 2020 and 0.80% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Ireland is equal to 50%.

Infrastructure

Ireland recorded 806 publicly accessible recharging points in 2018 (see Table 5.7.3-1), of which 666 were normal power (≤22kW) and 140 high power (>22kW) recharging points. Concerning the next decade, the IE NIR shows a confirmation of the NPF targets for 2020 and 2025 (950 and 1,100, respectively). For 2030, the revised target of 1,200 represents a slight decrease compared with the NPF (-4%) that originates from a reduction of the targeted number of high power recharging points. In the NIR, the percentage of planned high power recharging points in the total publicly accessible recharging infrastructure increases from 12% or 100 (2020) to 16% or 150 (2025) and 20% or 200 (2030) but it has to be highlighted that the 2020 target was already overpassed in 2018. The Irish NIR confirms the targets for private recharging points provided in the NPF: 18,020 in 2020, 200,100 in 2025 and 700,200 in 2030. This confirms a clear strategy of Ireland to support the uptake of electro-mobility primarily on private recharging infrastructure, while keeping publicly accessible infrastructure at a bare minimum. It can be noticed in fact that the percentage of publicly accessible infrastructure from the total infrastructure is 17.43% in 2018 and foreseen to decrease to 5% (2020), 0.55% (2025) and 0.17% (2030).

The 2018 ***attainment*** of future public recharging infrastructure targets is 84.84% for 2020 to 67.17% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Ireland is equal to 3%.

Ratio

Based on the IE NIR and NPF, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that for the next decade the foreseen sufficiency index is expected to progressively increase to values that are considerably above 10 and thus inadequate. The fact that Ireland has a clear strategy regarding private recharging infrastructure does not seem to solve the problem fully.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	2.75*	4.49	9.26	62.34	164.79	780.30

* Value calculated from IE NPF

Information on charging efficiency

The Irish NIR provides an example of usage for the high power (>22kW) recharging infrastructure. It mentions that the average overall number of transactions per day in 2018 was 840 corresponding to all the existing 140 high power recharging points, while the average duration of a stay was of 47 minutes. It is worth noting that in 2018 there were no recharging and no overstay fees at this infrastructure.

5.7.3.1.2 CNG

Vehicles

Compared to the NPF, the Irish NIR does not include any more estimates for CNG light-duty vehicles, reflecting a modification in the policy direction where the support focuses principally on electrification in the light vehicle sector. Since the IE NIR mentions that "*in the heavy-duty sector there is a recognition that electrification is not currently a viable alternative*" and other solutions must be considered, the report contains only future estimates for CNG HCV but their values are significantly reduced in comparison with the NPF ones (20 vs 150 for 2020, 100 vs 1,050 for 2025 and 150 vs 1,550 for 2030).

Because there are no total CNG vehicle estimates, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

In 2018, Ireland recorded one public CNG refuelling point and three private fleet operators' ones. Table 5.7.3-1 shows an overall reduction of the targets for public CNG refuelling points provided in the NIR compared to the NPF over the next decade (1 vs 13 for 2020, 23 vs 27 for 2025 and 42 vs 49 for 2030). The Irish NIR also provides revised targets for private CNG refuelling points in comparison to the NPF (3 vs 5 for 2020, the same number of 43 for 2025 and 126 vs 53 for 2030), reflecting the forecast that during the next decade the share of private CNG refuelling infrastructure will progressively increase and become dominant.

A map with the locations of the 14 public CNG refuelling stations to be rolled out as part of Causeway Project is provided (for more information on the project, see Section 5.7.4.3). The Irish NIR mentions the objective of the Gas Network Ireland that 20% of the gas in the network will be renewable by 2030.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 100% for 2020 and 2.38% for 2030. According to the assessment methodology described in Section 2.1, the

2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The ***average annual growth rate*** corresponding to the period 2016-2030 for public CNG refuelling infrastructure evolution planned by Ireland could not be calculated since in 2016 there were no public CNG refuelling points deployed.

Ratio

Since there are no total CNG vehicle estimates provided in the Irish NIR, it is not possible to compute the sufficiency index.

5.7.3.1.3 LNG

Vehicles

At the end of 2018, there were no LNG vehicles in use. Similarly to the NPF, the Irish NIR provides no LNG vehicle estimates for the future and therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

At the end of 2018, there were no LNG road refuelling points deployed. Similarly to the NPF, the Irish NIR does not commit to any targets for LNG road refuelling infrastructure and therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

For the same reason, it is not possible to compute the sufficiency index.

5.7.3.1.4 Hydrogen

Vehicles

Estimates for hydrogen vehicles are absent in the Irish NIR as they were lacking also in the NPF. The NIR mentions there are currently no hydrogen vehicles in use in Ireland and no real suppressed demand for hydrogen vehicles at current market prices. However, it states that a potential deployment of around 100 vehicles in 2022/23 is under consideration by a range of engaged stakeholders possibly with government support.

Because no clear quantitative hydrogen vehicle estimates were provided, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

In line with the strategy regarding the hydrogen vehicles, the Irish NIR as the NPF does not commit to targets for hydrogen refuelling infrastructure and justifies this by the lack of demand at this stage. However, it mentions that there is under consideration by a range of engaged stakeholders, potentially with government support, a deployment of a sustainable hydrogen production and three clustered refuelling points in 2022/23.

Because no clear quantitative hydrogen refuelling infrastructure targets were provided, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

For the same reason, it is not possible to compute the sufficiency index.

5.7.3.1.5 Biofuels

Vehicles

No quantitative information regarding vehicles fuelled by biofuels is provided in the Irish NIR. However, the IE NIR contains some details on the biofuels consumption in transport (see Section Additional information on alternative fuels infrastructure developments) and about the Biofuels Obligation Scheme (see Section Legislative & Regulatory).

Infrastructure

Information is not available in the Irish NIR.

Ratio

Information is not available in the Irish NIR.

5.7.3.1.6 LPG

Vehicles

The Irish NIR does not provide information on the number of LPG vehicles. However, according to EAFO, Ireland recorded 3,700 LPG vehicles in use in 2018, all of which were passenger cars (Table 5.7.3-1).

Infrastructure

The Irish NIR does not provide information on the number of LPG refuelling points. According to EAFO, Ireland recorded 50 LPG refuelling points in 2016, 47 in 2017, and 45 in 2018.

Ratio

Based on EAFO data for Ireland, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road. The sufficiency index could only be computed for the 2016 – 2018 period.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	86.00*	85.11*	82.22*			

* data from EAFO

5.7.3.2 Rail transport

5.7.3.2.1 Electricity

Vehicles

The IE NIR recorded 144 locomotives in 2018 and this number is expected to increase in the next decade (196 in 2025 and 600 in 2030). However, the IE NIR mentions that "*these figures include hybrid trains which are expected to come into service in the coming years*".

Infrastructure

Information is not available in the Irish NIR.

5.7.3.3 Waterborne transport (maritime)

5.7.3.3.1 Electricity

Vessels

Information is not available in the Irish NIR.

Infrastructure

The feasibility study on the development of AFI in Irish ports foreseen in the NPF has been carried out and was included as an annex of the IE NIR[24]. Favourable economic (e.g. price of electricity below European average) and geographic conditions, a stringent regulatory environment and scale of operations were identified to have a common influence in the successful deployment of AFI in general, and shore-side electricity (SSE) in particular. Taking these drivers into account, the study considered the demand for, and feasibility of, AFI in Irish ports. The study found that many of the characteristics evident at current ports providing AFI are not present at Irish ports as "*Ireland does not gain from geographic conditions favourable to … renewable energy production*" and the scale of operations in Irish ports and the number of ships calling to them does not generate sufficient demand to justify the capital investment that AFI requires. As a result, forecasted demand for SSE in Irish ports was considered low. The same view resulted from stakeholder consultations highlighting concerns that forecasted demand does not justify large scale capital investment in AFI. Based on these findings from the market demand analysis, the Irish NIR is not setting targets for SSE at maritime ports on the TEN-T network at this time but commits however to a continued monitoring of markets trends.

[24] Irish Maritime Development Office, 2019, "The Development of Alternative Fuel Infrastructure in Irish Ports – A Feasibility Study"

5.7.3.3.2 LNG

Vessels

Information is not available in the Irish NIR.

Infrastructure

Similarly to the NPF, the Irish NIR does not commit to any targets for LNG refuelling infrastructure at maritime ports on the TEN-T network.

The feasibility study on the development of AFI in Irish maritime ports (see Section 5.7.3.3.1) covered also LNG refuelling infrastructure. As already mentioned in the section dedicated to SSE, the study found that many of the characteristics common to ports with successful AFI deployment are not present at Irish ports: Ireland does not gain from favourable economic (e.g. price of natural gas below European average) and geographic conditions (e.g. large natural gas resources), the scale of operations in Irish ports does not generate sufficient demand and Ireland falls outside the Emission Control Areas with stringent regulatory standards. Therefore, the demand for LNG refuelling infrastructure in Irish ports was considered low. The innate conservatism and risk aversion of the shipping industry was also mentioned as a reason to consider investment in LNG unlikely because of the potential obsolescence of LNG technologies through the development of alternative fuels such as hydrogen and ammonia. The Irish NIR mentions that, based on these arguments, it did not provide targets for LNG refuelling infrastructure at maritime ports on the TEN-T network at this time. However, it commits to facilitate discussions between the maritime industry and other industries currently using LNG and to monitor annually the use of alternative fuels use.

5.7.3.4 Waterborne transport (inland)

Not applicable since Ireland has no inland ports in the TEN-T Core Network.

5.7.3.5 Air transport

The NIR mentions that "*Ireland's policy to reduce the climate impact of aviation emissions is aligned with the strategies being pursued at EU level and globally*" by the International Civil Aviation Organisation (ICAO). Regarding aircraft technology, the two major Irish airlines have invested recently in newer fuel efficient aircraft.

It is mentioned that the Irish state airports Dublin, Cork and Shannon are reducing their year-to-year carbon footprint being accredited by Airport Council International (ACI) at "Level 2 Reduction" status. Several examples of existing or foreseen sustainability activities are provided:

- "*Dublin is committed, and Cork Airports also intends, to become carbon neutral under the Airport Carbon Accreditation Scheme of the ACI by 2020*" through initiatives such as the use and generation of green electricity and various other renewable energy projects.

- Dublin and Cork Airports, as part of ACI EUROPE, "*have committed to achieving net zero emissions by 2050 at the latest*", as part of a collective pledge of 194 airports in 24 countries.

5.7.3.5.1 Electricity

Airplanes

Information is not available in the Irish NIR.

Infrastructure (for stationary airplanes)

The Irish NIR, similarly to the NPF, does not include quantitative future targets for electricity supply at Irish airports for use by stationary airplanes. However, it mentions that Dublin Airport from the TEN-T Core Network is replacing diesel-powered ground power units with fixed electrical ground power (FEGP) units. An amount of 46 FEGP units are currently available at most of the aircraft contact stands on three out of the four piers at this airport and the Dublin Airport Authority has committed to introduce FEGP on all future new contact stands.

5.7.3.5.2 Biofuels

Airplanes

The Irish NIR mentions that there are no sustainable aviation fuel (SAF) stocks in any Irish airport, as no flights to/from Ireland have requested the use of such fuel. The report states that despite most commercial aircraft in use in Ireland are capable of using a blend of conventional and SAF, all aircraft still use conventional fuel.

Infrastructure

Information is not available in the Irish NIR.

5.7.4 ***Measures assessment***

The Irish NIR, as the NPF, contains an extensive and detailed description of measures. They cover a wide variety of types and several AFs and modes, however the vast majority focuses on electricity/road and, to a lesser extent, CNG/road. The policy direction in Ireland is to encourage the move away from fossil fuelled vehicles to AFV and other sustainable transport modes in order to reduce national emissions. Electro-mobility and EVs are a prominent mitigation in the Irish Climate Action Plan, foreseen to rely mostly on private recharging infrastructure.

5.7.4.1 Legal measures

The Irish NIR contains 18 legal measures (versus 10 in the NPF) to promote AF, with detailed descriptions (12 measures appear only in the NIR, 6 are common to the NIR and NPF while 4 were only present in the NPF). Most of the NIR measures are represented by national plans that address entirely or partly the topic of alternative fuels and by national legal acts transposing EU Directives.

In line with the overall focus on electrification of the NIR, the most numerous cluster concerns electricity/road containing 15 measures, of which 6 are specifically dedicated to this pair of AF/transport mode, and was assessed to display an increased ambition level compared to the NPF (see Table 5.7.6-1 for the ambition levels of other clusters).

5.7.4.1.1 Legislative & Regulatory

There are 12 measures identified in this category out of which 8 appear only in the NIR.

A ban to sale new fossil fuel cars from 2030 and to stop the granting of national car tests from 2045 is under consideration.

Several national plans that concern alternative fuels are mentioned:

- the Climate Action Plan together with its planned Amendment Bill and its predecessor the National Mitigation Plan,
- the National Planning Framework for land use,
- the Development Plan Guidelines for planning authorities,
- the National Energy and Climate Plan and
- the National Aviation Policy.

Listed as well are the Biofuels Obligation Scheme with stricter future requirements[25] and the transposition of the EU Energy Performance of Buildings Directive in the national Building Regulations. As part of AFI Legislations, the Irish NIR presents the Electrical Wiring Standards to which the recharging points' installation must comply and the CNG Installation Legislation regarding the corresponding licences.

5.7.4.1.2 Administrative

The Irish NIR describes six administrative measures, of which two were also present in the NPF. The Low-Emission Vehicle Taskforce foreseen in the NPF was established in December 2016 focusing exclusively on EVs in a first phase and covering other low-emission fuels, including CNG, LNG and hydrogen, in a second phase. The two Statutory Instruments from 2018 that served to transpose the AFI Directive provisions not addressed through the NPF are presented. There are also mentioned the Clean Vehicles Directive transposition and the National Adaptation Framework including mitigation and climate adaptation measures and sectoral sub-plans for transport infrastructure and for gas and electricity networks. Concerning electricity, an Electric Vehicle Deployment Roadmap is under development and guidance will be issued to planning authorities to ensure a consistent and future proofed approach to the rollout of recharging infrastructure.

5.7.4.2 Policy measures

The Irish NIR reports 21 policy measures intended to foster alternative fuels in Ireland, most of them represent financial incentives. The modes of transport covered are road, rail or a combination of modes where fuels have been subject of the measures.

[25] A scheme that places an obligation on fuel suppliers in the road transport to ensure that a certain of all fuel is from renewable sources (the obligation rate increases over time - 4% by volume in 2010, 10% by volume in 2019 and 11% in 2020.

5.7.4.2.1 Measures to ensure national targets and objectives

Road transport

A set of 15 policy measures meant to support the achievement of the Irish AF objectives have been identified in the Irish NIR (9 measures appear only in the NIR, 6 are common to the NIR and NPF). Nine measures present in the NPF are not part of the NIR anymore. They are all in place or planned for the future with one exception (the free public recharging of EVs which was discontinued in 2019/2020). The majority is represented by financial incentives (sometimes with different conditions depending on the AF) for road as transport mode.

Within the measures in place targeting specifically electricity, the Irish NIR lists:

- purchase subsidies (grants of up to €5,000 for the private purchase of a new BEV or PHEV and of €3,800 for companies purchasing electric LCVs),
- tax reductions/exemptions
    - Vehicle Registration Tax relief of up to €5,000 for BEVs – until the end of 2021, up to €2,500 for PHEVs - until the end of 2020;
    - BEVs qualify for a 0% Benefit-in-Kind rate up to €50,000 without mileage conditions - until the end of 2022;
    - toll incentive scheme (BEVs qualify for 50% and PHEVs for 25% toll reductions up to a maximum of €500 per year).

As general measures targeting several AFs, the IE NIR includes:

- different tax related incentives
    - annual motor tax based on CO_2 emission band;
    - punitive measures related to fossil fuels
        - tax based on a vehicle’s nitrogen oxide emissions applied to new car purchases and used imports
        - increasing carbon tax (at least €80 per tonne by 2030 is foreseen)
    - Accelerated Capital Allowance support scheme regarding corporation tax for vehicles and infrastructure purchase – existing for electricity and CNG, under consideration for hydrogen;
    - minimum excise duty rate – existing for natural gas and biogas as a propellant set at the current EU minimum rate of €2.60 per GJ, under consideration for hydrogen.

Two measures targeting HCV fuelled on AFs (electricity, CNG, LNG, hydrogen) are in the process of adoption:

- purchase subsidies (grants of up to 30% of the cost differential between a traditional fossil fuelled HCV and an AF equivalent)
- toll incentive scheme.

Of the measures that were presented in the NPF but not in the NIR, three concerned LPG, two synthetic and paraffinic fuels and one biofuels.

Other transport modes

No measure specifically dedicated to the other transport modes (water, air and rail) is listed in the Irish NIR.

5.7.4.2.2 Measures that can promote AFI in public transport services

In the Irish NIR, six policy measures related to the public transport are presented (one measure is only part of the NIR, five are common to the NIR and NPF, while three were only present in the NPF).

Three measures correspond to rail as mode of transport and concern the electrification of public transport in the Dublin area. The DART (Dublin Area Rapid Transit) Expansion Programme is expected to create a full metropolitan area DART network and to transition current diesel commuter lines to electricity from the city centre to Drogheda, Co. Louth, to Celbridge/Hazelhatch and Maynooth, Co. Kildare. In 2022 is expected the delivery of Ireland’s first diesel-electric trains enlarging the rail fleet by approximately 300 new rail carriages. A new metro system, MetroLink, will be also funded and will stretch from Swords, north Co. Dublin, to Dublin’s south city centre serving critical destinations including Dublin Airport and Dublin City University. Light rail projects will also receive investments including the Green Line Capacity Enhancement Project which will add capacity to the light rail network in Dublin through additional and longer trams.

Two measures regard the public urban bus fleet. The National Development Plan committed Ireland to no longer purchase diesel-only buses for the urban public bus fleet from July 2019 and a decision was made to purchase hybrid-electric buses in the short term (nine hybrid buses have entered into service in Dublin city centre). To inform the long term approach, a low-emission bus trial was launched in December 2018 to assess full electric, diesel-electric hybrids and CNG buses. A major project to be funded is BusConnects which commits to the uptake of low-emission technologies and which will be rolled out across all major cities in Ireland. It is anticipated that by 2023, half of the bus fleet (approximately 500 buses) will be converted to low-emission vehicles, with plans for full conversion by 2030.

The Electric Small Public Service Vehicle (eSPSV) Grant Scheme currently offers purchase subsidies for new BEVs (up to €7,000) or PHEVs (€3,500) for taxis, hackneys and limousines. Plans are mentioned to increase the level of the grants for BEVs to up to €10,000 from 1 January 2020. In order to encourage an increase in electric wheelchair accessible vehicles (WAV) in the taxi fleet, from 2020 further support will be given to through an extra €2,500 grant for the conversion of an eSPSV to a WAV.

5.7.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

A group of two measures from the Irish NIR have been identified as helping the deployment of private electro-mobility infrastructure. These measures are included and assessed in the measures on AFI deployment and only mentioned here. They are the EV Home Charger Grant and the Accelerated Capital Allowance tax incentive scheme (companies allowed to write off 100% of recharging points purchase value against profit of same year).

5.7.4.3 Deployment and manufacturing support

5.7.4.3.1 AFI deployment

A set of 10 measures related to AFI deployment has been included in the Irish NIR (five measures appear only in the NIR, five are common to the NIR and NPF, while three were only present in the NPF). All NIR measures correspond to road as transport mode, with five targeting electricity, four CNG and one hydrogen.

Concerning electricity/road, the listed measures are promising and include:

- the EV Home Charger Grant (subsidy in place of up to €600 for the purchase and installation of a home recharging point but no indication of future allocated budget is given),
- the EV High Power Charging Infrastructure Development Project (government supported project to install >100 high power points (150kW) at key locations on the national road network, to replace 100 high power points (50kW) and also to refurbish up to 200 high power points (22kW) in 2020-2022),
- the planned support for installing EV Fast Chargers for taxis at Transport Hubs,
- the support for local authorities to rollout up to 2,000 on-street public recharging points over the next 5 years (which would mean the over achievement of the committed publicly accessible target for 2025 which is 1,100).

For CNG/road, the measures presented regard:

- two installation projects receiving funding from the CEF
    - Causeway project – 14 public refuelling points and 1 large scale renewable gas injection point by 2021 and
    - its follow up Green Connect project – 21 public refuelling points and 4 renewable gas injection points
- a national funded project at validation stage named GRAZE (Mitchelstown Central Grid Injection Point) to create the first large scale central injection point on the gas network.

The Accelerated Capital Allowance incentive scheme mentioned within policy measures section also applies to infrastructure purchase and is in place for electricity and CNG and under consideration for hydrogen.

The NPF measures not present anymore in the NIR concerned the Accelerated Capital Allowance scheme related to LPG, renewable jet fuel refuelling points in airports and the reduction of electricity tax for SSE.

5.7.4.3.2 Support of manufacturing plants for AF technologies

No measure regarding the support of manufacturing plants for AF technologies is presented in the Irish NIR.

5.7.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

No information is presented in the Irish NIR.

5.7.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.7.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. Among the clusters of measures identified in the Irish NIR, four clusters contain dedicated measures (electricity/road, electricity/rail, CNG/road and hydrogen/road) while the other six contain general measures addressing combinations of several alternative fuels[26]. For all other pairs of AF and transport mode, there are either no measures or the pair is not applicable to Ireland.

Table 5.7.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	H	C	**H**	+
LNG	Road	L	N	**L**	+
	Water - maritime	L	N	**L**	=
H2	Road	L	C	**L**	=
Biofuels	Road	L	N	**L**	-
LPG	Road	L	N	**L**	-
Synthetic & paraffinic fuels	Road	L	N	**L**	-
Electricity	Water - maritime	L	N	**L**	-
	Air	L	N	**L**	-
	Rail	M	C	**M**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

In line with the overall focus on road electrification reported in the NIR, the most numerous cluster concerns electricity/road containing a comprehensive set of 19 NIR measures out of which 12 are new measures, displaying a high overall score and showing an increased level of ambition compared with the NPF.

Even though the CNG related infrastructure targets and vehicle estimates have been reduced in the NIR, the corresponding CNG/road cluster containing 14 measures has been assessed to have a high score, to be comprehensive and to show an increased level of ambition.

The Irish NIR did not commit to hydrogen AFI targets or AFV estimates but includes a set of support measures assessed to be comprehensive and having a low score but a similar level of ambition compared to the NPF.

The electricity/road and CNG/road clusters have at least one measure that scores high, thus the overall score is H. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road and CNG/road result to have a high impact, the measures for the pair electricity/rail have a medium impact. For all the other assessable clusters of measures, the partial or total lack of future targets and estimates does not allow putting this assessment into perspective. However, as all these other pairs have an overall low score, they have therefore a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for electricity/road, electricity/rail, CNG/road and LNG/road, has remained the same for hydrogen/road and LNG water-maritime and has

[26] The cluster Synthetic & paraffinic fuels/road contained measures only in the IE NPF.

decreased[27] for biofuels/road, LPG/road, synthetic&paraffinic fuels/road, electricity/water-maritime and electricity/air.

5.7.4.5 Research, Technological Development & Demonstration

The Irish NIR contains 10 RTD&D activities, nine are only present the NIR, one is common to the NIR and NPF while other eight were only present in the NPF. For most activities, the financial details are given, with the overall budget surpassing 1.5 million €. The RTD&D activities from the NIR cover more uniformly the transport modes, the AFs and their related technologies. Compared with the NPF measures, they are more concrete, diversified and documented and the clusters electricity/road and CNG/road have an increased level of ambition.

Two research projects related to biofuels are mentioned (one on the production of oxygenated hydrocarbons from lignocellulosic waste by acid hydrolysis and the other on large scale algal biofuel production). Another project presented is a European project with Interreg funding aiming to accelerate the transition to renewable energy in agricultural transport in North-West Europe by making clean hydrogen technology for field operations ready for practice. Three projects listed in the NIR concern potential emission savings from the HCV segment.

5.7.5 *Additional information on alternative fuels infrastructure developments*

The Irish NIR contains information on the changes in fuels use in the transport sector (see Table 5.7.5-1). As it can be noticed, biofuels use is foreseen to increase progressively, remaining the most significant alternative fuel[28] in road transport until 2025 but in 2030 electricity is expected to take the lead. A decrease of diesel use is expected in the next years and the tax based on a vehicle's nitrogen oxide emissions applied to new car purchases and used imports could have an influence in this direction. No increase in LNG use in maritime transport is expected as marine diesel oil will continue to be the only fuel used in water transport.

Table 5.7.5-1 Changes in fuels use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	24.00%	22.00%	19.00%	21.00%	21.00%	17.00%
	Diesel	73.00%	74.00%	77.00%	72.00%	69.00%	64.00%
	Electricity	0.00%	0.00%	0.00%	0.00%	1.00%	10.00%
	CNG	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%
	Biofuels	3.00%	4.00%	4.00%	6.00%	8.00%	9.00%
	Other AF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Total Road	**100.00%**	**100.00%**	**100.00%**	**99.00%**	**99.01%**	**100.01%**
Maritime	Marine diesel oil	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

[27] The decrease in level of ambition at cluster level originates from the disappearing in the NIR of measures that were present in the NPF.

[28] In 2018, circa 216 million litres of sustainable biofuels (approximately 162 million litres biodiesel and 54 million litres of bioethanol) were placed on the Irish market

5.7.6 *Summary of the assessment*

Tabular overview

Table 5.7.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	**CNG / road**	**LNG / road**	**LNG / water (maritime)**	**H2 / road**	**LPG / road**
AF Vehicles / Vessels		Past situation (2016)	2,176*	10*	0	0	NA	4,300***
		Situation (2018)	7,464	2**	0	0	NA	3,700
		Estimate (2030)	936,363	150**	NA	NA	NA	NA
		Future share (2030) [%]	30.19%	0.26%**				
		Estimate attainment (2018 vs 2030) [%]	0.80%					
		Progress (2018)	adequate					
Publicly accessible AF Infrastructure		Past situation (2016)	790	0	0	NA	0	78*
		Situation (2018)	806	1	0	NA	0	45***
		Target (2030)	1,200	42	NA	NA	NA	NA
		Target attainment (2018 vs 2030) [%]	67.17%	2.38%				
		Progress (2018)	slow	adequate				
Sufficiency Index		2016	2.75					
		2018	9.26					
		2020	62.34					
		2025	164.79					
		2030	780.30					
Measures	**Legal measures**	Ambition (NIR vs NPF)	+	+	=	=		
	Policy measures + Deployment & manufacturing support	Score	H	H	L	L	L	L
		Comprehensiveness	C	C	N	N	C	N
		Impact	H	H	L	L	L	L
		Ambition (NIR vs NPF)	+	+	+	=	=	-
	RTD&D	Ambition (NIR vs NPF)	+	+	=	=		

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken or calculated from IE NPF; ** HCV; *** Value taken from EAFO (absent in both NPF and NIR).

The Irish NIR addresses most of the requirements of Annex I from the Directive, although not with the same level of detail for all the alternative fuels and transport modes.

Regarding the combination of AF/AFV/AFI with transport mode, electricity and CNG are covered for road transport; LNG, hydrogen and biofuels are partially covered for road transport; electricity is partially covered for rail transport; shore-side electricity supply and LNG are partially covered for maritime water transport; electricity supply for stationary airplanes is partially covered for air transport; all the other combinations are either absent or not applicable.

The main outcomes of the technical assessment of the Irish NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Ireland recorded a total of 7,464 electric vehicles and 806 publicly accessible recharging points in 2018. Compared to the NPF the IE NIR presents a new scenario concerning EV estimates for the next decade, i.e. an earlier and higher EV market uptake for 2020 (+136.83%), a decrease in 2025 (-30.97%) and an increased number for 2030 (936,363 vs. 823,455 EVs, of which 89.72% passenger cars, 10.14% LCVs and 0.13% buses and coaches). Instead, NPF targets of public recharging infrastructure are kept in the NIR, with minor differences. The progress in 2018, calculated according to the assessment technology described in Section 2.1, is adequate for EVs and is slow for the infrastructure. Indeed Ireland seems to largely rely on private recharging infrastructure for which an accelerated increase is foreseen. For this same reason, the ratio AFV to AFI considering only the public recharging infrastructure situation is progressively degrading as its value is expected to increase considerably over time.

- **CNG** – Compared to the NPF, the Irish NIR does not include any more estimates for CNG light-duty vehicles, reflecting a modification in the policy direction where the support focuses principally on electrification in the light vehicle sector. The IE NIR only records two HCVs in 2018 and provides estimates in 2020, 2025 and 2030 again only for HCVs. This fact makes impossible to calculate of the 2018 progress and attainment or of the infrastructure sufficiency index. Against this situation, the strategy for refuelling infrastructure is reported as evolving toward an increasing share of private CNG refuelling points. In 2030, the total number of CNG refuelling points planned is 168, of which only 42 are publicly accessible refuelling points. With respect to the latter, the progress in 2018 is adequate.
- **LNG** – The Irish NIR, as the NPF, does not propose vehicle estimates nor targets for LNG refuelling infrastructure.
- **Hydrogen** – Similarly to the NPF, the Irish NIR does not commit to targets for hydrogen refuelling infrastructure or to estimates for hydrogen vehicles. However, the possibility for a deployment is under consideration.
- **Biofuels** – No specific information is provided in the Irish NIR.
- **LPG** – The Irish NIR does not provide information on the number of LPG vehicles nor on the existing or future infrastructure.

Rail transport

- **Electricity** – The IE NIR recorded 144 locomotives in 2018 and this number is expected to increase in the next decade (196 in 2025 and 600 in 2030). However, the IE NIR mentions that "*these figures include hybrid trains which are expected to come into service in the coming years*".

Waterborne transport (maritime)

- **Electricity** - The feasibility study on the development of AFI in Irish ports foreseen in the NPF has been carried out and was included as an annex of the IE NIR. The study found that many of the characteristics evident at current ports providing AFI are not present at Irish ports as "*Ireland does not gain from geographic conditions favourable to ... renewable energy production*" and the scale of operations in Irish ports and the number of ships calling to them does not generate sufficient demand to justify the capital investment that AFI requires. Based on these findings, the Irish NIR did not set targets for shore-side electricity supply at maritime ports on the TEN-T network at this time but commits to a continued monitoring of markets trends.

- **LNG** – The feasibility study mentioned above reported for LNG infrastructure at ports the same conclusions as for shore-side electricity. For this reason, the IE NIR did not provide targets for LNG refuelling infrastructure at maritime ports on the TEN-T network at this time. However, it commits to facilitate discussions between the maritime industry and other industries currently using LNG and to monitor annually the use of alternative fuels use.

Air transport

- **Electricity** – The Irish NIR, similarly to the NPF, does not include quantitative future targets for electricity supply at Irish airports for use by stationary airplanes. However, it mentions that the Dublin Airport from the TEN-T Core Network is replacing diesel-powered ground power units with fixed electrical ground power (FEGP) units. FEGP units are currently available at most of the aircraft contact stands on three of the four piers at this airport, and the Dublin Airport Authority has committed to introduce FEGP on all future new contact stands.

The Irish NIR contains a rather comprehensive list of **measures** to support the envisaged AFI targets and AFV estimates. The legal measures to promote AFs are represented mainly by national plans that address entirely or partly the topic of alternative fuels and by national legal acts transposing EU Directives.

Concerning Policy and Deployment & Manufacturing support measures, the majority of support measures including the most prominent ones relate to electricity/road and CNG/road, noting that Ireland does not intend to foster publicly accessible recharging infrastructure. The two clusters have been quantitatively assessed with similar results: high overall score and comprehensiveness, and thus high impact. They however correspond to different envisaged AFI targets and AFV estimates, increased in the case of electro-mobility and decreased for the CNG in comparison with the NPF situation. For all the other assessable clusters of measures, the partial or total lack of future targets and estimates does not allow putting this assessment into perspective. However, with the only exception of the pair electricity/rail, which has a medium impact, all the other pairs have an overall low score, and therefore have a low impact.

The increased emphasis of the policy direction on electro-mobility has also influenced changes in the Irish NIR compared to the NPF with regards to the disappearing of some measures dedicated to LPG and synthetic & paraffinic fuels.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for electricity/road, electricity/rail, CNG/road and LNG/road, has remained the same for hydrogen/road and LNG water-maritime and has decreased[29] for biofuels/road, LPG/road, synthetic & paraffinic fuels/road, electricity/water-maritime and electricity/air. The RTD&D activities included in the NIR have changed compared to those in the NPF. They currently cover more uniformly the transport modes, the AFs and their related technologies. Compared with the NPF, they are more concrete, diversified and documented.

[29] The decrease in level of ambition at cluster level originates from the disappearing in the NIR of measures that were present in the NPF.

5.7.7 *Final remarks*

The Irish NIR provides a rather comprehensive report on the efforts to implement the Directive. The NIR is largely in line with the provisions of Annex I to the Directive, with the exception of missing estimates for LNG vehicles, vessels and related infrastructure targets for the years 2020, 2025 and 2030. The Irish NIR includes a significant number of measures to promote the uptake of electric vehicles and some measures on the use of electricity in the rail sector as well as for the possible promotion of CNG (heavy-duty vehicles). Future reporting should include information on further measures to promote other alternative fuels and modes of transport.

The Irish NIR estimates that approximately 940,000 electric vehicles could be on the roads by 2030, representing about 30% of the fleet by that time. Taking into account the current situation, fleet and existing trends, this level of ambition appears to be consistent with the pace of deployment of electric vehicles considered be necessary for a full transition to carbon neutrality by 2050. Nevertheless, the number of public recharging points for 2025 and 2030 seems far too low against the estimated fleet of electric vehicles. Ireland would be encouraged to explain in greater detail how it intends to ensure sufficient public infrastructure for a vehicle fleet that is expected to grow rapidly. Information on charging efficiency is provided. The NIR does not include information on plans for shore-side electricity supply in ports in the short term. Ireland should update planning and reporting on this matter. Furthermore, the Irish NIR does not include quantitative future targets for electricity supply to stationary aircraft at Irish airports. However, it mentions that Dublin Airport, which forms part of the TEN-T Core Network, is replacing diesel-powered ground power units with fixed electrical ground power units. It would be beneficial to provide further detail on the possible extension of these facilities to other airports. Further information should be provided on the share of the electrified rail network.

Hydrogen for road transport is not considered in the NIR.

The NIR reports that by 2030, Ireland expects no more than 150 CNG heavy-duty vehicles, a significant drop compared to the estimates number in the NPF (1,550), which demonstrates Ireland's reduction of ambition towards CNG. Information is not available on CNG fuelled passenger cars. The NIR does not provide estimates for LNG vehicles, vessels and the relevant infrastructure by 2020, 2025 and 2030.

The NIR does not include information on the number of LPG vehicles, nor does it provide information on the LPG infrastructure.

The share of biofuel blends with conventional fuels in road vehicles is estimated at 6% in 2020 and is expected to be 9% by 2030, thus contributing to the objectives of the recast Renewable Energy Directive. Ireland should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.7.8 *ANNEX - Description of the Member State*

On a surface area of 70,300 km², Ireland has a population of 4.830 million people in 2018, which makes up for a population density of 69 inhabitants/km².

Number of main urban agglomerations

- 4 urban agglomerations > 50,000 inhabitants

In 2018, Ireland achieves a per capita gross domestic product at market prices of €66,670, which represents a per capita gross domestic product in purchasing power standards of 191 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Ireland is 478 km. The total road network length is 18,426 km, of which 916 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Ireland: 8% (353 km) of the North Sea – Mediterranean Corridor.

Through the TEN-T Road Corridors, Ireland is connected with the following Member States:
- the United Kingdom (through the North Sea - Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Ireland accounts for 2,590,989 registered road vehicles of which 2,182,920 are categorized as passenger cars, 317,798 as light goods vehicles, 37,871 as heavy goods vehicles and 12,500 as buses and coaches. The motorisation rate is 452 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 3 maritime ports in the TEN-T Core Network (Cork, Dublin, Limerick)
- 2 maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Cork, Dublin)
- 6 airports in the TEN-T Comprehensive Network

5.8 Greece (EL)

5.8.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Greece NPF the Commission concluded:

The Greek NPF addresses many of the requirements of Article 3. It contains a detailed description of the current state and some future estimates for alternative fuels vehicles in the transport sector and establishes targets required by Article 3 of the Directive. However, the NPF does not contain any designation of urban/suburban agglomerations to be equipped with recharging points and the number and location of recharging points and LNG refuelling points to be put in place along the TEN-T Core Network is not defined.

The Greek NPF estimates a very modest share of below 0.1% electric vehicles on the road in 2020. The proposed set of measures based mainly on tax reliefs could support reaching the declared objectives since it was evaluated as being comprehensive and having a medium assessment score. The ratio of one public recharging point per 5 electric vehicles estimated for 2020 indicates that Greece has defined appropriate targets for recharging infrastructure in line with the requirements of the Directive. The spatial distribution of the future recharging points is not provided in the NPF.

The Athens central airport in the TEN-T Core Network has currently fixed electricity supply points and mobile ground power units for use by stationary airplanes. Other airports are using mobile ground power units. However, the Greek NPF does not include targets for electricity supply for stationary airplanes and it only mentions the possibility of pilot deployment for evaluating the feasibility and viability of such electricity supply points at specific airports.

In Greece, existing shore-side infrastructure for supplying electricity to ships primarily relates to tourist ports whereas at major maritime ports infrastructure is limited and mainly relates to pilot applications (such as the ELEMED project). The Greek NPF contains targets for further increasing shore-side electricity in its ports, concrete values being provided for different categories of ports (tourist ports, maritime ports of the TEN-T Core Network and outside of it). The NPF mentions that adopting a maritime electricity tariff category will be examined coupled with tax breaks for ships that use shore-side electricity supply.

For CNG vehicles, the estimated shares are slightly higher than for EVs (0.23% in 2020 and 0.5% in 2025). Due to high estimates for CNG vehicles and non-proportional expansion of refuelling points, the number of publicly accessible CNG refuelling points in the future will likely be insufficient. The NPF shows the ambition of increasing the number of CNG refuelling points with 13 new ones by 2020 on selected urban agglomerations along the TEN-T Core Network in the framework of a project partially funded by the Connecting Europe Facility. The NPF also presents different projects to significantly extend the existing natural gas distribution network.

The NPF has established a target of 2 LNG refuelling points for heavy-duty vehicles in 2025, which is insufficient to ensure appropriate coverage of the TEN-T Core Network on Greek territory. The NPF mentions also a project entailing the design and development of LNG tanker truck transhipment facilities at the Revythousa LNG terminal.

Currently, only the Port of Piraeus has the potential to provide ships berthed with LNG by transporting it from Revythousa facilities, using specially fitted ships. The Public Gas Corporation of Greece is currently examining the potential for developing LNG facilities at the other 4 maritime ports of the TEN-T Core Network.

The Greek NPF presents the situation of LPG for which the current number of vehicles, corresponding to a share of 3.04% from all the vehicles in circulation, is expected to grow to shares higher than 4.5% in 2020, than 5.5% in 2025 and than 7.5% in 2030. It also establishes appropriate refuelling infrastructure targets consistent with the vehicle projections.

The Greek NPF does not examine the potential for using hydrogen in the transport sector.

The Greek NPF, intending to accelerate the AF deployment in transport, contains a relatively wide portfolio of measures. More than half of the presented measures are of administrative, legislative and regulatory type targeting transposition provisions of the Directive and laying down terms and conditions for the installation and operation of the AFI. A high amount of the measures is under consideration whilst only a reduced amount is already in place. Some of the mentioned measures seem to have the potential to contribute towards reaching the national targets and objectives. In many cases, the lack of concrete information (for example budget ceiling or quantification of future incentives) for the measures makes it difficult to evaluate the scope according to our methodology. Electro-mobility is promoted mostly with financial measures in the form of taxation exemptions while direct incentives for purchase of vehicles are lacking. For natural gas, the Greek NPF focuses in a first stage to extend and improve the existing natural gas distribution network. The NPF also contains several support measures to promote the deployment of alternative fuels infrastructure in public transport services and of private electro-mobility infrastructure.

Greece is interested to cooperate with the neighbouring countries in the context of the deployment of alternative fuels infrastructure on the TEN-T Core Network to ensure EU-wide circulation. The NPF states that Greece cooperates with Cyprus and Italy in the frame of the EU funded POSEIDON-MED II project that aims to have LNG adopted as a marine fuel in the Eastern Mediterranean. Greece also cooperates with Cyprus and Slovenia in the frame of the ELEMED project regarding the introduction of shore-side electricity supply to the East Mediterranean Corridor (Adriatic and Ionian seas).

5.8.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.8.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / All		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road / electricity, LNG		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).			No
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			No
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Water maritime / electricity, LNG		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, water maritime, air / electricity, CNG, LNG, LPG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, water maritime, air / electricity, CNG, LNG, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, water maritime, air / electricity, CNG, LNG, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points			No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)			No

The checklist shows the requirements of Annex I from the Directive that are covered in the EL NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, LNG, and LPG for road transport; LNG also for waterborne maritime transport; all the other combinations are either absent or not applicable.

The Greek NIR reports 83 measures in total (of which 70 are Legal measures). Under the Policy and Deployment & Manufacturing sections it was possible to identify three AF/transport mode clusters of measures, all assessable.

5.8.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.8.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	345	46	3,500	700*	8,000	4,000	15,000	10,000*
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Attainment [%]			9.86%	6.57%	4.31%	1.15%	2.30%	0.46%
CNG / road	NIR	1,406	13	2,570	22	5,050	35	11,550	55
	Change NIR vs NPF [%]			-80.96%	0.00%	-85.57%	0.00%	-83.50%	0.00%
	Attainment [%]			54.71%	59.09%	27.84%	37.14%	12.17%	23.64%
LNG / road	NIR	0	0	0	1	250	2	900	4
	Change NIR vs NPF [%]				0.00%	0.00%	0.00%	0.00%	0.00%
	Attainment [%]								
LNG / water (maritime)	NIR	0	NA	NA	2	NA	5	NA	5
	Change NIR vs NPF [%]				100.00%		150.00%		25.00%
	Attainment [%]								
Shore-side electricity supply / water (maritime)	NIR		NA		7		27		42
	Change NIR vs NPF [%]				0.00%		0.00%		0.00%
	Attainment [%]								
Electricity supply / air (stationary airplanes)	NIR		55		NA		97		97
	Change NIR vs NPF [%]								
	Attainment [%]						56.70%		56.70%
LPG / road	NIR	343	1,050	450	1,100	600	1,500	750	NA
	Change NIR vs NPF [%]				0.00%		0.00%		
	Attainment [%]			76.22%	95.45%	57.17%	70.00%	45.73%	

Legend:

(grey)	not applicable
(blank)	the value could not be computed
NA	no value/information provided/available in the NIR

* Values taken from the Greek NPF since the NIR only provided total recharging infrastructure targets and no breakdown for publicly accessible and private infrastructure.

5.8.3.1 Road transport

5.8.3.1.1 Electricity

Vehicles

Greece recorded 345 electric vehicles in use in 2018 (see Table 5.8.3-1), of which 322 were passenger cars (308 BEV and 14 PHEV), 21 LCVs (all BEV) and 2 BEV buses and coaches. The Greek NIR also reports 387 PTWs in 2018. For the next decade, the EL NIR provides estimates that seem to also include PWTs. These are 3,500 for 2020, 8,000 for 2025 and 15,000 for 2030 and are identical to the NPF. As for the heavy-duty sector, the EL NIR only estimates 40 BEV buses and coaches for 2025 and 90 for 2030.

The 2018 ***attainment*** of EV future estimates is 10% for 2020 and 2.3% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Greece is equal to 35%.

Infrastructure

Greece recorded 46 publicly accessible recharging points in 2018 (Table 5.8.3-1), of which 40 normal power (≤22kW) and 6 high power (>22kW) recharging points. For the next decade the EL NIR presents combined targets for the number of recharging points (public + private) for 2020 and 2030 (and they are identical to those in the NPF). Only for the year 2025, the EL NIR provides the breakdown between public and private recharging points (again identical to the NPF). The NPF however had provided targets for publicly accessible recharging points also for 2020 and 2030. On this basis, the NPF targets have been assumed still valid also for the NIR. Thus 700 publicly accessible recharging points for 2020, 4,000 for 2025 and 10,000 for 2030, are indicated in Table 5.8.3-1. No information is available on the future share of high power recharging points in the total number or public recharging points.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure target is 6.57% for 2020 and 0.46% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Greece is equal to 49%.

Ratio

Based on the EL NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. Because the Greek NIR has not clearly indicated the 2020 and 2030 targets for public recharging points, the sufficiency index is not reported in the table. When using the numbers from the NPF, the sufficiency index would be 5 for 2020 and 1.5 for 2030. This represents an adequate sufficiency index for the whole period.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	5.19	6.22	7.50		2.00	

Information on charging efficiency

Information is not available in the EL NIR.

5.8.3.1.2 CNG

Vehicles

Greece recorded 1,406 CNG vehicles in use in 2018 (Table 5.8.3-1**Error! Reference source not found.**), of which 920 were passenger cars, 130 LCVs, 109 HCVs and 247 buses and coaches. In addition, the EL NIR presents an estimate of 2,570 vehicles for 2020, of 5,050 vehicles for 2025, and of 11,550 vehicles for 2030 (made by 10,000 passenger cars, 250 HDVs and 1,200 buses and coaches). The estimated numbers in the NPF were however considerably higher (13,500, 35,000, and 70,000 in 2020, 2025, and 2030, respectively), indicating that the ambition has decreased from the NPF to NIR.

The 2018 ***attainment*** of future CNG vehicles estimates is around 55% for 2020 and around 12% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Greece is equal to 19%.

Infrastructure

The Greek NIR reports 11 CNG refuelling points in 2016 and 2017, 13 in 2018, and targets 22 refuelling points in 2020, 35 in 2025, and 55 in 2030 (Table 5.8.3-1). These numbers are identical to the NPF.

The 2018 ***attainment*** of future publicly accessible CNG refuelling infrastructure targets is close to 59% for 2020 and close to 24% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible CNG refuelling infrastructure evolution planned by Greece is equal to 12%.

Ratio

Based on the EL NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the whole period 2016-2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	85.18	99.64	108.15	116.82	144.29	210.00

5.8.3.1.3 LNG

Vehicles

Greece recorded no LNG vehicles in 2018. For next years, the EL NIR confirms the NPF estimate of zero, 250 and 900 LNG vehicles (all of them heavy commercial vehicles) for the years 2020, 2025 and 2030, respectively.

Since at the end of 2018 there are no LNG vehicles deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Greece reported no LNG refuelling points in use for road vehicles in 2018, and has set a target of one public LNG refuelling point in 2020, two in 2025, and four in 2030, as it can be seen in Table 5.8.3-1 (in line with the values reported in the NPF).

Since at the end of 2018 there are no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the EL NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LNG**				0.00	125.00	225.00

5.8.3.1.4 Hydrogen

Vehicles

Similarly to the NPF, the Greek NIR reports no hydrogen in 2018 and does not foresee any development in the future.

Infrastructure

The Greek NIR reports no hydrogen refuelling point in 2018 and, similarly to the NPF, does not foresee any development in the future.

5.8.3.1.5 Biofuels

Vehicles

The Greek NIR reports a long list of norms and regulations setting the specifications of biofuels (ethanol and biodiesel) and allowing the possibility to sell biofuels either mixed with conventional fuels, or neat. However there is no information on number of vehicles or on consumption of biofuels in Greece.

Infrastructure

The Greek NPF had stated that there is no infrastructure to provide biofuels or synthetic and paraffinic fuels. Biofuels are available in liquid or gaseous form and are sold on the Greek market mixed with diesel (biodiesel) or gasoline (ethanol) directly from existing refineries. No future targets are given in the Greek NIR.

5.8.3.1.6 LPG

Vehicles

Greece recorded 343 pure LPG vehicles in use in 2018 (see Table 5.8.3-1), of which 248 were passenger cars, 80 LCVs, 11 HCVs and 4 buses and coaches). In the NPF, the reported situation was very different, with 264,053 LPG vehicles (for the year 2016) because the bi-fuel (petrol-LPG) vehicles were included. Now the EL NIR presents the future estimates of pure LPG vehicles, which are 450, 600, and 750, for 2020, 2025, and 2030, respectively. Because the NPF had provided future estimates regarding bi-fuel vehicles, it is not possible to assess the change between the NIR and NPF.

The 2018 ***attainment*** of future LPG vehicles estimates is 76.22% for 2020 and 45.73% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Greece from 2016 until 2018 for LPG vehicles deployment is -14.33% of the overall planned deployment during the period 2016-2030, because a decrease has been reported between 2016 and 2018.

Infrastructure

The Greek NIR provides information on the number of publicly accessible LPG refuelling points for the period 2016-2018 (634 points in 2016, 811 in 2017, and 1,050 in 2018) and the future targets (1,100 in 2020, and 1,500 in 2025). The target for 2030 is missing in the NIR.

The 2018 ***attainment*** of future publicly accessible LPG refuelling infrastructure targets is 95.45% for 2020 and 70% for 2025. The ***progress*** could not be computed due the lack of the 2030 target.

Ratio

Based on the EL NIR, it is not possible to calculate the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road, because the LPG infrastructure is clearly dimensioned and used by the bi-fuel vehicles too.

5.8.3.2 Rail transport

5.8.3.2.1 Electricity

Vehicles

Greece recorded 30 (presumably new) electric locomotives in 2018, but no future estimates.

Infrastructure

Information is not available in the Greek NIR.

5.8.3.3 Waterborne transport (maritime)

5.8.3.3.1 Electricity

Vessels

Greece has no electric vessels and does not give future estimates.

Infrastructure

The EL NIR does not provide any information regarding shore-side electricity supply for seagoing ships in 2018. The NPF had reported that the port of Piraeus accepted a large number of cruise liners and other passenger and vehicle ferries, which remained berthed for several hours in some cases, burning conventional fuels, and emitting large quantities of polluting gases. A proposal on electricity supply at the port of Piraeus has been submitted as part of the 2014-2020 Competitiveness, Entrepreneurship and Innovation Operational Programme, in order to conduct a feasibility study into the investment.

The Greek NIR confirms the NPF plan to have 7, 27, and 42 shore-side electricity supply points for seagoing ships in 2020, 2025, and 2030, respectively.

5.8.3.3.2 LNG

Vessels

The Greek NIR does not provide information on the past nor on the estimated number of LNG vessels.

Infrastructure

The Greek NIR does not report any LNG infrastructure in 2018, but presents a revised and slightly more ambitious plan for the next decade compared to the NPF, consisting of two LNG refuelling points in maritime ports for 2020, and five in 2025 and 2030 (in the NPF they were one, two and four, respectively for 2020, 2025 and 2030).

Since at the end of 2018 there were no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

5.8.3.4 Waterborne transport (inland)

Not applicable since Greece has no inland ports in the TEN-T Core Network.

5.8.3.5 Air transport

5.8.3.5.1 Electricity

Airplanes

No information provided.

Infrastructure (for stationary airplanes)

The Greek NIR lists 55 recharging points at airports over the period 2016-2018. No target is reported for 2020, while from 2025 to 2030 there is a target of 97 recharging points for stationary airplanes. The NPF had stated that only the Athens central airport (Eleftherios Venizelos Airport) had fixed electricity-recharging supply points to meet the recharging needs of stationary airplanes. Stationary airplanes could recharge from 76 fixed recharging points and there were in addition 33 portable power generators owned by private ground handlers. The other central and regional airports in Greece had no fixed recharging points, just portable generators.

5.8.3.5.2 Biofuels

Airplanes

No information on flights / airplanes powered by biofuels is provided in the EL NIR.

Infrastructure

Information is not available in the Greek NIR.

5.8.4 ***Measures assessment***

The Greek NIR presents a very long list of measures (70 Legal, 9 Policy, 2 Deployment & Manufacturing support and 2 RTD&D). The Legal measures cover all transport modes and generally contain the minimum level of information necessary for their comprehension and for the qualitative assessment of their ambition compared to the NPF. One of the Policy measures is in reality a Legal measure too, while the Deployment & Manufacturing measures lack any information/data needed to perform a quantitative assessment.

5.8.4.1 Legal measures

The Greek NIR contains 70 legal measures, divided in 39 Legislative & Regulatory and 31 Administrative measures. Eleven out of the 39 Legislative & Regulatory measures are envisaged, which means that they are in process of adoption or under consideration. Considering all the legal measures together, they appear to be designed as the necessary tools to allow the realisation of the AFV/AFI plans as presented in the NPF and revised in the NIR. On the basis of the available information, it can be considered that the level of ambition of the legal measures has increased in the NIR, compared to the NPF, because there are many new measures listed in the NIR. Several new Ministerial Decisions, Laws, or Presidential Decrees have been adopted in 2019.

5.8.4.1.1 Legislative & Regulatory

The Greek NIR contains 39 Legislative and Regulatory measures (11 are “envisaged”). The following new ones are highlighted:

- Joint Ministerial Decision No 42863/438/2019: Laying down the terms, conditions and technical specifications for installing charging devices for electric vehicle batteries (recharging points) at vehicle service facilities, at publicly accessible recharging points throughout the urban, intra-urban and national road network, and at parking facilities in public and private buildings.
- Joint Ministerial Decision No 33180/351/2019: Laying down the terms and conditions for establishing and operating liquid fuel, liquid petroleum gas (LPG) and natural gas

filling stations (refuelling points) within port zones and tourist ports (marinas) for fuel to be sold exclusively to ships.

- Presidential Decree 64/2019: Implementation of a Regulation on safe bunkering of liquefied natural gas fuelled vessels.
- Ministerial Decision No 7135/81/2019 and Ministerial Decision No 44464/452/2019: Laying down the terms and conditions for the creation, development, operation and maintenance of a digital register of operating '*fuel and energy supply stations, liquid and gaseous fuel filling stations, indoor car parks with fuel pumps and all kinds of stations supplying fuels for public and private use*', and all other necessary details.
- Ministerial Decision No 29122/314/2019: Laying down the procedure, other conditions and all other technical details for sealing filling stations that supply LPG only, CNG only, and mixed stations that supply any combination of liquid fuels, LPG and CNG.
- Joint Ministerial Decision No 93067/1083/2018: Laying down the technical specifications, competent bodies and terms and conditions for establishing and operating filling stations with devices (refuelling points) for the supply of CNG to wheeled vehicles, such as (1) filling stations that supply CNG only; or (2) mixed filling stations that supply (a) liquid fuels, LPG and CNG; or (b) LPG and CNG; or (c) liquid fuels and CNG.
- Law 4067/2012 (start year 2018): New building regulation - Establishment licence for electric vehicle charging stations in public areas.

5.8.4.1.2 Administrative

The Greek NIR lists 31 Administrative Legal measures. Most of them are international EN ISO standards. The following new ones can be highlighted:

ELOT EN 62196-1 (2019): Plugs, socket-outlets, vehicle connectors and vehicle inlets — Conductive charging of electric vehicles — Part 1: General requirements.

ELOT EN 62196-3 (2019): Plugs, socket-outlets, vehicle connectors and vehicle inlets - Conductive charging of electric vehicles - Part 3: Dimensional compatibility and interchangeability requirements for AC/DC pin and contact-tube vehicle couplers.

5.8.4.2 Policy measures

The Greek NIR lists nine Policy Measures (of which one is a Legal measure and is not included in the quantitative assessment), which refer mainly to road transport and are all existing or adopted. In the NPF, there were 21 policy measures, but only 5 of them were existing, while all the others were under discussion.

5.8.4.2.1 Measures to ensure national targets and objectives

The policy measures described in the Greek NIR are all presented as measure that should ensure national targets and objectives are reached. Some of the measures are quite general and others are of financial nature.

Road

- Establishment and composition of an Interministerial Committee for implementation of the project '*Promoting electro-mobility in Greece*'.
- Exemption of electric cars from the luxury tax.

- Electric, hybrid, and hydrogen-fuelled passenger motor vehicles for private or public use, registered in Greece for the first time up to 31 October 2010, are exempt from the circulation tax.
- Hybrid cars are exempt from 50% of the registration tax, and electric vehicles are not subject to the registration tax.
- Measures to limit vehicle traffic in the centre of Athens: All hybrid cars are exempt from the restrictions on circulation.
- Measures to combat smog, and town planning arrangements: Electric or hybrid cars … are not subject to an excise duty, a supplementary single-payment tax and a registration tax.

Other transport modes

No specific measures listed in the EL NIR.

5.8.4.2.2 Measures that can promote AFI in public transport services

Information is not available in the Greek NIR, however one of the measures listed under the previous heading is related to the purchase of 90 electric and natural gas buses and coaches, which can be considered as an indirect measure to promote AFI in public transport services.

5.8.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Information is not available in the Greek NIR.

5.8.4.3 Deployment and manufacturing support

5.8.4.3.1 AFI deployment

The Greek NIR mentions one generic deployment measure but does not provide any information for a possible assessment.

5.8.4.3.2 Support of manufacturing plants for AF technologies

The Greek NIR mentions one generic manufacturing support measure but does not provide any information for a possible assessment.

5.8.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the EL NIR.

5.8.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.8.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, only three clusters of measures could be identified in the Greek NIR, on electricity, CNG and hydrogen, all for road transport. No measure was found regarding LNG (contrary to the NPF), nor for waterborne, rail, or air transport. All the clusters obtained a medium or a low score and only the one for the pair electricity/road resulted to be comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road has a medium impact, while those for the other two pairs have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased only for electricity/road, while it has decreased for CNG and LNG.

Table 5.8.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	M	N	**L**	-
LNG	Road				-
	Water - maritime				-
H2	Road	L	N	**L**	=

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.8.4.5 Research, Technological Development & Demonstration

The Greek NIR lists only two RTD&D projects. Both projects, "POSEIDON MED II" and "ELEMED", were already included in the NPF.

The POSEIDON MED II project is an EU co-funded project with a total budget of 33.4 million € for the period 2015-2020. It aims at the preparation of all final studies for the creation of a full chain of supply of LNG as fuel for shipping in the Southeast Mediterranean. The project is expected to make Greece an international hub for the bunkering and distribution of LNG in Southeast Europe.

ELEMED was an EU funded project with a budget of €860,000, for the period 2015-2018. It aims at the preparation of technical studies and plans regarding electricity supply and electrification of ships, analysis of the regulatory framework, a model-based financial analysis and the construction of facilities on a pilot basis to supply electricity to ships at the port of Kyllini, to implement environmentally-friendly maritime transport in the Adriatic and the Ionian Sea.

5.8.5 *Additional information on alternative fuels infrastructure developments*

The Greek NIR does not provide information on the changes in fuel use.

5.8.6 *Summary of the assessment*

Tabular overview

Table 5.8.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode				
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LPG / road
AF Vehicles / Vessels		Past situation (2016)	166	937	0	0	394
		Situation (2018)	345	1,406	0	0	343
		Estimate (2030)	15,000	11,550	900	NA	750
		Future share (2030) [%]	0.24%	0.18%	0.20%		0.01%
		Estimate attainment (2018 vs 2030) [%]	2.30%	12.17%			45.73%
		Progress (2018)	adequate	adequate			-14.33%
Publicly accessible AF Infrastructure		Past situation (2016)	32	11	0	0	634
		Situation (2018)	46	13	0	NA	1,050
		Target (2030)	10,000*	55	4	5	NA
		Target attainment (2018 vs 2030) [%]	0.46%	23.64%			
		Progress (2018)	slow	slow			
Sufficiency Index		2016	5.19	85.18			
		2018	7.50	108.15			
		2020	5.00*	116.82	0.00		
		2025	2.00	144.29	125.00		
		2030	1.50*	210.00	225.00		
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	+	+
	Policy measures + Deployment & manufacturing	Score	M	M			
		Comprehensiveness	C	N			
		Impact	M	L			
		Ambition (NIR vs NPF)	+	-	-	-	
	RTD&D	Ambition (NIR vs NPF)				+	

Legend:

	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Values based on the Greek NPF since the NIR only provided total recharging infrastructure targets and no breakdown for publicly accessible and private infrastructure.

The Greek NIR provides an incomplete coverage of the requirements of Annex I from the Directive. Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, LNG, and LPG for road transport; LNG also for waterborne maritime transport; all the other combinations are either absent or not applicable. The Greek NIR has not provided considerations on the need of renewable jet fuel refuelling points in airports and has not reported any particular needs during the initial phase of the deployment of AF infrastructure.
The EL NIR contains a long lists of Legal measures addressing all transport modes and alternative fuels, but when it comes to policy measures, these are only related to road transport and to electro-mobility in particular.

The main outcomes of the technical assessment of the Greek NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** - Greece recorded 345 electric and plug-in hybrid electric vehicles in use in 2018 (of which 322 were passenger cars, 21 LCVs and 2 buses/coaches). The EL NIR confirms the estimates made in the NPF, but does not distinguish EVs from PTWs and provide total numbers. For 2030 a total number of 15,000 EVs+PTWs is foreseen, with zero HCVs and 90 buses and coaches. The 2018 progress is adequate. As for recharging infrastructure, Greece recorded 46 publicly accessible recharging points in 2018. The number of public recharging points for 2020 and 2030 is missing in the NIR, but was given in the NPF (700 and 10,000, respectively). For the year 2025 instead, the EL NIR specifies that 4,000 public and 8,000 private recharging points (in total 12,000) are envisaged. In this case, the 2018 progress is slow, but the current and foreseen sufficiency index is adequate.

- **CNG** – Greece recorded 1,406 CNG vehicles in use in 2018, of which 920 were passenger cars, 130 LCVs, 109 HCVs and 247 buses and coaches. The NIR estimates for the years 2020, 2025, and 2030 are 2,570, 5,050, and 11,550 CNG vehicles (10,000 passenger cars, 250 HDVs and 1,200 buses and coaches), respectively. This represents a decrease of ambition of around 80% compared to the NPF. The 2018 progress for vehicles uptake is adequate. On the other hand, the EL NIR registers 13 public CNG refuelling points in 2018 and confirms the NPF plan for the next decade, i.e. 22 CNG public refuelling points for 2020, 35 in 2025, and 55 in 2030, respectively. The 2018 progress for infrastructure is slow, while the sufficiency index is adequate for the whole period.
- **LNG** – Greece did not record any road LNG vehicles or refuelling points in 2018. A development is foreseen, but only after 2020, since the NIR confirms the NPF estimate of 250 and 900 LNG vehicles (all of them HCVs) for the years 2025 and 2030, respectively. The LNG refuelling points targets for the years 2020, 2025, and 2030 are 1, 2, and 4, respectively.
- **Hydrogen** – The Greek NPF had declared that the use of hydrogen in the transport sector was not expected in the near future. The EL NIR follows on this line and does not report any vehicle estimate or infrastructure target until 2030. It is however worth mentioning that some measures of financial nature reported in the Greek NIR also cover hydrogen.
- **Biofuels** – The Greek NIR provides no relevant information on biofuels for transport.
- **LPG** – Greece recorded 343 pure LPG vehicles in use in 2018 (of which 248 were passenger cars, 80 LCVs, 11 HCVs and 4 buses and coaches). The future estimates of LPG vehicles for 2020, 2025, and 2030 are 450, 600, and 750, respectively. The NPF has provided much higher numbers that included bi-fuel LPG-gasoline vehicles. The number of publicly accessible LPG refuelling points in 2018 was 1,050, and the future targets are 1,100 in 2020, and 1,500 in 2025.

Rail transport

- **Electricity** – Greece recorded 30 electric locomotives in 2018, but the Greek NIR provides no future estimates.

Waterborne transport (maritime)

- **Electricity** – The EL NIR does not provide any information regarding shore-side electricity supply for seagoing ships in 2018. For the next decade, the Greek NIR confirms the NPF targets of 7, 27, and 42 shore-side electricity supply points for seagoing ships by 2020, 2025, and 2030, respectively. No battery-powered vessels are reported, nor any specific future development in this sector.

- **LNG** – In none of Greece's maritime ports was LNG supply available in 2018. The NIR estimates two LNG refuelling points in maritime ports for 2020, and five in 2025 and 2030, which is slightly more ambitious than the NPF. No information on LNG vessels could be found in the NIR.

Air transport

- **Electricity** - The Greek NIR lists 55 recharging points for stationary airplanes over the period 2016-2018. No target is reported for 2020, while from 2025 to 2030 there is a target of 97 recharging points for stationary airplanes.
- **Biofuels** – Information is not available in the Greek NIR on renewable jet fuel refuelling points in airports.

The Greek NIR contains a long list of mainly Legislative & Regulatory and Administrative **measures**. They address all transport modes and alternative fuels and provide a solid legal background to progress with the uptake of alternative fuels vehicles and infrastructure.

However, the level of implementation of these measures, which can be derived by the number and information provided in the list of Policy and Deployment & Manufacturing support measures, is still quite at an early stage. In fact, only three clusters of Policy measures could be identified in the Greek NIR, on electricity, CNG and hydrogen, all for road transport. No measure was found regarding LNG, nor for waterborne, rail or air transport. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road has a medium impact, while those for the other two pairs have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased only for electricity/road.

The Greek NIR lists only two RTD&D projects, one on the preparation of the necessary studies for the creation of a full chain of supply of LNG as fuel for shipping in the Southeast Mediterranean, the other to support electrification of waterborne maritime transport in the Adriatic and Ionian seas.

5.8.7 *Final remarks*

The Greek NIR provides a sufficiently comprehensive report on the efforts to implement the Directive, although it does not report on some important provisions of Annex I to the Directive. Overall, the level of ambition for the development of alternative fuel vehicles and vessels and the relevant infrastructures seems to be rather limited. The Greek NIR presents a very long list of legal measures, but only a limited number seems to address concretely the uptake of alternative fuel vehicles and infrastructure, with a focus on road transport, while it does not mention measures for waterborne, rail, or air transport.

With regard to electricity, the NIR expects some 15,000 electric vehicles on the roads by 2030, representing less than 0.3% of the vehicle fleet by that time. Furthermore, deployment of only 10,000 recharging points is foreseen by 2030. Taking into account the current situation and expected trends, this level of ambition appears quite low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. No information on charging efficiency is provided. The NIR estimates that there will be 27 shore-side electricity supply facilities in 2025 and 42 in 2030, aiming to cover the needs of the five ports in the TEN-T Core Network. There were 55 electricity supply points for stationary aircraft in 2018. The NIR expects an increase to 97 points by 2025, which will remain constant in number for 2030. The electricity supply points for stationary aircraft are and will mainly be located at the Eleftherios Venizelos Airport. Portable power generators will be installed in other airports. There was a small number of electric locomotives in 2018. Further information on the electrification of the rail network should be provided in future reporting.

The NIR does not include any information on future development of hydrogen as a transport fuel in Greece. Although hydrogen is not binding under the Alternative Fuels Infrastructure Directive, it would be relevant that Greece provides information on how to ensure EU-wide connectivity for HCEV.

The NIR also shows a limited level of ambition with the use of natural gas in road transport. There were 13 CNG refuelling points in 2018 for a small fleet of 1,406 CNG vehicles. It is estimated that in 2030 the number of CNG refuelling points will be 55 and the number of vehicles will be 11,550, representing 0.18% of the future vehicle fleet. Two LNG refuelling points are planned in Greece for 2025 and four for 2030. This seems insufficient taking into account the extensiveness of the TEN-T Road Core Network. A limited number of LNG heavy-duty vehicles is also foreseen (250 and 900 LNG heavy-duty vehicles by 2025 and 2030 respectively). All five ports of the Greek TEN-T Core Network are expected to have LNG refuelling points by 2025, as required by the Directive.

Regarding LPG, the NPF had reported a figure of 264,053 LPG vehicles by 2016. This figure included bi-fuel (petrol-LPG) vehicles. The NIR, on the other hand, only reports pure LPG vehicles e.g. 343 in 2018, 600 by 2025 and 750 by 2030) which does not allow a comparison between the NIR and the NPF. The number of LPG filling stations will increase from 1,050 in 2018 to 1,500 in 2025. Bi-fuel LPG vehicles are the main alternative fuel vehicle fleet in Greece.

Greece should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.8.8 *ANNEX - Description of the Member State*

On a surface area of 132,000 km², Greece has a population of 10.741 million people in 2018, which makes up for a population density of 81 inhabitants/km².

Number of main urban agglomerations

- 9 urban agglomerations > 50,000 inhabitants

In 2018, Greece achieves a per capita gross domestic product at market prices of €17,210, which represents a per capita gross domestic product in purchasing power standards of 68 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Greece is 1,815 km. The total road network length is 40,163 km, of which 1,843 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Greece: 25% (1,346 km) of the Orient – East Mediterranean Corridor.

Through the TEN-T Road Corridors, Greece is connected with the following Member States:
- Bulgaria (through the Orient – East Mediterranean Corridor)

Number of registered road vehicles

At the end of 2017[30], Greece accounts for 8,236,900 registered road vehicles of which 5,236,000 are categorized as passenger cars, 1,344,100 as goods vehicles[31] and 26,300 as buses and coaches. The motorisation rate is 492 passenger cars per 1,000 inhabitants.

The present situation of few AFV/electric vehicles (1749/345) on Greek roads, with for example less than 0.022% of AFV/0.0042% electric vehicle/passenger cars, *is regarded by Greece as insufficient and in need of improvement.* In the NPF was written that there are 3.5% AFV on Greek roads, with less than 0.01% of electric passenger cars. The higher amount of AFV in the NPF is due to the LPG bi-fuel vehicles that were counted in the NPF.

Number of ports in the TEN-T Core Network

- 5 maritime ports in the TEN-T Core Network (Athina-Piraeus, Heraklion, Igoumenitsa, Patras, Thessaloniki)
- 20 maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 3 airports in the TEN-T Core Network (Athina, Heraklion, Thessaloniki)
- 35 airports in the TEN-T Comprehensive Network

[30] No data available for 2018.
[31] No data available for light and heavy goods vehicle categories.

5.9 Spain (ES)

5.9.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Spanish NPF the Commission concluded:

The Spanish NPF focusses on LPG and natural gas, for which substantial infrastructure is already in place. The Spanish NPF contains modest targets and measures for increasing shore side electricity in its ports. Coverage of electricity supply for stationary airplanes at the major airports is already good and no increase is foreseen.

The Spanish NPF strongly emphasizes LNG. LNG refuelling is available for all maritime ports in the TEN-T core network and in several ports of the comprehensive network, and additional bunkering terminals and ship-to-ship refuelling are planned. There are already 15 publicly accessible LNG refuelling points for heavy duty vehicles present in the Spanish territory and it is foreseen to add 20 more by 2020. Altogether, the planned LNG refuelling points could guarantee that the maximum distance requirement for LNG refuelling points along the TEN-T core road network would be fulfilled on the Spanish territory.

Spain has considered hydrogen in its NPF. The deployment of 20 publicly accessible hydrogen refuelling points and 500 hydrogen fuel cell vehicles by 2020 is foreseen.

The Spanish NPF contains an extensive list of measures, most already in place. Most of them can be considered having a low to medium impact on market actor's decisions. Regulatory measures have been put in place to facilitate infrastructure deployment. Longer durations for the validity of financial support measures could provide certainty for market actors and hence increase the likelihood that the national targets and objectives of the NPF can be reached.

The consideration of the interests of regional and local authorities, as well as stakeholders during the drafting of the Spanish NPF can be viewed as exemplary. Further co-operation will continue in the follow up phase of the NPF.

Spain is actively involved in coordinating its plans on alternative fuels infrastructure with other member states as well as collaborating with them in this field, in particular for the deployment of alternative fuel infrastructure for electricity, natural gas and LPG. Spain and France collaborate for the establishment of a hydrogen refuelling station corridor connecting the two countries.

5.9.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.9.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / All		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, water-maritime, air / all		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	All / All		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	All / All		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	All	All	Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, water-maritime / electricity, CNG, LNG, hydrogen, LPG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, water-maritime / electricity, CNG, LNG, hydrogen, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, water-maritime, air / electricity, CNG, LNG, hydrogen, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	Yes
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / All		Yes

The checklist shows that almost all the requirements of Annex I from the Directive are covered.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, hydrogen and LPG for road transport; LNG for road and maritime transport; all the other combinations are either absent or not applicable.

The Spanish NIR reports almost 100 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify eight AF/transport mode clusters of measures, of which seven were assessable.

5.9.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.9.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	32,508	5,187	150,000	10,000	800,000	17,000	5,000,000	NA
	Change NIR vs NPF [%]			59.57%				92.31%	
	Attainment [%]			21.67%	51.87%	4.06%	30.51%	0.65%	
CNG / road	NIR	12,393	60	23,000	150	100,000	200	200,000	NA
	Change NIR vs NPF [%]			33.72%	97.37%				
	Attainment [%]			53.88%	40.00%	12.39%	30.00%	6.20%	
LNG / road	NIR	960	34	2,000	85	7,000	110	25,000	NA
	Change NIR vs NPF [%]			150.00%	93.18%		150.00%		
	Attainment [%]			48.00%	40.00%	13.71%	30.91%	3.84%	
LNG / water (maritime)	NIR	1	43	9	43	10	43	12	43
	Change NIR vs NPF [%]			200.00%	230.77%		2.38%		
	Attainment [%]			11.11%	100.00%	10.00%	100.00%	8.33%	100.00%
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Shore-side electricity supply / water (maritime)	NIR		2		45		NA		NA
	Change NIR vs NPF [%]				800.00%				
	Attainment [%]				4.44%				
Electricity supply / air (stationary airplanes)	NIR		434		NA		NA		470
	Change NIR vs NPF [%]								
	Attainment [%]								92.34%
H2 / road	NIR	28	4	50	6	200	15	1,000	NA
	Change NIR vs NPF [%]			-90.00%	-70.00%				
	Attainment [%]			56.00%	66.67%	14.00%	26.67%	2.80%	
LPG / road	NIR	41,085	589	100,000	650	200,000	750	500,000	NA
	Change NIR vs NPF [%]			-50.00%	-18.75%				
	Attainment [%]			41.09%	90.62%	20.54%	78.53%	8.22%	

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.9.3.1 Road transport

5.9.3.1.1 Electricity

Vehicles

As shown in Table 5.9.3-1, Spain recorded a total of 32,508 EVs in 2018. The majority of them are passenger cars (15,855 BEV and 12,707 PHEV), followed by 3,788 electric light commercial vehicles and 158 electric buses and coaches. In addition, the number of electric powered two wheelers in 2018 was 22,111. The Spanish NIR's estimates for electric vehicles are 150,000 in 2020, 800,000 in 2025 and 5,000,000 in 2030. These estimates are provided without details on vehicle classes and represent a higher policy ambition compared with the NPF with changes of +59.57% for 2020 and +92.31% for 2030 (no estimate was provided in the NPF for 2025).

The 2018 ***attainment*** of future EV estimates is 21.67% for 2020 and 0.65% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Spain is equal to 53%.

Infrastructure

Spain recorded 5,187 publicly accessible recharging points in 2018 (Table 5.9.3-1), of which 4,665 were normal power (≤22kW) recharging points and 522 high power (>22kW) recharging points. While Spain had not provided targets for publicly accessible recharging points for 2020, 2025 and 2030 in its NPF, this has been modified in the NIR: 10,000 publicly accessible recharging points are now foreseen for 2020 and 17,000 for 2025. The NIR does not provide estimates for private recharging points.

The ES NIR indicates that full information on the number of recharging points is unavailable and that the Spanish Government is participating in the European project (PSA-IDACS) promoted by the European Commission to gather all the relevant data.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 51.87% for 2020 and 30.51% for 2025. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible recharging infrastructure evolution planned by Spain is equal to 16%.

Ratio

Based on the ES NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. As it can be seen, in 2020 the foreseen sufficiency index is higher than 10, which, considering the low share of high power recharging points in 2018 (10%), has to be regarded as probably inadequate. The sufficiency index further deteriorates in 2025 when it becomes 47.06.

Sufficiency Index	2016	2017	2018	2020	2025	2030
Electricity	2.35	4.02	6.27	15.00	47.06	

Information on charging efficiency

The Spanish NIR contains two tables providing information about the charging efficiency of high power (>22kW) recharging points. Namely, the averaged data by high power recharging point per day (on average, a recharging point provides 1.85 recharges, is used 2.3 hours and supplies 33.985 kWh per day) and the daily data regarding the average number of recharges and duration. The total energy supplied is also provided. Every day, around 198 recharging operations take place at high power recharging points, representing a total average energy of 1,904.610 kWh for a total average duration of 129.51 hours.

5.9.3.1.2 CNG

Vehicles

The total number of CNG vehicles recorded by Spain in 2018 was 12,393 of which 6,452 (52%) were passenger cars, 1,438 (12%) LCVs, 2,108 (17%) HCVs and 2,395 (19%) buses and coaches (Table 5.9.3-1). The Spanish NIR estimates 23,000 CNG vehicles for 2020, 100,000 for 2025 and 200,000 for 2030. These estimates are provided without details on vehicle classes. The Spanish NPF had only provided estimates for the number of CNG vehicles in 2020; the NIR revised estimate is 33.72% higher than that of the NPF, reflecting a greater policy ambition.

The 2018 ***attainment*** of future CNG vehicles estimates is 53.88% for 2020 and 6.20% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Spain is equal to 31%.

Infrastructure

Spain recorded 60 CNG publicly accessible refuelling points in 2018, see Table 5.9.3-1. The NPF had only provided a target for CNG refuelling infrastructure in 2020. The ES NIR presents a revised target for 2020 (150 points), which is 97.37% higher than in the NPF and a new target of 200 CNG refuelling points in 2025. This shows an increase of ambition for CNG.

The 2018 ***attainment*** of future publicly accessible CNG refuelling infrastructure targets is 40.00% for 2020 and 30.00% for 2025. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible CNG refuelling infrastructure evolution planned by Spain is equal to 21%.

Ratio

Based on the ES NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the implementation period until 2025.

Sufficiency Index	2016	2017	2018	2020	2025	2030
CNG	140.74	143.20	206.55	153.33	500.00	

5.9.3.1.3 LNG

Vehicles

Spain recorded 960 LNG vehicles in use in 2018, composed entirely by heavy commercial vehicles (Table 5.9.3-1). Such LNG fleet has increased remarkably since 2012 when there were just 12 vehicles. The Spanish NPF had estimated to have 800 LNG vehicles registered in 2020 and according to the NIR that value had been surpassed already in 2018. The NIR revised estimate for the number of LNG vehicles in 2020 is 2,000 that is 150% higher than in the NPF. In addition, new estimates for LNG vehicles in 2025 and 2030 are 7,000 and 25,000 respectively, presumably all heavy-duty vehicles.

The 2018 ***attainment*** of future LNG vehicles estimates is 48.00% for 2020 and 3.84% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain from 2016 until 2018 for LNG vehicles deployment is 2.60% of the overall planned deployment during the period 2016-2030.

Infrastructure

Table 5.9.3-1 shows that in 2018 there were already 34 publicly accessible LNG refuelling points in Spain. The ES NIR declares that there were 24 combined CNG/LNG stations under construction in 2019. The Spanish NPF had only provided targets for 2020 and 2025. The NIR now presents revised targets for LNG refuelling points: 85 in 2020 and 110 in 2025, which are respectively 93.18% and 150% higher than in the NPF.

The 2018 ***attainment*** of future publicly accessible LNG refuelling infrastructure targets is 40% for 2020 and 30.91% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain for publicly accessible LNG refuelling infrastructure deployment from 2016 until 2018 versus the period 2016-2030 could not be computed because of the lack of the 2030 target.

Ratio

Based on the ES NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index	2016	2017	2018	2020	2025	2030
LNG	21.20	17.24	28.24	23.53	63.64	

5.9.3.1.4 Hydrogen

Vehicles

The ES NIR indicates that there are 28 hydrogen-powered vehicles (20 passenger cars and 8 buses) in Spain in 2018. There were also 4 PTW & other vehicles. According to the NIR, the fleet of hydrogen-powered cars is limited to demonstration projects and 38 of these vehicles were authorised to circulate on public roads in 2019. It is expected to reach 50 hydrogen-powered vehicles by 2020, 200 by 2025 and 1,000 by 2030. The 2020 estimate is 90% lower than the 500 vehicles foreseen in the NPF.

The 2018 ***attainment*** of future hydrogen vehicles estimates is 56% for 2020 and 2.8% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain from 2016 until 2018 for hydrogen vehicles deployment is 1.62% of the overall planned deployment during the period 2016-2030.

Infrastructure

Table 5.9.3-1 shows that in 2018 there were four hydrogen publicly accessible refuelling points in Spain. The ES NPF had only provided a target for 2020 of 20 hydrogen refuelling points. The NIR provides a revised value of six refuelling points in 2020 (70% lower) and a new target of 15 in 2025.

The 2018 ***attainment*** of future publicly accessible hydrogen refuelling infrastructure targets is 66.67% for 2020 and 26.67% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain for publicly accessible hydrogen refuelling infrastructure deployment from 2016 until 2018 versus the period 2016-2030 could not be computed due to the lack of the 2030 target.

Ratio

Based on the ES NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road until 2025.

Sufficiency Index	**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Hydrogen	2.00	3.00	7.00	8.33	13.33	

5.9.3.1.5 Biofuels

Vehicles

The Spanish NIR indicates that, currently, there are no official figures for the number of vehicles compatible with blends of higher concentrations than E5 or B7, or registrations of such vehicles. Furthermore, all diesel vehicles can use high proportions of HVO (Hydrotreated Vegetable Oil).

Infrastructure

All pumps at Spanish service stations offering diesel can supply blends with up to 7% biodiesel by volume (B7). Moreover, normal petrol pumps can contain up to 5% bioethanol by volume (E5). Thus, whenever a vehicle is filled with B7 diesel and petrol, biodiesel and bioethanol are being consumed, respectively. Since 2011, the diesel sold in Spain contains a considerable volume of HVO.

In 2018, there were 63 Spanish service stations selling blends with higher bioethanol (8 stations) and biodiesel (55 stations) content, although the introduction of these blends in Spain has not stopped decreasing since 2016 and they could be found in only 0.5% of all service stations.

5.9.3.1.6 LPG

Vehicles

Spain had a fleet of 41,085 LPG vehicles in use in 2018 (of which 37,402 were passenger cars, 3,455 LCVs, 132 HCVs and 96 buses and coaches) (see Table 5.9.3-1). There were also 425 PTW. Most of these vehicles are bi-fuel (petrol-LPG) and the proportion of heavy-duty vehicles is nominal since they are not yet sold with LPG-dedicated engines, although Spanish companies are doing dual fuel (diesel-LPG) conversions on trucks over 3,500 kg with good results. The Spanish NIR recognises that the evolution of LPG since 2016 – when the NPF was approved – has not gone as quickly as expected and presents revised future numbers for LPG vehicles. The NIR revised estimate for the number of LPG vehicles in 2020 is 100,000, which is 50% lower than in the less optimistic NPF scenario. In addition, the ES NIR presents new estimates for LPG vehicles in 2025 and 2030 of 200,000 and 500,000 respectively (without providing details on vehicle classes), which were absent in the NPF.

The 2018 ***attainment*** of future LPG vehicles estimates is 41.09% for 2020 and 8.22% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain from 2016 until 2018 for LPG vehicles deployment is 5.41% of the overall planned deployment during the period 2016-2030.

Infrastructure

Table 5.9.3-1 shows that in 2018 there were 589 LPG publicly accessible refuelling points in Spain. The NIR indicates that the number of stations accessible to the public has grown by 26% since the approval of the NPF. Although the LPG refuelling station operators maintain their interest in increasing the extensive reach of the national network, investments in infrastructure are not being made at the pace initially envisaged since Spain considers the current infrastructure sufficient to supply a fleet of over 200,000 vehicles. The Spanish NPF had only provided a target of 800 for the number of LPG refuelling points in 2020. The NIR now presents a revised target for LPG refuelling points of 650 in 2020, which is 18.75% smaller than in the NPF, and a new target of 750 refuelling points in 2025.

The 2018 ***attainment*** of future publicly accessible LPG refuelling infrastructure targets is 90.62% for 2020 and 78.53% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain for publicly accessible LPG refuelling infrastructure deployment from 2016 until 2018 versus the period 2016-2030 could not be computed because the 2030 target is absent.

Ratio

Based on the ES NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index	2016	2017	2018	2020	2025	2030
LPG	31.67	36.27	69.75	153.85	266.67	

5.9.3.2 Rail transport

5.9.3.2.1 Electricity

Vehicles

The NIR mentions that for the transition period until the rail network is fully electrified, or for lines that will not be electrified, RENFE (Spanish national railways network) is planning the conversion of part of the diesel fleet to LNG, hydrogen or batteries, as the sole means of traction or in combination with electric traction.

Infrastructure

According to the Spanish NIR, almost 40% (over 6,000 km) of the rail network in the TEN-T Core is not electrified. The NIR further indicates that there are existing plans to electrify over 1,000 km of these lines. In addition, part of the diesel rail traffic will be diverted to the high speed network which is being extended through the Spanish territory.

5.9.3.3 Waterborne transport (maritime)

5.9.3.3.1 Electricity

Vessels

The Spanish NIR does not provide any details in this matter.

Infrastructure

Table 5.9.3-1 shows that in 2018 Spain had two shore-side electricity supply points for ships and ferries, in Melilla and Motril respectively. Additional six shore-side electricity supply points were planned to be in operation by the end of 2019. According to the ES NIR, it is expected to have 45 electricity supply points for ships and ferries in 2020. This shows an increase in ambition compared with the NPF where the target for 2020 was of five electricity supply points.

Since only a target corresponding to 2020 was provided, the 2018 ***attainment*** of shore-side electricity supply points in maritime ports could be calculated only based on that target and is equal to 4.44%. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain for the deployment of shore-side electricity supply points in maritime ports from 2016 until 2018 versus the period 2016-2030 could not be computed because of the lack of the 2030 target.

5.9.3.3.2 LNG

The Spanish NIR declares that, since the approval in December 2016 of the NPF, the development of the market of LNG as a marine fuel in Spain has progressed well.

Vessels

In 2018, Spain had one vessel (that covers the Valencia-Palma de Mallorca line) using LNG in its auxiliary engine. In 2019, two ferries, propelled with two dual petrol-LNG engines, started operation in the lines Barcelona-Palma de Mallorca and Huelva-Canarias. The Spanish NPF had only provided an estimate for the number LNG seagoing vessels in 2020, whereas the NIR presents a revised estimate for 2020 (9 vessels), which is 200% higher than in the NPF, and new estimated numbers of 10 and 12 LNG vessels in 2025 and 2030 respectively (Table 5.9.3-1).

The 2018 ***attainment*** of future LNG seagoing ships and ferries estimates is 11.11% for 2020 and 8.33% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Spain obtained from 2016 until 2018 for LNG seagoing ships and ferries deployment in maritime ports is 8.33% of the overall planned deployment during the period 2016-2030.

Infrastructure

The ES NIR indicates that all 43 Spanish ports of general interest are currently in a position to supply LNG by means of tanks, subject to market conditions. That supply is complemented by the adaptation of two terminals for the supply of LNG, which are already operational in the ports of Barcelona and Bilbao, and a supply vessel that is operational in the port of Huelva. In addition, another supply vessel currently operates with a base in the port of Barcelona, although with availability subjected to market condition and license.

The NPF targets for LNG supply points to ships and ferries have been **already 100% attained** (see Table 5.9.3-1). According to the assessment methodology described in Section 2.1, the ***progress*** Spain obtained from 2016 until 2018 for LNG refuelling infrastructure deployment in maritime ports is also 100.00% of the overall planned deployment during the period 2016-2030.

5.9.3.4 Waterborne transport (inland)

The Spanish NIR does not contain any information about use of alternative fuels in inland waterborne transport.

5.9.3.5 Air transport

5.9.3.5.1 *Electricity*

Airplanes

The Spanish NIR does not provide any details regarding deployment of hybrid-electric or fully-electric airplanes.

Infrastructure (for stationary airplanes)

According to the ES NIR, in the baseline situation, corresponding to 2015, there were 400 power supply points for stationary aircraft in the airports of general interest in Spain. From 2016 until 2018, 65 units were replaced and 34 new units installed, so there are currently 434 power supply points. It is expected that by 2030 there will be 36 new points and significant investment in replacing equipment. Table 5.9.3-1 shows that the target for 2030 is of 470 electricity supply points for stationary airplanes.

The 2018 ***attainment*** is 92.34% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Spain from 2016 until 2018 in the deployment of electricity supply for stationary airplanes is 43.75% of the overall planned deployment during the period 2016-2030.

5.9.4 ***Measures assessment***

As in the NPF, the Spanish NIR contains an extensive list of measures that covers various fuels and modes, but mainly targeting electricity, CNG, LNG for road transport and LNG for maritime and, to a lesser extent, hydrogen. The NIR also showcases measures at Autonomous Communities level as well as local measures in the major cities Barcelona, Madrid, Malaga, Seville, Valencia, Valladolid and Saragossa.

5.9.4.1 Legal measures

The Spanish NIR contains 34 legal measures which represent an increase compared to the 25 legal measures identified in the NPF. Legal measures are implemented at national level and nine of them are cross-cutting applicable to all alternative fuels and related to both vehicles and infrastructure. Some of these measures relate to the fulfilment of the Paris Agreement targets (the *Climate Change and Energy Transition Bill* and the draft *2021-2030 Integrated National Energy and Climate Plan*) and to the implementation of the European Directives, such as the Energy Performance of Buildings Directive 2018/844/EU, the Air Pollution Directive 2016/2284/EU and the Alternative Fuels Infrastructure Directive 2014/94/EU. At Autonomous Communities level Andalusia, Catalonia, Valencia, Extremadura, Balearic Islands, Navarre, Basque Country and Murcia have developed legal frameworks, strategies and plans to foster the deployment of AFV/AFI.

Some of the legal measures in the ES NIR can be considered updates of the measures provided in the NPF (e.g. related to Green Public procurement). The majority of the legal measures described in the NIR are already in place (around 14% were under consideration).

Considering all the legal measures together, they appear to be designed as the necessary tools to allow the realisation of the AFV/AFI plans as presented in the NPF and revised in the NIR. Based on the available information, the level of ambition of the legal measures can be considered to have increased in the NIR, compared to the NPF, for electricity and hydrogen for road and LNG for maritime transport.

5.9.4.1.1 Legislative & Regulatory

Of all the legal measures described in the Spanish NIR, 23 can be categorised as legislative and regulatory measures. Fourteen measures are applicable to road transport while nine are dedicated to maritime transport. The following can be highlighted:

- The new *Spanish Industrial Policy 2030* and its sectoral agendas for automotive, shipping and capital goods setting out specific measures to promote alternative fuels in transport
- The *Strategic Plan of Integrated Support to the Automotive Sector, 2019-2025*, for the transition towards a new sustainable mobility model, led by a Sustainable Mobility Committee to coordinate policy, support measures and RTD&D actions for the penetration of zero and low-emission vehicles
- The increase of the availability of public recharging points by deregulating electric charging and creating an information register to monitor its activity. The figure of

- charge manager established in the Electricity Sector Act 24/2013, which was seen too rigid, was cancelled by Royal Decree-Law 15/2018
- The Royal Decree 235/2018 laying down the calculation methods and reporting requirements with regard to the intensity of greenhouse gas emissions of fuels and energy in transport
- The Decree 335/2018 amending several royal decrees regulating the natural gas sector and creating a new structure that allows LNG loading operations related to bunkering LNG as a marine fuel in the current phase of the market's development.

5.9.4.1.2 Administrative

Of all the legal measures described in the Spanish NIR, 11 can be categorised as administrative measures. Six measures are applicable to road transport and five are specific for maritime transport. The following can be highlighted:

- The adoption of technical standards related to natural gas refuelling stations for CNG/LNG vehicles, automotive CNG/LNG fuel specifications and certification of LNG tanker drivers who offload to LNG bunkering stations.
- The creation of the Spanish Hydrogen Working Group and the reactivation of the Technical Committee on Standardisation for hydrogen technologies, CTN-181, to contribute to CEN/CENELEC work and meet the requirements of the Directive 2014/94/EU.
- The activities on recommendation for port authorities regarding requirements for LNG bunkering at ports, part of the CEF funded project *CORE LNGas HIVE*.

5.9.4.2 Policy measures

The Spanish NIR contains 22 policy measures applicable at national level, representing an increase compared to the 11 policy measures identified in the NPF. Eight of the policy measures described in the NIR refer to road transport and 14 refer to maritime transport. In addition, the NIR summarises the most relevant policy measures at regional and local level, namely 33 measures valid in autonomies and regions and 6 measures in force locally. The majority of the policy measures can be considered updates of the measures provided in the NPF, in particular annual renewal of financial support measures. Although most of the policy measures described in the NIR are existing, about 13% of the policy measures can be considered to be past measures (i.e. expired by 2019).

5.9.4.2.1 Measures to ensure national targets and objectives

All the 22 policy measures described in the NIR and applicable at national level can be considered as measures to ensure national targets and objectives. Around 73% of these measures are of a financial nature.

Road transport

Over the last years, the Spanish government has approved various programmes to subsidise the purchase of alternative fuels vehicles (electric, CNG, LNG, LPG and hydrogen) and their infrastructure. These programmes and their budget are approved every year by means of a Royal Decree. The NIR mentions:

- *MOVEA 2016* with a budget of 16.6 million € financed a total of 2,132 vehicles and 42 recharging points; *MOVEA 2017* had a budget of 14.26 million € and financed a total of 2,370 vehicles and 26 recharging points.
- *MOVALT 2018* with two programmes: *MOVALT vehicles,* with a budget of 20 million €, made it possible to finance 2,977 AFV and *MOVALT infrastructure* that has a budget of 20 million € and whose call for applications is pending (it is estimated to finance around 310 recharging points).
- *MOVES 2019* was approved in February 2019 with a budget of 45 million € and will be managed by the Spanish autonomous communities.
- *MOVES One-off projects 2019*, approved in July 2019, provides continuity to the *MOVES Programme* with a budget of 15 million € for funding projects on urban mobility and innovation regarding electro-mobility and hydrogen.

It is also worth mentioning:

- The *2016-2019 CLIMA programme* has financed 28 projects in the area of transport, thanks to the financial contribution of over 1.2 million €. The majority are projects to replace vehicle fleets powered by conventional fossil fuels with electric vehicles and, to a lesser extent, projects to promote the use of biomethane by vehicles and connecting vessels to the national port's network.
- The continuation of the *PIMA waste* and *PEMAR* for efficient use of biogas and production of biofuels from used oils.

In terms of measures at Autonomous Communities level, it can be highlighted:

- Andalusia 2017-2020 line of grants (80% ERDF funded) for all types of AFV and AFI;
- Asturias grants in 2017 for the installation of recharging points for EVs and refuelling points for CNG and LPG; and in 2018 for the purchase of AFV and the installation of recharging points and refuelling points for CNG;
- Aid for the installation of recharging points in different parts of the Canary Islands and line of grants to promote the deployment of ten rapid recharging points for electric vehicles in Tenerife;
- Cantabria grants in 2017, 2018 and 2019 for the installation of rapid and fast recharging points;
- Castile-La Mancha aids in 2018 and 2019 for the purchase of LPG, CNG, LNG or hydrogen vehicles;
- Castile-Leon grant for the purchase of new EVs (BEV, PHEV or hybrid) or where the propulsion system is based on internal combustion engines that can use alternative fossil fuels;
- Catalonia grants for the purchase of vehicles to use as taxis;
- Madrid 2017 and 2018 aid to self-employed and SMEs to modernise the fleet of LCV with highly energy-efficient models that consume less fuel and emit less CO_2 and NO_x and incentives to modernise the taxi fleet, 2018 grants for the deployment of recharging points (conventional, fast, rapid and ultra-fast charging), 2018 aids for the purchase of M1 vehicles

powered by LPG, LNG, CNG or bi-fuel (petrol and gas), BEVs, REEVs, PHEVs and hydrogen vehicles, and exclusively electric motorcycles (L-category);

- Community of Valencia 2017, 2018 and 2019 aid for public or private companies and bodies for the installation of recharging points and aid for the purchase of EVs or AFVs;
- Balearic Islands aid in 2018 to promote the installation of recharging points (normal, semi-fast and fast) and to promote low-emission BEV, PHEV, CNG and LPG vehicles for rental and taxis;
- The Rioja grants in 2018 for municipalities with fewer than 25,000 inhabitants for the installation of fast recharging points for public use;
- Navarra 2017 aid to local authorities with fewer than 20,000 inhabitants for the purchase of BEV and the installation of recharging points;
- Basque Country aid in 2018 for the purchase of electric mopeds, EV or hybrid HDV and for AFI for electricity and CNG and for the conversion of LCV to CNG/LPG and HDV to CNG, aid for AFI installations in shared garages. Aid programme in 2019 for investments in efficient and alternative vehicles and for the promotion of electric recharging points for public use.

Regarding tax incentives, rebates of car registration and road taxes as well as personal income tax reduction applicable to benefits in-kind for business AFV for private use have been in force since 2016. In addition, at Autonomous Communities level, the Canary Islands have eliminated the general indirect tax for the purchase of hybrid and electric vehicles as well as for public transport vehicles powered by CNG and LPG. Castile-Leon has proposed a deduction of the regional income tax for the purchase of electric vehicles; the Rioja provides the possibility of a deduction in the annual tax declaration equal to 15% of the purchase value of new electric vehicles and Navarra provides tax deductions for investments in the installation of recharging points and in BEV and PHEV. At local level, Saragossa exempts electric vehicles from parking fees in certain zones of the city and provides discounts to the motor vehicle tax for low and zero emission vehicles.

Waterborne transport

The Spanish NIR contains 14 measures that can be considered as policy measures for waterborne maritime transport. Compared to the four measures identified in the NPF, this shows an increase in ambition. It is particularly noticed:

- The elimination of the tax on provision of shore-side electricity from January 2020 and the 50% reduction in the berthing fee charged to vessels docked in port when connected to the electricity grid.
- The existing 50% discount on the total tax due for access and berthing in Zone I and/or Zone II for vessels powered by LNG or vessels that use LNG in their auxiliary engines, supplemented with 10 to 40% reductions on the port duty for vessels depending on the Port Authority. Likewise, additional 10 to 40% reduction, depending on the Port Authority, of the port duty applicable to LNG cargos for bunkering and up to 30% rebate on the occupation rate applicable to terminals for LNG bunkering.
- The provision of 40 million € in 2018, as Spanish Government-backed financing for building and for converting existing vessels to low-emission. This instrument has been in

force since the 1990s and its annual budgetary contribution is set out in the Budget Act for each year. Initially geared to the building of new low-emission vessels, it currently allows guarantees for the conversion of vessels too.

- The activities within the "*CORE LNGas Hive — Core Network Corridors and Liquefied Natural Gas Project*", funded by the European Commission through the CEF (2014-EU-TM-0732-S) aimed at promoting the development of LNG as a marine fuel and the launching in 2018 of the *LNGHIVE2* strategy for the continuation of the institutional measures and developments of *CORE LNGas HIVE*.

5.9.4.2.2 Measures that can promote AFI in public transport services

The Spanish NIR does not contain specific measures that can promote AFI at national level, although a number of autonomies and regions provide grants and incentives for the purchase of AFV for use as taxis (Catalonia, Madrid, Balearic Islands, and Navarra) and for the procurement of electric buses for urban public transport. There are also initiatives at local level in Madrid, Seville and Saragossa.

5.9.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Although the Spanish NIR does not explicitly mention measures for the promotion of private electro-mobility infrastructure, the programmes *MOVEA 2016* and *2017*, *MOVALT 2018* and *MOVES 2019* included budget provisions for funding private recharging points. In addition, autonomies and regions provided grants and incentives for the installation of recharging points in business premises and condominium garages.

5.9.4.3 Deployment and manufacturing support

5.9.4.3.1 AFI deployment

The Spanish NIR contains 18 deployment support measures for AFI at national level, which compared to the 9 measures identified in the NPF, represent an increase in ambition. In addition, the NIR mentions several initiatives at regional and local level. Most of these measures are existing. Eleven AFI deployment support measures refer to road transport, seven of them to recharging infrastructure, and the rest to CNG, LNG, hydrogen and LPG refuelling points. At Autonomous Communities level, Canary Islands, Catalonia and Balearic Islands, as well as Madrid at local level, provide support for the deployment of recharging points. The NIR highlights the support for building hydrogen infrastructure in Mallorca and Madrid as well as regional promotion initiatives for hydrogen in Castile-La Mancha, Andalusia, Basque Country and Aragon.

Four deployment support measures concern waterborne maritime transport (two for electricity and two for LNG refuelling points) and two measures target electricity supply infrastructure for stationary aircraft.

Spain relies on European co-funding mechanisms for AFI deployment, namely the CEF blending Facility (*CIRVE*, *E-VIA FLEX-E*, *EUROP-E*, *AMBRA*, *ECOGATE*, OPS masterplan for Spanish ports and *CORE LNGas HIVE*) and the ERDF (for example for installing biofuels pumps in Valencia). The Spain-France-Andorra cooperation programme *POCTEFA Interreg* is also considered. Furthermore, there are some public-private initiatives for installing publicly accessible recharging points in rail stations, airports and public places.

5.9.4.3.2 Support of manufacturing plants for AF technologies

Of all the deployment and manufacturing support measures listed in the Spanish NIR, nine can be categorised as support to manufacturing plants for AF technologies. Two measures are dedicated to road transport: the continuation of the '*Reindustrialisation and industrial competitiveness strengthening programme*' (mentioned in the NPF) and a project for manufacturing LPG engines for buses. The remaining seven measures are related to the building (or the conversion) of maritime vessels and ferries to run with LNG.

5.9.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Spanish NIR.

5.9.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.9.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, clusters of measures are identified for the pairs electricity/road, CNG/road, LNG/road and LNG/water-maritime, hydrogen/road, LPG/road and electricity/water-maritime. Nothing assessable could be defined for the pair LNG/water-inland.

The majority of the assessable measures mentioned in the NIR score medium. For the clusters electricity/road and LNG/water-maritime, a score between medium and high can be considered. The cluster electricity/water-maritime scores high. The duration of policy measures is subject to yearly budgetary approval. The results of the applied assessment methodology are based on the assumption that continuity is given to Policy and Deployment & Manufacturing support measures. The clusters electricity/road, CNG/road, LNG/road, LNG/water-maritime, hydrogen/road and LPG/road can be considered to be comprehensive. The cluster electricity/water-maritime results not comprehensive. In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, those for the pairs electricity/road and LNG/water-maritime result to have a medium-high impact, all the other assessable clusters have a medium impact.

As it can be seen in Table 5.9.4-1, compared to the NPF the level of ambition has increased in the NIR for all the assessable clusters, with the exception of LPG/road, for which it remains the same.

Table 5.9.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M/H	C	**M/H**	+
CNG	Road	M	C	**M**	+
LNG	Road	M	C	**M**	+
	Water - maritime	M/H	C	**M/H**	+
	Water - inland	X			
H2	Road	M	C	**M**	+
Electricity	Water - maritime	H	N	**M**	+
LPG	Road	M	C	**M**	=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, those for the pairs electricity/road and LNG/water-maritime result to have a medium-high impact; those for the pairs CNG/road, LNG/road, electricity/water-maritime, hydrogen/road and LPG/road have a medium impact; while all the others are not assessable.

5.9.4.5 Research, Technological Development & Demonstration

The Spanish NIR describes 25 RTD&D programmes, which represent a significant increase compared to the 7 RTD&D projects identified in the NPF. National financing and support for RTD&D projects target electricity, CNG, hydrogen, LPG and biofuels for road transport. The majority of the NIR projects can be considered follow-ups or expansions of the projects listed in the NPF. In addition, the Spanish government promotes the participation in European working groups and associations (for batteries, hydrogen, autogas LPG-cluster and bio-ethanol), in the IPCEIs (Important Projects of Common European Interest) for batteries and for hydrogen and in the Fuel Cell and Hydrogen Joint Undertaking. The Spanish NIR highlights several regional projects on biomethane production (from waste and from algae) and use. For maritime transport, the NIR mentions two RTD&D initiatives: one on LNG ships building and another on smart electricity grids in ports.

The Spanish NIR also describes four projects on AF in railways. Two projects are related to pilot tests of LNG locomotives and demonstration of the LNG refuelling infrastructure. The other two projects deal with hybridising with LNG and hydrogen sub-urban and mid-range trains and with the development of a hydrogen electric tram powered by battery and fuel cells.

On the basis of the available information, and compared to the NPF, the level of ambition in the NIR can be considered to have increased for RTD&D actions for most fuels and transport modes.

5.9.5 *Additional information on alternative fuels infrastructure developments*

The Spanish NIR does not provide information on the changes in fuel use.

5.9.6 *Summary of the assessment*

Tabular overview

Table 5.9.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode						
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	10,667	4,785	318	NA	NA	12	14,823
		Situation (2018)	32,508	12,393	960	1	NA	28	41,085
		Estimate (2030)	5,000,000	200,000	25,000	12	NA	1,000	500,000
		Future share (2030) [%]	15.56%	0.62%	2.57%			0.00%	1.56%
		Estimate attainment (2018 vs 2030) [%]	0.65%	6.20%	3.84%	8.33%		2.80%	8.22%
		Progress (2018)	adequate	adequate	2.60%	8.33%		1.62%	5.41%
Publicly accessible AF Infrastructure		Past situation (2016)	4,547	34	15	NA	NA	6	468
		Situation (2018)	5,187	60	34	43	NA	4	589
		Target (2030)	NA	NA	NA	43	NA	NA	NA
		Target attainment (2018 vs 2030) [%]				100.00%			
		Progress (2018)	slow	adequate		100.00%			
Sufficiency Index		2016	2.35	140.74	21.20			2.00	31.67
		2018	6.27	206.55	28.24			7.00	69.75
		2020	15.00	153.33	23.53			8.33	153.85
		2025	47.06	500.00	63.64			13.33	266.67
		2030							
Measures	Legal measures	Ambition (NIR vs NPF)	+	=	=	+		+	=
	Policy measures + Deployment & manufacturing support	Score	M/H	M	M	M/H		M	M
		Comprehensiveness	C	C	C	C		C	C
		Impact	M/H	M	M	M/H		M	M
		Ambition (NIR vs NPF)	+	+	+	+		+	=
	RTD&D	Ambition (NIR vs NPF)	+	+	+	+		+	+

The Spanish NIR considers all alternative fuels transport modes, with particular focus on CNG, LNG and electricity. While for CNG/road a moderate infrastructure is in place, Spain is putting efforts to deploy electric recharging points and LNG refuelling points. In its NPF, Spain had considered a strong growth of LPG, however the NIR recognises that the evolution of LPG vehicles since 2016 has not gone as quickly as expected and that deployment of LPG refuelling points is also proceeding at slower pace than initially anticipated. Spain's continued support to LNG as a marine fuel has led to a good development of the market in LNG waterborne maritime transport.

The NIR does not establish infrastructure targets/vehicle estimates for all fuels and modes for each of the years of reference (2020, 2025 and 2030). Specifically, several targets are not provided for AFI in 2030. Therefore, it cannot be stated that the Spanish NIR covers the whole AFID period (2016-2030). Compared to the Spanish NPF that addressed most of the requirements of Article 3 of the Directive, the Spanish NIR almost fully addresses the requirements of Annex I of the Directive, with the exception of: a) information on the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network; and b) information on any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Spanish NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Concerning EVs, Spain recorded a total of 32,508 electric vehicles in 2018 (of which 28,562 were passenger cars, 3788 LCVs and 158 buses and coaches). The Spanish NIR estimates for the number of electric vehicles are 150,000 in 2020, 800,000 in 2025 and 5,000,000 in 2030, which translate in higher estimates than in the NPF for 2020 (+59.57%) and for 2030 (+92.31%). While Spain did not provide infrastructure targets in its NPF, the NIR targets for publicly accessible recharging points are 10,000 for 2020 and 17,000 for 2025. The 2018 progress results to be adequate for the vehicles and slow for infrastructure, while the sufficiency index remains adequate until 2018 and becomes insufficient from 2020, in particular in 2025, due to the low level of ambition in terms of recharging points.
- **CNG** – Spain recorded a total of 12,393 CNG vehicles in 2018 (of which 6,452 were passenger cars, 1,438 LCVs, 2,108 HCVs and 2,395 buses and coaches). Compared to the NPF, where only a vehicle estimate for 2020 was provided, the Spanish NIR presents a revised estimate of 23,000 CNG vehicles for 2020 (33.72% higher than in the NPF), and new estimates of 100,000 vehicles for 2025 and 200,000 vehicles for 2030. Spain recorded 60 CNG refuelling points in 2018; the NIR presents a revised set of targets for 2020 (150 points), which is 97.37% higher than in the NPF and expects to have 200 CNG refuelling points in 2025. The 2018 progress results to be adequate for both the vehicles and infrastructure and the sufficiency index is below the indicative value of 600 for the implementation period until computable (2025).
- **LNG** - Spain recorded 960 LNG vehicles in use in 2018, composed entirely by HCVs. The Spanish NPF expected to have 800 LNG vehicles registered in 2020; the NIR presents a revised set of vehicle estimates 150% higher than the NPF for 2020. The estimates for LNG vehicles in 2025 and 2030 are 7,000 and 25,000 respectively. In 2018, there were 34 LNG refuelling points in Spain. The NIR presents revised targets for LNG refuelling points for 2020 and 2025 that are respectively 93.18% and 150% higher than in the NPF.
- **Hydrogen** – There were 28 hydrogen-powered vehicles (20 passenger cars and 8 buses) in Spain in 2018. Spain had included hydrogen in its NPF. The NIR estimate for hydrogen vehicles in 2020 is 90% lower than the NPF. The new estimates are 50 hydrogen-powered vehicles by 2020, 200 by 2025 and 1,000 by 2030. Concerning hydrogen infrastructure, there were 4 publicly accessible hydrogen fuelling points in 2018 and, similarly to the vehicle estimates, the NIR presents revised targets for hydrogen infrastructure (6 points in 2020 and 15 in 2025), which for 2020 is 70% lower than in the NPF.
- **Biofuels** – The Spanish NIR does not contain data or estimates on the number of vehicles running on high concentrations of biofuels. In 2018, there were 63 Spanish service stations selling blends with higher bioethanol (8 stations) and biodiesel (55 stations) content.
- **LPG** - Spain had a fleet of 41,085 LPG vehicles in 2018 (of which 37,402 passenger cars, 3,455 LCVs, 132 HCV and 96 buses and coaches). The Spanish NIR presents a revised set of estimates for LPG vehicles (100,000 in 2020, 200,000 in 2025 and 500,000 in 2030) that for 2020 is 50% lower than in the less optimistic NPF scenario. Regarding LPG infrastructure, in 2018 there were 589 LPG refuelling points. In line with the vehicle reduction scenario, the NIR presents revised targets for LPG refuelling points (650 in 2020 and 750 in 2025) which for 2020 is 18.75% smaller than in the NPF.

Rail transport

The NIR indicates that almost 40% (over 6,000 km) of the Spanish rail network in the TEN-T Core is not electrified and there are plans to electrify over 1,000 km of those lines. For lines that will not be electrified, RENFE (Spanish national railways network) is planning the conversion of part of the diesel fleet to LNG, hydrogen or batteries, as the sole means of traction or in combination with electric traction.

Waterborne transport (maritime)

- **Electricity** - The number of shore-side electricity supply points at the Spanish maritime ports was 2 in 2018. According to the NIR, it is expected to have 45 electricity supply points in 2020.
- **LNG** - In 2018, Spain had one vessel using LNG in its auxiliary engine. The Spanish NPF only provided estimates for the number LNG seagoing vessels in 2020 whereas NIR presents a revised estimate for 2020 (9 vessels) which is 200% higher than in the NPF. The estimated number of LNG vessels in 2025 and 2030 is 10 and 12 respectively. As for LNG infrastructure, the ES NIR indicates that all 43 Spanish ports of general interest are currently in a position to supply LNG by means of truck tankers, complemented with LNG terminals in 2 ports. This means that the NPF targets for LNG supply points to ships and ferries (13 in 2020 and 42 in 2025) have been already attained.

Waterborne transport (inland)

Information is not available in the Spanish NIR.

Air transport

- **Electricity (for stationary airplanes**) - According to the NIR, there are currently 434 power supply points for stationary aircraft at the airports of general interest in Spain; the target is 470 points in 2030.

The Spanish NIR contains an extensive list with 108 national **measures**, covering various fuels and modes, mostly targeting electricity, CNG, LNG for road transport and LNG for maritime transport and to a lesser extent hydrogen. The NIR also showcases measures at Autonomous Communities level as well as local measures in major cities. The NIR contains 34 legal measures implemented at national level, of which nine are cross-cutting applicable to all alternative fuels and related to both vehicles and infrastructure. Considering all the legal measures, they appear to be designed as the necessary tools to allow the realisation of the AFV/AFI plans as described in the NPF and revised in the NIR.

There are 22 policy measures applicable at national level in the Spanish NIR. The majority of them can be considered updates of the measures provided in the NPF, in particular annual renewal of financial support measures. As for deployment and manufacture support, 27 measures have been identified from the NIR. The result of the applied assessment methodology shows that, if continuity is given to policy and support measures, the set seems sufficient to advance with the attainment of the declared targets and objectives. With the exception of LPG, the level of ambition for policy and deployment & manufacture support measures between the

NPF and the NIR has increased for all the assessable clusters. In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, those for the pairs electricity/road and LNG/water-maritime result to have a medium-high impact, all the other assessable clusters have a medium impact

The Spanish NIR describes 25 RTD&D programmes. Based on the available information, and compared to the NPF, the level of ambition in the NIR can be considered to have increased for most alternative fuels and transport modes.

5.9.7 *Final remarks*

The Spanish NIR provides a quite comprehensive report on the efforts to implement the Directive. The NIR is in line with the provisions of Annex I to the Directive and all alternative fuels are addressed. The market for electric passenger vehicles and heavy-duty LNG vehicles is expected to grow significantly in the coming years; the market for CNG and LPG vehicles is also foreseen to grow but to a lesser extent. The Spanish NIR expects hydrogen to remain a niche market. A significant number of measures to promote alternative fuels in all modes of transport are being implemented with different scopes and impacts. Spain is involved in the implementation of a significant number of R&D&I programmes, both at national and European level, for the production of alternative fuels and the development of new generations of batteries and fuel cells and, to a lesser extent, for the construction of LNG ships.

With regard to electricity, the NIR expects up to five million electric vehicles on the roads by 2030, representing around 16% of the vehicle fleet by that time. Taking into account the current situation and expected trend developments, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. Nevertheless, only 17,000 recharging points are planned for 2025, which seems insufficient for the estimated fleet of 800,000 electric vehicles in that year. An increase of ambition would contribute to better meeting the objective of realising a dense, wide-spread and easy to use network of recharging and refuelling infrastructure throughout the EU. Spain should provide information on its targets for recharging infrastructure in 2030. Information on charging efficiency is provided. Forty-five shore-side electricity supply facilities for ships and ferries are expected in 2020. For stationary aircraft 434 power supply points are already installed in the Spanish airports. Almost 40% (over 6,000 km) of the Spanish TEN-T Core rail Network is not yet electrified; further efforts are needed in this regard. The NIR indicates that there are already plans to electrify over 1,000 km of these lines. In general, the report highlights Spain’s strong commitment to promoting the use of electricity in the transport sector.

As for hydrogen, the NIR shows a low development of both vehicles and infrastructure. Fifteen hydrogen filling stations are planned for 2025 and no target has been defined for 2030. Spain should provide further information in future reporting on planning for 2030 and beyond.

Concerning natural gas, there were 12,393 CNG vehicles by 2018. The NIR estimates 100,000 CNG vehicles by 2025 and 200,000 CNG vehicles by 2030 as well as 200 refuelling points by 2025. Further, the NIR sets the target of 7,000 LNG vehicles in 2025 and 25,000 LNG vehicles by 2030. No 2030 target for LNG refuelling stations was provided. However, the NIR estimates 110 LNG refuelling points by 2025. This seems sufficient taking into account the length of the

Spanish TEN-T Road Core Network, provided that the refuelling points are equally distributed along the network. Moreover, all Spanish ports of the TEN-T Comprehensive Network are in a position of supplying LNG by the use of road tankers, complemented by LNG terminals in two ports. On the other hand, the estimated number of LNG vessels by 2025 and 2030 is very small in relation to the number of ports with capacity to supply LNG. Spain should encourage the use of LNG vessels to take advantage of the existence of this infrastructure.

There were 41,085 LPG vehicles by 2018. Around 100,000 LPG vehicles are estimated for the year 2020. LPG vehicles will rank second in the alternative vehicle fleet in Spain in 2030. The NIR estimates around 500,000 LPG vehicles by 2030. The NIR shows a smaller development of the LPG vehicles market compared to the estimates provided in the NPF.

According to the NIR, only 0.5% of the service stations provide blends with higher bioethanol and biodiesel. Spain should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.9.8 *ANNEX - Description of the Member State*

On a surface area of 506,000 km², Spain has a population of 46.658 million people in 2018, which makes up for a population density of 92 inhabitants/km².

Number of main urban agglomerations

- 128 urban agglomerations > 50,000 inhabitants

In 2018, Spain achieves a per capita gross domestic product at market prices of €25,730, which represents a per capita gross domestic product in purchasing power standards of 91 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Spain is 5,706 km. The total road network length is 165,749 km, of which 15,585 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Spain: 48% (2,727 km) of the Mediterranean Corridor and 46% (2,040 km) of the Atlantic Corridor.

Through the TEN-T Road Corridors, Spain is connected with the following Member States:
- Portugal (through the Mediterranean Corridor)
- France (through the Mediterranean and the Atlantic Corridor)

Number of registered road vehicles

At the end of 2018, Spain accounts for 34,630,709 registered road vehicles of which 24,074,151 are categorized as passenger cars, 4,637,954 as light goods vehicles, 568,899 as heavy goods vehicles and 64,905 as buses and coaches. The motorisation rate is 516 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 13 maritime ports in the TEN-T Core Network (A Coruña, Algeciras, Barcelona, Bilbao, Cartagena, Gijón, Huelva, Las Palmas, Palma de Mallorca, Sevilla, Tarragona, Tenerife-Santa Cruz, Valencia)
- 24 maritime ports in the TEN-T Comprehensive Network
- 1 inland ports in the TEN-T Core Network (Sevilla)
- No inland ports in the TEN-T Comprehensive Network

The inland waterways TEN-T Core Network in Spain is 92 km long.

Number of airports in the TEN-T Core Network

- 10 airports in the TEN-T Core Network (Alicante, Barcelona, Bilbao, Las Palmas, Madrid-Barajas, Málaga, Palma de Mallorca, Sevilla, Tenerife Sur-Reina Sofía, Valencia)
- 29 airports in the TEN-T Comprehensive Network

5.10 France (FR)

5.10.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the French NPF the Commission concluded:

The French NPF fully addresses the requirements of Article 3. It contains an extensive discussion of the current state and future development of alternative fuels and corresponding infrastructure in the transport sector. For the different fuels and modes, it discusses targets as required by Article 3 of the Directive. However, for some fuels/modes the target commitment is ambiguous, which, at times, makes it difficult to understand the ambition of the French NPF.

The focus of the French NPF is mainly on electric vehicles with estimates of roughly 1.6% EV on the road in 2020. Based on the targets provided, it can be concluded that the aims for recharging infrastructure accessible to the public seem insufficient in comparison with the future estimated EVs. Each department of metropolitan France is already today equipped with at least one recharging point. It seems that the distance requirement on the TEN-T Core Network of one recharging point at least every 60 km is fulfilled. The French NPF also highlights the role that electricity can play in airports for use by stationary airplanes, shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports of the TEN-T Core Network and in other ports.

The current and targeted number of CNG refuelling points can be considered sufficient, although the NPF does not provide future estimates for CNG vehicles. The NPF focus for CNG is on the TEN-T Core Network and nine French large urban areas. The French NPF emphasizes the role that natural gas vehicles can play for the public transport sector, cleaning vehicles, garbage trucks, and captive fleets of light-duty vehicles. The provided information indicates the fulfilment of the distance requirement of at least one CNG refuelling point every 150 km.

For heavy-duty trucks, the committed target provides the appropriate number of LNG refuelling points, which is strictly necessary in the sense of the Directive and this number is assumed to assure a normal circulation at least within the road TEN-T Core Network. The localisation map confirms the uniform geographical coverage without important gaps and the fulfilment of the distance requirement of at least one refuelling point every 400 km.

The French NPF commits to the provision of LNG bunkering by 2025, at least, on one maritime port of each coastal area of the country: Channel - North Sea, Atlantic and Mediterranean. According to evolving market demand, truck to ship mobile bunkering offers or small fixed points could emerge by 2030 in several inland ports of the TEN-T Core Network. France targets to equip at least three ports with LNG refuelling on its inland waterways.

France has taken steps to promote the deployment of a hydrogen-refuelling infrastructure and funds several ongoing projects in this field. This deployment is based on a bottom-up approach within specific networks and it involves establishing captive fleet clusters. The targets could be revised upwards in the event of a strong increase in the offer of available vehicles and related market conditions.

The French NPF has a big portfolio of measures, the great majority already in effect. These measures are structured in: legislative and regulatory (20), informative (11), incentive (15), call for projects (6), RTD&D (3) and measures for cross-border coordinated actions and *projects funded by EU programmes (11). The measures defined in the French NPF are comprehensive for the following fuels in road transport: electricity, CNG, LNG, and hydrogen. They can be considered exemplary for electric vehicles and the associated infrastructure.*

France cooperates with neighbouring countries and other Member States to support EU-wide circulation for AFV and cross-border continuity for AFI. An important enabler for this cooperation is, according to the French NPF the Connecting Europe Facility.

5.10.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.10.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, Water, Air / Electricity, CNG, LNG, H2, LPG		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, Water, Air / Electricity, CNG, LNG, H2, Biofuels, LPG		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, Water / Electricity, CNG, LNG		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	All / Electricity		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, Water / Electricity, H2, CNG, LNG		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road / Electricity		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	Yes
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / Electricity, CNG, LNG, H2		Yes
Other information reported		All / All		Yes

The checklist shows that most of the requirements of Annex I from the Directive are covered.

In several cases, the French NIR does not offer quantitative information on future AFI targets and AFV estimates for the years required by the Directive (2020, 2025 and 2030) but for different years, based on national strategies (2023 and 2028). In the case of AFV estimates, it only provided information on the natural gas vehicles (including both CNG and LNG vehicles in one category).

Regarding the combination of AF/AFV/AFI with transport mode, electricity and hydrogen are well covered for road transport, while natural gas (including biomethane), biofuels and LPG are partially covered for road transport; hydrogen is partially covered for rail transport; shore-side electricity supply and LNG are partially covered for waterborne transport; electricity supply for stationary airplanes is partially covered for air transport; all the other combinations are absent.

The French NIR reports around 55 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify 11 AF/transport mode clusters of measures, all assessable.

5.10.3 *Quantitative assessment: Vehicles and infrastructure*

The French NIR mentions that the Clean Mobility Development Strategy 2 (*Stratégie de développement de la mobilité propre* 2 – SDMP2) proposal, appended to the Multiannual Energy Programme draft revision, will lay down the guidelines for the decarbonisation of transport and will set new objectives for 2023 and 2028. "*The SDMP2 chiefly clarifies scenarios of trends relating to vehicle fleets, the outlook in terms of increasing the number of recharging points to boost alternative fuels, changes in terms of transport's consumption of the various energy sources and the proposed guidelines for each of the levers (decarbonisation of the fuel consumed by vehicles, vehicle energy efficiency, control of transport demand, modal shift, optimisation of vehicle use*). *The estimates presented in the reporting table on the fleet of vehicles using alternative fuels and the targets relating to the number of recharging and refuelling points are therefore based on the objectives of the SDMP2 proposal* ***which is still awaiting adoption****; as yet these fleet deployment estimates are therefore not French commitments".* Indeed, in order to carry out the assessment of the French NIR, these indicative targets have been considered, but in a conservative way, according to the following scheme: SDPM2 targets for 2023 are considered as 2025 targets in the NIR; SDPM2 targets for 2028 are considered as 2030 targets in the NIR.

Table 5.10.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	200,250	24,800	616,465	35,000[1]	2,433,250	100,000[2]	6,929,700	NA
	Change NIR vs NPF [%]			-35.78%	0.00%				
	Attainment [%]			32.48%	70.86%	8.23%	24.80%	2.89%	
CNG / road	NIR	15,306[3][4]	61[4]	11,600[3]	79[1]	97,800[3]	121[5]	207,700[3]	285[6]
	Change NIR vs NPF [%]				0.00%		4.31%		
	Attainment [%]			131.95%	77.22%	15.65%	50.41%	7.37%	21.40%
LNG / road	NIR	15,306[3][4]	20[4]	11,600[3]	NA	97,800[3]	25[1]	207,700[3]	41[6]
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]			131.95%		15.65%	80.00%	7.37%	48.78%
LNG / water (maritime)	NIR	NA	4	NA	NA	NA	7[1]	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]						57.14%		
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	NA	NA	3[1]
	Change NIR vs NPF [%]								0.00%
	Attainment [%]								
H2 / road	NIR	351[4]	20[7]	235	NA	9,050	100[5]	NA	400[6]
	Change NIR vs NPF [%]						233.33%		
	Attainment [%]			149.36%		3.88%	20.00%		5.00%
LPG / road	NIR	156,323[4]	1,700	150,000	NA	150,000	NA	150,000	NA
	Change NIR vs NPF [%]								
	Attainment [%]			104.22%		104.22%		104.22%	

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

[1] targets from the FR NPF; [2] at least the value indicated since this target refers to 2022; [3] natural gas (CNG+LNG) vehicles; [4] data from EAFO since the FR NIR did not provide this information; [5] at least the value indicated since this SDMP2 target refers to 2023; [6] at least the value indicated since this SDMP2 target refers to 2028; [7] data from “VIG'HY l'observatoire de l'hydrogène” (https://www.vighy-afhypac.org/) since the FR NIR did not provide this information.

5.10.3.1 Road transport

5.10.3.1.1 Electricity

Vehicles

France recorded 200,250 battery electric and plug-in hybrid electric vehicles in use in 2018 (see Table 5.10.3-1), of which 160,000 (≈80%) were passenger cars, 39,600 LCVs, 100 HCV and 550 buses and coaches[32]. The French NIR also reports 24,000 PTWs in 2018. The French NIR EV's estimates are 616,465 for 2020, 2,442,300 for 2025 and 6,929,700 for 2030[33]. They consist in a revised estimate for 2020 (35.78% lower than the NPF values), and new estimates for 2025 and 2030. The vast majority of the electric vehicles that France expects to see on the roads in 2030 will be passenger cars (6,200,000 out of which 4,100,000 BEVs), but 710,000 LCVs, 12,000 BEV HCVs, and 7,700 BEV buses and coaches are also foreseen.

The 2018 ***attainment*** of future EV estimates is 32.48% for 2020 and 2.89% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by France is equal to 34%.

Infrastructure

France recorded 24,800 publicly accessible recharging points in 2018 (Table 5.10.3-1), corresponding to 9,566 normal power (≤22kW) recharging stations and to 855 high power (>22kW) recharging stations. The NIR also mentions that 225,000 private recharging points existed in France in 2018 according to the estimation of the public distribution system operator.

The FR NIR does not specifically provide targets for 2020/2025/2030. However, it states that, "*in 2018, the French government and manufacturers pledged to have 100,000 recharging points installed by the end of 2022.*" The NIR mentions that the density of recharging points is difficult to foresee because of several uncertainties (e.g. EV fleet numbers and composition (BEV and PHEV), geographical spread of EVs, access to private recharging points, vehicle range and driver behaviour) which prevent the setting of targets for 2025 and 2030. The FR NPF contained a target of 35,000 publicly accessible recharging points for 2020 and a 7,000,000 total target for private and publicly accessible recharging points for 2030.

The French NIR states that the existing recharging infrastructure network (10,421 stations in 2018 and 11,600 stations in 2019) provides a better geographic coverage than the one announced in the NPF for 2020, based on a scenario of 8,150 recharging stations.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure target is 70.86% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated

[32] In the case of HCVs and buses and coaches, data corresponds to the values from 2017 since the FR NIR did not provide values for 2018.
[33] The SDMP2 estimates for EVs (excluding PTWs) and are 1,327,600 for 2023 and 5,296,900 for 2028, respectively.

average annual growth rate corresponding to the period 2016-2025[34] for publicly accessible recharging infrastructure evolution planned by France is equal to 23%.

Ratio

Based on the French NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. For the past period 2016-2018, the ratios are inferior to the value of 10 and thus can be regarded as adequate. Instead, for 2020, the sufficiency index exceeds the recommended value and can be regarded as inadequate. For 2025 and 2030, the ratios could be not calculated because of the lack of AFI targets for these specific years.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	6.75	6.93	8.07	17.61*		

*calculated using the AFI target value provided in the NPF

Information on charging efficiency

The French NIR states that the Corri-door network co-funded by CEF-T can be seen as representative in terms of the utilisation rate of high power (>22kW) recharging points. In 2018, the network of 200 high power recharging points recorded 40,000 recharges with an average duration of 32 minutes. Therefore, they recorded on average a charge time of 18 minutes per day with 0.55 recharges per day (one recharge every 1.825 days).

5.10.3.1.2 CNG

Vehicles

The French NIR does not differentiate between CNG and LNG vehicles, presenting data for natural gas vehicles. For the period 2016-2018, the French NIR only provides the situation for 2017: 12,150 natural gas vehicles in use, out of which 8,200 were LCVs, 1,350 HCVs and 2,600 buses and coaches. According to EAFO, there were 15,306 natural gas vehicles in 2018 in France. In contrast to the NPF, which did not contain natural gas vehicle estimates, the FR NIR presents all the required estimates for the next decade: 11,600 for 2020, 97,800 for 2025 and 207,700 for 2030. The foreseen composition of the natural gas fleet in 2030 is 129,000 LCVs, 70,000 HCVs and 8,700 buses and coaches.

The 2018 ***attainment*** of future natural gas vehicles estimates is 131.95% for 2020 and 7.37% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged natural gas vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the natural gas vehicle fleet evolution planned by France is equal to 26%.

[34] Considering for 2025 the target provided for 2022.

Infrastructure

For the period 2016-2018, the French NIR does not provide numerical information on the existing CNG infrastructure[35]. According to EAFO, there were 61 CNG refuelling points in France at the end of 2018. As targets for the next decade, the FR NIR mentions only the SDMP2 proposal targets that represent the number of stations needed to supply the projected vehicle numbers. Thus, it is stated that France will require at least 121 CNG stations by 2023 and 285 by 2028. Therefore, this assessment considers as conservative target for 2025 at least 121 CNG stations and at least 285 CNG stations for 2030. The FR NPF contained targets of 79 CNG refuelling stations for 2020 and of 116 for 2025. The new considered NIR target for 2025 represents a slight increase of 4.31% compared to the NPF.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 77.22% for 2020 and 21.4% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by France is equal to 14%.

Ratio

The ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road cannot be computed since the FR NIR provided only information on natural gas vehicles (CNG+LNG).

5.10.3.1.3 LNG

Vehicles

No available data since the LNG vehicles are not discriminated from natural gas vehicles (see Section 5.10.3.1.2).

Infrastructure

For the period 2016-2018, the French NIR does not provide numerical information on the existing LNG infrastructure[36]. According to EAFO, there were 20 LNG refuelling points in France at the end of 2018. As targets for the next decade, the FR NIR mentions only the SDMP2 proposal LNG infrastructure targets that represent the number of stations needed to supply the projected vehicle numbers. Thus, it is stated that France will require at least 17 LNG stations by 2023 and 41 by 2028. The FR NPF contained a target of 25 LNG refuelling stations for 2025. This assessment considers as conservative target for 2030 at least 41 LNG refuelling stations since this value was indicated by SDMP2 for 2028.

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 80% for 2025 and 48.78% for 2030. According to the assessment methodology described in Section 2.1, the progress obtained by France from 2016 until 2018 for public LNG refuelling infrastructure deployment is 47.5% of the overall planned deployment during the period 2016-2030.

[35] It only provides the situation at the end of 2019, mentioning 110 CNG refueling stations deployed.
[36] It only provides the situation at the end of 2019, mentioning 34 LNG refueling stations deployed.

Ratio

The ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road cannot be computed since the FR NIR provided only information on natural gas vehicles (CNG+LNG).

5.10.3.1.4 Hydrogen

The FR NIR mentions that the French government adopted the Energy Transition Hydrogen Deployment Plan (*Plan de déploiement de l'hydrogène pour la transition énergétique*) in 2018 which is setting objectives for the deployment of vehicles and refuelling infrastructure that will be appended to the SDMP2 when it is adopted. In this assessment, the objectives from this plan are therefore considered.

Vehicles

According to EAFO, there were 351 hydrogen-powered vehicles in use in France at the end of 2018 (77 passenger cars and 274 LCVs). The French NIR only indicates that around 100 hydrogen-powered passenger cars were in use in 2018, while the information for the other vehicles categories is missing. The FR NIR provides estimates of 235 vehicles (220 LCVs, 15 HDVs[37]) by 2020 and 9,050 vehicles (8,700 LCVs, 350 HDVs) by 2025 while the FR NPF had not included any estimate.

The 2018 ***attainment*** of future hydrogen vehicles estimates is above 100% for 2020 and 3.88% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by France for hydrogen vehicles deployment from 2016 until 2018 versus the period 2016-2030 could not be computed because the 2030 estimate is absent.

Infrastructure

For the period 2016-2018, the French NIR does not provide numerical information on the existing hydrogen refuelling infrastructure[38]. According to “VIG'HY l'observatoire de l'hydrogène”[39], there were 20 public hydrogen refuelling points in France at the end of 2018. As targets for the next decade, the FR NIR mentions only the total[40] hydrogen infrastructure targets from the hydrogen plan: 100 hydrogen stations by 2023 and 400 by 2028. This assessment considers as conservative target for 2025 at least 100 stations and at least 400 stations for 2030. The FR NPF contained a target of 30 hydrogen refuelling stations for 2025, and therefore the new considered target represents a significant increase of 233%.

The 2018 ***attainment*** of future hydrogen refuelling infrastructure targets is 20% for 2025 and 5% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by France from 2016 until 2030 for hydrogen refuelling infrastructure deployment is 2.31% of the overall planned deployment during the period 2016-2030.

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[37] The FR NIR provides one single value per year for the merged set of transport systems (HCVs+Buses and coaches+maritime vessels+ inland vessels+locomotives). In this assessment, these numbers are considered to refer to the road vehicle categories HCVs + Buses and coaches.

[38] It only provides the situation at the end of 2019, mentioning 29 hydrogen refuelling stations deployed mainly with the support of the “Territoires hydrogène” labelling scheme.

[39] https://www.vighy-afhypac.org/

[40] The plan does not specify differentiated targets between stations open to the public and those for captive fleets.

Ratio

Based on the FR NIR and the assumptions described above, the following table shows the ratio between vehicles and refuelling points (i.e. sufficiency index) for the pair hydrogen/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Hydrogen	2.73*		17.55**		90.50***	

* calculated using values provided in the NPF; ** calculated using values from EAFO and "VIG'HY l'observatoire de l'hydrogène" website (https://www.vighy-afhypac.org/); *** calculated using AFI targets provided by the Energy Transition Hydrogen Deployment Plan for 2023.

5.10.3.1.5 Biofuels

Vehicles

Information is not available in the FR NIR.

Infrastructure

Information is not available in the FR NIR.

5.10.3.1.6 LPG

Vehicles

For 2018, the French NIR does not provide quantitative information on the LPG fleet in use[41]. According to EAFO, France recorded 156,323 LPG vehicles in use in 2018, of which 142,105 were passenger cars and 14,218 LCVs. The French NIR considers that in the next decade the situation will remain constant and provides an estimate of 150,000 vehicles (all passenger cars) for the whole period (Table 5.10.3-1).

Because the French NIR provided decreasing estimates for LPG vehicles, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

For the period 2016-2018, the French NIR provides the same value stating that LPG is sold in almost 1,700 refuelling stations. The NIR considers that "*LPG is the alternative fuel that currently has the densest coverage in terms of stations, which are capable of supplying 10 times more vehicles than the current vehicle fleet*".

Because the French NIR did not provide targets for publicly accessible LPG refuelling infrastructure, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the FR NIR, NPF and EAFO, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road. The

[41] The FR NIR provides one single value of 210,000 for the merged set of all LPG transport systems across all transport modes for 2017.

sufficiency index for 2020, 2025 and 2030 could not be computed as the targets of infrastructure were not indicated.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LPG**	106.89*		91.95**			

* calculated using AFV values provided in the NPF; ** calculated using AFV values from EAFO

5.10.3.2 Rail transport

5.10.3.2.1 Electricity

Information is not available in the French NIR.

5.10.3.2.2 Hydrogen

The French NIR mentions as an AFI deployment measure the plans of SNCF (Société Nationale des Chemins de fer Français) to bring 15 regional hydrogen-powered trains into service on non-electrified lines that are currently covered by diesel trains. This alternative is considered less costly than electrification work and the first trains should come into service in 2022. It is mentioned that the regions will be involved in financing these trains and the State could support the project through the Hydrogen Plan.

5.10.3.3 Waterborne transport (maritime)

5.10.3.3.1 Electricity

Vessels

Information is not available in the French NIR.

Infrastructure

No quantitative information aggregated at national level regarding the shore-side electricity supply points in the maritime ports is provided in the FR NIR. The French NPF contained data on the 2016 situation (at least 1 SSE supply point) and a list of additional targeted ports to provide SSE supply in the future. However, the French NIR noted that the port of Marseille has three existing supply points for five ferries operating between Corsica and the French mainland. For the future, it is mentioned that the South region recently announced its new 'zero-fume stopovers' electrification scheme, which should result in all ferry quays being connected by 2023 and the installation of a SSE supply for cruise ships in Marseille port by 2025. The FR NIR presents as well the intention of Dunkirk's Grand Port Maritime to equip its container terminal with an 8 MW SSE supply point by the end of 2019 that should be able to cater for 7 vessels initially; depending on the needs' evolution 2 additional supply points could be installed.

5.10.3.3.2 LNG

Vessels

Similarly to the NPF, information is not available in the French NIR.

Infrastructure

The FR NIR presents only information on the current situation without providing details regarding future targets. It mentions that all ports with LNG tanker terminals (Marseille-Fos, Dunkirk, and Nantes-Saint Nazaire) and the port of Le Havre (not having a terminal) currently offer LNG bunkering services by truck. The FR NPF had included a target of seven ports to provide LNG refuelling services by 2025.

The 2018 ***attainment*** of future LNG refuelling infrastructure targets in maritime ports is 57.14% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by France for LNG refuelling infrastructure deployment in maritime ports from 2016 until 2018 versus the period 2016-2030 could not be computed because of the lack of the 2030 target.

5.10.3.4 Waterborne transport (inland)

5.10.3.4.1 Electricity

Vessels

Information is not available in the French NIR.

Infrastructure

The FR NIR does not provide quantitative targets aggregated at national level regarding the shore-side electricity supply points in the inland ports. The French NPF contained data on the 2016 situation (60 SSE supply points) and a list of additional targeted inland ports to provide SSE supply by 2025. However, the French NIR notes that some waterways not included in the NPF targets offer or are installing SSE supply points. Vienne and Arles (on Rhône river) are provided as examples, having two high-power and seven medium-power SSE supply points. In total, the NIR mentions that the French inland waterway network had at least 110 SSE supply points for inland waterway vessels in 2019 (including 17 around the Seine basin and 91 in the Nord-Pas-de-Calais region). Investments are mentioned for the Seine basin for installing nine SSE supply points, each accommodating two vessels.

5.10.3.4.2 LNG

In contrast to the FR NPF that had provided a target of three inland ports to offer LNG refuelling supply in 2030, the FR NIR does not include any information on this topic.

5.10.3.5 Air transport

5.10.3.5.1 Electricity

Airplanes

Information is not available in the French NIR.

Infrastructure (for stationary airplanes)

No specific quantitative information was provided in the FR NIR on the electricity supply points in airports for stationary airplanes. The NIR mentions that *11 main airports in France have pledged to reduce their fossil fuel consumption; their plans are expected to result in a 20% cut in emissions from aircraft on the ground by 2025 compared to the 2010 reference year. These 11 airports have included objectives on the electrification of aircraft stands in their action plans according to the FR NIR.*

5.10.3.5.2 Biofuels

The FR NIR mentions that a roadmap setting out the government's aims in terms of deployment of biofuels for aviation is under preparation by several working groups including several stakeholders. Sustainable aviation fuels will be deployed in France by adding them to conventional fuels, with targets of 5% by 2030 and 50% by 2050.

Airplanes

No information on flights / airplanes powered by biofuels is provided in the French NIR.

Infrastructure

The FR NIR mentions that "*as aviation biofuels are 'drop-in' (i.e. fully miscible with fossil fuels), their distribution at airport hubs will use existing logistics in order to limit their costs and carbon footprint*". As a next step, a demonstration project involving the use of pipelines to supply biofuels to airports is indicated.

5.10.4 ***Measures assessment***

Similarly to the NPF, a large portfolio of measures for the deployment of alternative fuels in transport is mentioned in the French NIR. The measures presented in the NIR cover a wide variety of types, several alternative fuels and all transport modes (with a focus on road). The policy direction in France is to encourage the move away from fossil fuelled vehicles to AFV (especially zero-emission mobility) and the following documents support the development of alternative fuels strategy:

- the National Low-Carbon Strategy (*Stratégie Nationale Bas-Carbone* – SNBC) setting the strategic guidelines for implementing the transition to a low-carbon and sustainable economy
- the Multiannual Energy Plan (*Programmation pluriannuelle de l'énergie* – PPE), the strategic document for French energy policy, establishing two main priorities: reducing energy consumption, particularly of fossil fuels, and developing renewable energy. In

the transport sector, „*the PPE draft revision (PPE2) will set targets for reducing energy consumption and developing electric or plug-in hybrid electric vehicles and for the development of biogas and hydrogen"*.

- the Clean Mobility Development Strategy (*Stratégie de développement de la mobilité propre* – SDMP), appended to the Multiannual Energy Programme, laying down the guidelines for the decarbonisation of transport. The SDMP2 proposal[42] appended to the PPE draft revision (PPE2) is setting new objectives for 2023 and 2028 (the first SDMP set objectives for 2016-2018).
- The Mobility Framework Act (*Loi d'Orientation des Mobilités* – LOM[43]), providing a set of support measures for the development of the least polluting transport modes and promoting the transition to clean vehicles.

5.10.4.1 Legal measures

The French NIR mentions 23 legal measures, of which 13 in place (where 10 represent the continuation of measures presented in the NPF) and 10 in process of adoption. This fact highlights that the legal framework for alternative fuels is changing and improving in order to speed up the deployment of the related vehicles and infrastructure. The overall level of ambition of the legal measure set is clearly increased in the NIR compared to the NPF. The majority of legal measures refers specifically to infrastructure, and the most numerous cluster is electricity/road that contains 14 measures. Other pairs that include dedicated legal measures are hydrogen/road, electricity/water (maritime+inland), LNG/water (maritime+inland) and electricity/air. Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and NIR.

5.10.4.1.1 Legislative & Regulatory

There are 18 Legislative & Regulatory measures listed and described in detail in the French NIR. Eight of them are in place representing extensions of those described in the NPF, and two among these were amended in the last period. These eight measures notified in NPF were based mainly on measures derived from the Law No 2015-992 (Act on the Energy Transition for Green Growth, *Loi relative à la transition énergétique pour la croissance verte* – LTECV). The remaining ten measures in the process of adoption are the expression of the intention to overhaul the French legal framework and are based on the provisions of the Mobility Framework Act (*Loi d'Orientation des Mobilités* – LOM) that contains a "*set of support measures for the development of the least polluting transport modes and promotes the transition to clean vehicles*". The LOM is aimed at supporting alternative transport systems and fuels: it schedules numerous support measures for the deployment of alternative fuels, by extending or widening existing schemes (e.g. the change of Restricted Traffic Areas to Low-Emission Zones, the strengthening of the right to install recharging points) or by creating new ones based on lessons learned (e.g. reservation of spaces for electric boats in marinas from 2022, authorisation of the reservation of lanes and parking spaces for ultra-low emission vehicles). It also transposes several EU Directives that pave the way for the market entry of alternative fuels vehicles (e.g. AFI Directive, Clean Vehicle Directive, Energy Performance of Buildings Directive). The LOM also sets decarbonisation targets for the land transport sector aiming at full

[42] under adoption when the French NIR was submitted
[43] examined at second reading in Parliament when the French NIR was submitted

decarbonisation in 2050 and at banning the sale of new fossil fuel passenger cars and LCVs from 2040.

5.10.4.1.2 Administrative

The French NIR presents five administrative measures, all in place in 2019. Three measures are continuations of NPF measures. The transport modes covered by these measures are road, water-inland and air. Four measures regard electricity as alternative fuel and infrastructure (e.g. setting the conditions for organising the public recharging service at service areas on the concessionary motorway network, specifications relating to the shore-side connection of inland waterway vessels, regulations on the use of means to supply aircraft with power and air-conditioning/heating during stopovers at the aerodromes of Paris-Charles-de-Gaulle, Paris-Orly and Paris-Le Bourget). The decree on air quality certificates is also listed as an administrative measure, with the purpose of the certificates being described as allowing users of the least polluting vehicles to enjoy traffic benefits.

5.10.4.2 Policy measures

The significant FR NIR policy measure portfolio proves the high level French involvement in fostering alternative fuels in transport that is continuously improving in the last years. The French NIR reports 18 measures for ensuring national objectives, 2 for public transport and 2 for private recharging infrastructure. The majority of these measures represent financial incentives addressing electricity and hydrogen, and were in place in 2019. Eleven measures appear only in the NIR; of the remaining 11 measures, which are common to the NIR and NPF, 7 were improved in the NIR, therefore the overall level of ambition increased.

5.10.4.2.1 Measures to ensure national targets and objectives

Road transport

The FR NIR comprises a set of 14 policy measures meant to support the achievement of the French AF objectives related to road transport (5 measures appear only in the NIR, 9 are common to the NIR and NPF). They cover all aspects of alternative fuels deployment: AF, AFV and AFI. The majority (12) is represented by financial incentives (sometimes with different conditions depending on the AF).

Within the financial measures in place, the French NIR includes:

- purchase subsidies – bonus (in place since 2008) - in 2018, grants of €6,000 (maximum 27% of the vehicle price) for the individuals or legal persons purchasing a new zero emission passenger car or LCV (previously PHEV were covered), other allowances existing for some M2, N2 or L-category vehicles and for electric bicycles. A plan of limiting the subsidy only to vehicle with a price inferior to a threshold is mentioned for 2020.
- scrappage scheme (in place since 2015 and set to continue at least until 2022) - payment of an allowance for purchasing a new or used passenger car or LCV (or an electric 2- or 3-wheel vehicle or quadricycle that does not use lead batteries) if this is accompanied by the removal from circulation of a diesel passenger car or LCV registered before 2001 or a petrol passenger car or LCV registered before 1997. The allowance scale ranges

from €1,500 to €5,000 depending on the emissions of the replacement vehicle and the household's income.

- tax related incentives
  - tax on the registration of the most polluting vehicles (malus) - staggered additional tax that depends on the amount by which vehicles exceed an emission threshold that regularly changes to take account of developments in the market for passenger cars and LCVs and in the decarbonisation targets of this segment
  - accelerated depreciation for HCVs using natural gas, ethanol, electricity or hydrogen
  - increase in the depreciation ceiling for low-emission passenger cars (emitting less than 60 gCO_2/km)
  - company vehicle tax reduction (since 2016) – calculated based on the value of CO_2 emissions and air pollutant emissions
  - regional taxes on registration certificates – some regions provide an exemption (50% or 100%) to low-emissions vehicles powered by CNG, LPG, electricity and E85
  - benefit in kind – 50% reduction (with a maximum of €1,800 per year) for electric vehicles

Two other types of measures reported in the FR NIR regard a free parking incentive (green disk) for AFV in place since 2008 and the launch of an educational information website on EVs[44] in 2019.

Waterborne transport

Two foreseen financial measures refer to waterborne transport:

- accelerated depreciation for vessels using LNG
- application of a preferential rate of domestic final electricity consumption tax to increase the attractiveness of shore-side connections.

5.10.4.2.2 Measures that can promote AFI in public transport services

Buses

The French NIR lists two measures promoting electricity in public transport services:

- the Moebus programme that aims to support the purchase of electric buses and the installation of dedicated recharging points
- the partial coverage of the costs of connecting recharging points intended for public transport vehicles (existing but planned to improve with the new LOM law).

5.10.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The FR NIR lists two existing measures to promote private recharging infrastructure:

- energy transition tax credit for the deployment of recharging points in private homes covering 30% of the cost of one home recharging point, excluding installation costs (planned to evolve in 2020 with the introduction of a fixed amount subsidy of €300 per recharging point)

[44] Je-roule-en-electrique.fr

- the programme of Aid for the Development of Electric Vehicles through New Recharging Infrastructure (Aide au Développement du Véhicule Électrique grâce à de Nouvelles Infrastructures de Recharge – ADVENIR), launched in 2016 and supported by the system of energy savings certificates through which France funds part of the energy transition. Its aim is to facilitate the installation and partial financing of new intelligent recharging points outside public roads and multi-family buildings (mainly within the multi-family buildings and public enterprises and institutions).
    - The first phase of the programme had a target of 12,000 recharging points being installed before the end of 2018 and the aid for the purchase of the point and its installation amounted to 50% of the cost for individuals and 40% for enterprises, with a variable ceiling between €600 and €1,500, plus €360 in the case of an energy management device being also installed.
    - A new phase was launched in 2019, extending the programme to on-road publicly accessible recharging points with ceilings between €600 and €1,860. In addition, a new scheme will fund 50% of the cost of installing a collective recharging infrastructure in the car parks of the first 3,000 jointly-owned properties that submit an application. The funding will be directed to encourage the establishment of bidirectional recharging points and on-demand programmes (recharging points installed as part of an on-demand programme will receive a bonus of €300).

5.10.4.3 Deployment and manufacturing support

5.10.4.3.1 AFI deployment

The French NIR presents eight measures fostering AFI: one in place in the period 2016-2018, four existing in 2019 and three in process of adoption. They cover electricity, natural gas including biomethane, and hydrogen.

Five measures represent calls for projects supporting the deployment of infrastructure for road transport:

- electricity – two calls "Vehicles and Transport of the Future" (funding 21,241 recharging points through estimated subsidies of 64.7 million € between 2013 and 2017) and "Recharging infrastructure in non-interconnected areas" (in 2019, funding 13 projects with 3.3 million €) within the "Investing for the Future" programme
- natural gas – two calls "Integrated natural gas mobility solutions" (8 projects submitted in 2017 involving over 381 million € of investment, including 30 million € paid by the State, to install 100 stations on the TEN-T network and to purchase 2,100 HCVs between 2018 and 2022) and "Natural gas and biogas in white areas" (funding the installation of 19 stations and the purchase of 470 vehicles with an estimated support paid of 4.2 million €)
- hydrogen – "Hydrogen mobility ecosystems" call launched in 2019 (funding 11 projects with 35.5 million € to develop ecosystems bringing together renewable hydrogen production, distribution and use for the purpose of mobility in a given territory; opening of 35 stations is expected; a second phase is expected in 2020).

Another mentioned measure refers to the deployment of 15 regional hydrogen-powered trains on non-electrified lines that are currently covered by diesel trains, with the first trains expected to come into service in 2022.

Regarding waterborne maritime transport, the "Zero Fumes Stopover" plan announced by the southern region aims, in the medium term, to drastically reduce GHG and pollutant emissions from vessels moored in the ports of Marseille, Nice and Toulon. The metropolitan areas of Toulon and Marseille have already announced a target for the electrification of all docks by 2023. The plan should also allow the installation of a power supply for cruise ships in Marseille by 2025. In the port of Nice, the plan will support the purchase of power supply equipment using fuel cells. The committed regional budget of 30 million € is expected to be topped up by the State, the "Investing for the Future" programme managed by ADEME and European funds.

5.10.4.3.2 Support of manufacturing plants for AF technologies

The French NIR noted the participation in the European Battery Alliance which is a programme of research, development and industrialisation of fourth generation rechargeable lithium electrochemical cells and batteries built around those cells. In February 2019, 700 million € of State aid were announced to be released for the launch of the programme.

5.10.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the French NIR.

5.10.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.10.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. Among the clusters of measures identified in the French NIR, six clusters contain dedicated measures (electricity/road, CNG/road, LNG /road[45], LNG/water-inland, hydrogen/road and hydrogen/rail) while the other five contain general measures addressing combinations of several alternative fuels. For all remaining pairs of AF and transport mode, there are either no measures or the pair is not applicable to France.

[45] CNG/road and LNG/road are addressed together as natural gas within the AFI deployment measures

Table 5.10.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	M	C	**M**	+
LNG	Road	M	C	**M**	+
	Water - maritime	L	C	**L**	+
	Water - inland	L	N	**L**	+
Hydrogen	Road	M	C	**M**	+
Biofuels	Road	L	C	**L**	+
LPG	Road	L	N	**L**	=
Hydrogen	Rail	M	N	**L**	+
Electricity	Water - maritime	M	C	**M**	+
	Water - inland	L	N	**L**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

In line with the overall focus in promoting zero-emission mobility reported in the NIR for the recent years, the most numerous cluster is the electricity/road followed by hydrogen/road. The electricity/road cluster contains a comprehensive set of 23 NIR measures, displaying a high overall score and showing an increased level of ambition compared with the NPF. This cluster contains several measures assuring subsidies and tax reductions/exemptions for electric vehicles (especially BEVs) and a significant support for the deployment of recharging points (public and private) with the majority of them improving compared with the NPF situation. The hydrogen/road cluster is formed by a comprehensive set of 13 NIR measures, displaying a medium overall score and showing an increased level of ambition compared with the NPF. The newly introduced measures originate in the 2018 Energy Transition Hydrogen Deployment plan.

In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, in some cases, the partial or total lack of future targets and estimates is making difficult putting this assessment into perspective. Based on a comparative analysis with the measures presented in the other NIRs, it seems reasonable to assume that the pairs electricity/road should have a high impact, the measures for the pairs CNG/road, LNG /road, hydrogen/road and electricity/water-maritime should have a medium impact, all the other pairs should have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all identified pairs with the exception of LPG/road.

5.10.4.5 Research, Technological Development & Demonstration

This section contains three measures related to the "Investing for the Future programme".

The first measure presents the Phases I & II of the programme concerning "Vehicles and Transport of the Future" and contributed with several tens of millions of euro to the funding between 2011 and 2017 of various innovative projects aiming to launch products on the market in the short term.

The other two measures are related to the Phase III of the programme.

- The "Transport and Sustainable Mobility" section aims to support projects developed by enterprises based in the national territory and deploying technologies resulting from the work of public research laboratories on several priorities, among which "Cleaner and more efficient vehicles" and "Maritime and inland waterway transport".
- Innovation competition enabling repayable advances and subsidies of 1.7 million € to be granted to various innovative projects proposed by several SMEs ad start-ups engaged in developing innovative prototypes, in particular in the field of transport and sustainable mobility. Some of these innovations directly involve alternative fuels, such as rectification blocks for charging batteries, heat exchangers for cooling batteries and small hydrogen stations, magnetic charging systems or foils for electric boats.

5.10.5 *Additional information on alternative fuels infrastructure developments*

The French NIR contains some information on the changes in fuels use in the transport sector (see Table 5.10.5-1). Electricity and natural gas are foreseen to increase progressively in percentage use during the next decade while LPG present an almost constant trend. No data were provided for the waterborne transport mode.

Table 5.10.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Liquid fuels	99.4%	99.2%	99.1%	98.6%	96.4%	
	Electricity	0.2%	0.3%	0.3%	0.5%	1.7%	
	Natural gas	0.2%	0.3%	0.4%	0.6%	1.6%	
	LPG	0.2%	0.2%	0.2%	0.3%	0.3%	
	Total Road	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**99.95%**	

5.10.6 *Summary of the assessment*

Tabular overview

Table 5.10.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	103,989	12,589[1][2]		NA	NA	30[1]	181,706[1]
		Situation (2018)	200,250	15,306[1][2]		NA	NA	351[1]	156,323[1]
		Estimate (2030)	6,929,700	207,700[2]		NA	NA	NA	150,000
		Future share (2030) [%]	14.03%	0.42%					0.30%
		Estimate attainment (2018 vs 2030) [%]	2.89%	7.37%					104.22%
		Progress (2018)	adequate	slow					
Publicly accessible AF Infrastructure		Past situation (2016)	15,400	43[1]	1[1]	1[1]	0[1]	11[5]	1,700
		Situation (2018)	24,800	61[1]	20[1]	4	NA	20[3]	1,700
		Target (2030)	NA	285[4]	41[4]	NA	3[5]	400[4]	NA
		Target attainment (2018 vs 2030) [%]		21.40%	48.78%			5.00%	
		Progress (2018)	adequate	adequate	47.50%			2.31%	
Sufficiency Index		2016	6.75					2.73	106.89
		2018	8.07					17.55	91.95
		2020	17.61						
		2025						90.50	
		2030							
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	+	+	+	
	Policy measures + Deployment & manufacturing support	Score	H	M	M	L	L	M	L
		Comprehensiveness	C	C	C	C	N	C	N
		Impact	H	M	M	L	L	M	L
		Ambition (NIR vs NPF)	+	+	+	+	+	+	=
	RTD&D	Ambition (NIR vs NPF)	+					+	

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

[1] data from EAFO since the FR NIR did not provide this information; [2] natural gas (CNG+LNG) vehicles; [3] data from "VIG'HY l'observatoire de l'hydrogène" (https://www.vighy-afhypac.org/) since the FR NIR did not provide this information; [4] at least the value indicated since this SDMP2 target refers to 2028; [5] targets from the FR NPF.

The checklist shows that most of the requirements of Annex I from the Directive are covered by the French NIR. However, the quantitative information provided on future AFI and AFV objectives is not adequate in several cases: either lacking or provided for different years than the years required by the Directive (2020, 2025 and 2030), or provided for merged sets of alternative fuels (CNG and LNG treated in common as natural gas).

Regarding the combination of AF/AFV/AFI with transport mode, electricity and hydrogen are well covered, while natural gas (including biomethane), biofuels and LPG are partially covered for road transport; hydrogen is partially covered for rail transport; shore-side electricity supply and LNG are partially covered for waterborne transport; electricity supply for stationary airplanes is partially covered for air transport; all the other combinations are absent.

The main outcomes of the technical assessment of the French NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – France recorded a total of 200,250 electric vehicles and 24,800 publicly accessible recharging points in 2018. Compared to the NPF, the FR NIR presents a lower estimate for 2020 (-35.78%) but provides new estimates for 2025 and 2030. The situation foreseen in 2030 is of 6,929,700 EVs in use (of which 6,200,000 passenger cars, 710,000 LCVs, 12,000 HCVs and 7,700 buses and coaches). Instead, the FR NIR does not specifically provide infrastructure targets for 2020/2025/2030 but mentions a 2022 target set by the national government of 100,000 recharging points. The NPF had mentioned the target of 35,000 recharging points. The progress in 2018, calculated according to the assessment technology described in Section 2.1, is adequate both for EVs and recharging infrastructure. The ratio AFV to publicly accessible AFI is adequate for the period 2016-2018 but is foreseen to increase above 10 in 2020, becoming thus inadequate.
- **CNG** – Similarly to the NPF, the French NIR does not differentiate between CNG and LNG vehicles, presenting data for natural gas vehicles. According to EAFO, there were 15,306 natural gas vehicles in 2018 in France. In contrast to the NPF where natural gas vehicle estimates were absent, the FR NIR presents all the required vehicle estimates for the next decade: 11,600 for 2020, 97,800 for 2025 and 207,700 for 2030. The foreseen composition of the natural gas fleet in 2030 is 129,000 LCVs, 70,000 HCVs and 8,700 buses and coaches. The 2018 progress towards reaching the envisaged natural gas vehicle estimates results to be slow. According to EAFO, there were 61 CNG refuelling points in France at the end of 2018. As targets for the next decade, the FR NIR mentions only the Clean Mobility Development Strategy 2 proposal's targets (at least 121 CNG stations by 2023 and 285 by 2028). The FR NPF contained targets of 79 CNG refuelling stations for 2020 and of 116 for 2025. The 2018 progress towards reaching the envisaged CNG refuelling infrastructure targets results to be adequate. The sufficiency index for the CNG/road pair cannot be computed since the FR NIR provides only information on natural gas vehicles (CNG+LNG).
- **LNG** – Similarly to the NPF, the French NIR does not differentiate between CNG and LNG vehicles, presenting data for natural gas vehicles. According to EAFO, there were 20 LNG refuelling points in France at the end of 2018. As targets for the next decade, the FR NIR mentions only the Clean Mobility Development Strategy proposal's LNG infrastructure targets (at least 17 LNG stations by 2023 and 41 by 2028). The FR NPF contained a target of 25 LNG refuelling stations for 2025.
- **Hydrogen** – According to EAFO, there were 351 hydrogen-powered vehicles in use in France at the end of 2018. The FR NIR provides estimates of 235 vehicles (220 LCVs, 15 HDVs) by 2020 and 9,050 vehicles (8,700 LCVs, 350 HDVs) by 2025 while the FR NPF did not include any estimates. According to "VIG'HY l'observatoire de l'hydrogène"[46], there were 20 public hydrogen refuelling points in France at the end of 2018. As targets for the next decade, the FR NIR mentions only the total[47] hydrogen infrastructure targets from the Energy Transition Hydrogen Deployment Plan: 100 hydrogen stations by 2023 and 400 by

[46] https://www.vighy-afhypac.org/
[47] The plan does not specify differentiated targets between stations open to the public and those for captive fleets.

2028. The foreseen evolution represents a significant increase compared to the FR NPF target of 30 hydrogen refuelling stations for 2025.

- **Biofuels** – Information is not available in the FR NIR.
- **LPG** – According to EAFO, France recorded 156,323 LPG vehicles in use in 2018. The French NIR considers that in the next decade the situation will remain constant, estimating 150,000 vehicles (all passenger cars) to be in use. Regarding infrastructure, the French NIR provides the same value for the period 2016-2018 stating that LPG is sold in almost 1,700 refuelling stations. The NIR mentions that the current number of LPG refuelling points is capable of supplying 10 times more vehicles than the existing fleet.

Rail transport

- **Electricity** - Information is not available in the French NIR.
- **Hydrogen** - Through the Hydrogen Plan, the State will support the regions in funding the deployment of 15 hydrogen-powered trains foreseen to replace diesel trains functioning on non-electrified lines. This alternative is considered less costly than electrification work and the first trains should come into service in 2022.

Waterborne transport (maritime)

- **Electricity** - The French NIR notes that the port of Marseille has three existing supply points for five ferries operating between Corsica and the French mainland. For the future, a few projects are mentioned, like the South region's recent 'zero-fume stopovers' electrification scheme for all ferry quays by 2023 and for a supply for cruise ships in Marseille port by 2025, as well as the intention of Dunkirk's Grand Port Maritime to equip its container terminal with an 8 MW SSE supply point by the end of 2019 (to be supplemented by 2 other supply points if needed).
- **LNG** - Similarly to the NPF, no information is provided in the French NIR regarding LNG seagoing ships. As for LNG supply in the maritime ports, the FR NIR presents only information on the current situation without providing details on future targets. It mentions that all ports with LNG tanker terminals (Marseille-Fos, Dunkirk, and Nantes-Saint Nazaire) and the port of Le Havre (not having a terminal) currently offer LNG bunkering services by truck. The FR NPF had included a target of seven ports to provide LNG refuelling services by 2025.

Waterborne transport (inland)

- **Electricity** - The French NIR notes that some waterways, not included in the NPF targets, now offer or are installing SSE supply points. Vienne and Arles (on Rhône river) are provided as examples, having two high-power and seven medium-power SSE supply points. The French inland waterway network had at least 110 SSE supply points in 2019 (including 17 around the Seine basin and 91 in the Nord-Pas-de-Calais region). For the future, investments are foreseen for the Seine basin for installing nine SSE supply points, each accommodating two vessels.
- **LNG** - The FR NIR does not include any information on LNG refuelling supply while the FR NPF had provided a target of three inland ports offering LNG by 2030.

Air transport

- **Electricity** - The NIR only mentions that 11 main airports in France have pledged to reduce their fossil fuel consumption and that a 20% cut in emissions from aircraft on the ground by 2025 compared to the 2010 reference year is expected.
- **Biofuels -** The FR NIR mentions that a roadmap for the deployment of biofuels for aviation is under preparation. Sustainable aviation fuels will be deployed in France by adding them to conventional fuels, with targets of 5% by 2030 and 50% by 2050. As aviation biofuels are 'drop-in', their distribution at airport hubs will use existing logistics in order to limit their costs and carbon footprint.

Regarding the **measures**, the French NIR, similarly to the NPF, reports a solid policy package, consisting in 57 measures. The great majority of measures expresses an increase of ambition compared to the NPF, focusing more on zero-emission mobility. They cover a wide variety of types, several alternative fuels and all transport modes (with a focus on road).

The legal framework for alternative fuels is changing and improving in order to speed up the deployment of the related vehicles and infrastructure. The majority of legal measures refers specifically to infrastructure, and the most numerous cluster is electricity/road. Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR.

As for the Policy and Deployment & Manufacturing support measures, they cover all aspects of alternative fuels deployment: AF, AFV and AFI. The majority of the policy measures represent financial incentives (e.g. purchase incentives, scrappage scheme, different tax related incentives) and are in place in 2019. In line with the overall focus in promoting zero-emission mobility reported in the NIR for the recent years, the most numerous clusters are the electricity/road and hydrogen/road. The electricity/road cluster contains a comprehensive set of 23 NIR measures, displaying a high overall score and showing an increased level of ambition compared with the NPF. The hydrogen/road cluster is formed by a comprehensive set of 13 NIR measures, displaying a medium overall score and showing an increased level of ambition compared with the NPF. The newly introduced measures originate in the 2018 Energy Transition Hydrogen Deployment plan. In terms of expected impact of the Policy and Deployment & Manufacturing measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road results to have a high impact, the measures for the pairs CNG/road, LNG /road, hydrogen/road and electricity/water-maritime result to have a medium impact and all the other pairs result to have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all identified pairs with the exception of LPG/road.

The Research, Technological Development & Demonstration section contains general information on three main initiatives all being part of the "Investing for the Future programme": the "Vehicles and Transport of the Future" phase, the "Transport and Sustainable Mobility" section and an innovation competition for prototypes.

5.10.7 *Final remarks*

The French NIR provides a comprehensive report on the efforts to implement the Directive. The NIR is largely in line with the provisions of Annex I to the Directive. However, due a lack of some data this assessment draws on information taken from the French Clean Mobility Development Strategy for 2023 and 2028 targets. Moreover, the French NIR only estimates the number of nature gas vehicles, without distinguishing between CNG and LNG. Some clarifications on the numerical data provided in the NIR will be relevant. A significant number of measures are being implemented in France to promote alternative fuels in all transport mode, but with a special focus on electro-mobility. Further detail on measures promoting fuels uptake in other modes of transport would be beneficial.

With regard to electricity, the NIR estimates that approximately 6,930,000 electric vehicles could be on the roads by 2030, representing about 14% of the fleet by that time. Taking into account the current situation and expected trend development, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary to complete the full transition to carbon neutrality by 2050. The NIR plans for 100,000 publicly accessible recharging points (target of 2022) for a fleet of some 2,234,000 electric vehicles by 2025. However, no estimates are provided for recharging points in 2030. Information on charging efficiency is provided. The NIR reports that shore-side electricity supply is supplied in certain maritime and inland ports but it lacks aggregated data at national level. There is hence a lack of consistent information to assess whether all ports of the TEN-T Core Network will be equipped with these facilities at a certain point in time, or not. Further information should be provided in future reporting on the electricity supply in airports to stationary aircraft and on the further electrification of railways.

Regarding hydrogen for transport, the NIR reports a small fleet of 351 FCHVs and 20 hydrogen refuelling stations in 2018. According to the French Clean Mobility Development Strategy for 2023 and 2028, 100 hydrogen refuelling stations and about 9,000 FCHVs are estimated by 2025 and a more ambitious target of 400 hydrogen-refuelling points is estimated by 2028. The number of refuelling stations seem to be sufficient considering the length of the TEN-T Core Network, provided that the refuelling stations are widely distributed along the network. SNCF plans to put into service 15 hydrogen power trains on non-electrified lines.

In terms of natural gas for transport, the NIR expects 285 CNG refuelling points by 2028. Further, 41 LNG refuelling points are estimated by 2028. These numbers seem sufficient taking into the length of the French TEN-T Core Network, provided that the refuelling stations are widely distributed along the network. The NIR targets a fleet of 207,700 CNG and LNG vehicles by 2028. The basic infrastructure in place seems largely sufficient. All ports with LNG tanker terminals (Marseille-Fos, Dunkirk, and Nantes-Saint Nazaire) and the port of Le Havre (not having a terminal) currently offer LNG bunkering by truck, but no estimates are provided for the future nor for inland ports.

As for LPG, a fleet of around 150,000 will remain stable over the next decade. A network of 1,700 refuelling stations already exists. No future estimates are provided in the NIR.

A roadmap for the deployment of biofuels for aviation is under preparation. France intends to deploy sustainable aviation fuels by mandating blending with kerosene at a rate of 5% by 2030 and 50% by 2050.

5.10.8 *ANNEX - Description of the Member State*

On a surface area of 633,100 km², France has a population of 66.926 million people in 2018, which makes up for a population density of 106 inhabitants/km².

Number of main urban agglomerations

- 69 urban agglomerations > 50,000 inhabitants

In 2018, France achieves a per capita gross domestic product at market prices of €34,980, which represents a per capita gross domestic product in purchasing power standards of 104 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in France is 5,283 km. The total road network length is 398,605 km, of which 11,671 km are motorways.

The following lengths of the TEN-T Road Corridors are present in France: 13% (767 km) of the Mediterranean Corridor, 36% (1,583 km) of the Atlantic Corridor, 38% (1,611 km) of the North Sea –Mediterranean Corridor, 0.4% (18 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, France is connected with the following Member States:

- Germany (through the Rhine - Danube Corridor)
- England (through the North Sea -Mediterranean Corridor)
- Belgium (through the North Sea - Mediterranean Corridor)
- Luxembourg (through the North Sea - Mediterranean Corridor)
- Spain (through the Mediterranean and the Atlantic Corridor)
- Italy (through the Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, France accounts for 41,895,886 registered road vehicles of which 32,034,000 are categorized as passenger cars, 6,179,771 as light goods vehicles, 547,604 as heavy goods vehicles and 100,511 as buses and coaches. The motorisation rate is 479 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 8 maritime ports in the TEN-T Core Network (Bordeaux, Calais, Dunkerque, Le Havre, Marseille, Marseille-Fos-sur-Mer, Nantes Saint-Nazaire, Rouen)
- 19 maritime ports in the TEN-T Comprehensive Network
- 11 inland ports in the TEN-T Core Network (Chalon-sur-Saône, Dunkerque, Le Havre, Lille, Lyon, Marseille-Fos-sur-Mer, Metz, Mulhouse-Ottmarsheim, Paris, Rouen, Strasbourg
- 10 inland ports in the TEN-T Comprehensive Network

Number of airports in the TEN-T Core Network

- 8 airports in the TEN-T Core Network
- 19 airports in the TEN-T Comprehensive Network

5.11 Croatia (HR)

5.11.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Croatian NPF the Commission concluded:

The Croatian NPF addresses most of the requirements of Article 3. It contains a comprehensive discussion of the current state, but a somewhat limited discussion of future scenarios for most alternative fuels in the transport sector. For all fuels and some modes, it establishes targets as required by Article 3 of the Directive. The NPF does not contain concrete measures to encourage and facilitate the deployment of recharging points not accessible to the public.

The NPF does not contain vehicle estimates for the future deployment of EVs. The given recharging points target and especially high power recharging infrastructure seems to cover the needs of electric vehicles in terms of number of publicly accessible recharging points as well as minimum coverage requirements in Croatia in 2020. The NPF does neither consider electricity supply for stationary airplanes nor shore-side electricity.

The NPF does not contain vehicle estimates for the future deployment of CNG vehicles. Croatia currently has a sufficient network of CNG refuelling points when compared to CNG vehicles, but it does not meet the minimum coverage requirements. Regarding the 2025 minimum coverage target in terms of distance requirements, the existing measure for the deployment of CNG refuelling points seems sufficient. Croatia already counts a high number of CNG buses and future promotion of CNG vehicles for public transport is foreseen.

The Croatian NPF plans two LNG refuelling points for heavy-duty vehicles in road transport until 2025 and seven until 2030. Moreover, the NPF plans one LNG refuelling point in maritime transport in 2025 and seven until 2030. Furthermore, two LNG refuelling points for inland waterways are planned until 2030. It is not specifically stated in the NPF whether the inland waterways and maritime LNG refuelling points will be accessible for LNG heavy-duty vehicles. In case they are accessible, Croatia would meet the minimum distance requirement of one LNG refuelling point every 400 km on the road TEN-T Core Network in 2025.

The NPF does not consider hydrogen for transport.

The Croatian NPF contains a list of measures with a low impact score on overcoming deployment barriers in electro-mobility, CNG and LNG vehicles and infrastructure deployment. Only measures concerning electro-mobility are considered comprehensive. Most of the existing or planned measures end in 2018 or earlier, with no prolongation explicitly stated. The majority of measures stated in the NPF could not be assessed due to the limited information provided.

Croatia considered local authorities and stakeholders' interest, and coordinated the NPF with the local authorities. Moreover, Croatia cooperated with many Member States in projects concerning electro-mobility and LNG infrastructure deployment.

5.11.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.11.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport/Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne (maritime), /electricity, biofuel(s)	Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne (inland), /electricity, CNG, LNG, LPG, H2	Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network		N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road/electricity, CNG, LNG, H2	Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.		N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.	All / All	Y
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, waterborne (maritime)/ biofuels	Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030		N
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road /electricity, CNG, LPG	Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road /electricity, CNG, H2 LPG	Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points		N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / CNG, LNG, LPG	Y

The checklist shows the requirements of Annex I from the Directive that are covered in the Croatian NIR.

The HR NIR does not provide AF vehicle estimates for 2020, 2025 and 2030, and presents AFI targets only for electricity/road, CNG/road, hydrogen/road and only for 2020. Electricity is partially covered also for waterborne transport, both maritime and inland. Other combinations AF/transport mode, are either just mentioned or not reported at all.

The Croatian NIR reports a long list of legal initiatives, but provide assessable information only on around 33 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify seven AF/transport mode clusters of measures, of which five were assessable.

5.11.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.11.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	792	315	NA	515	NA	NA	NA	NA
	Change NIR vs NPF [%]				73.99%				
	Attainment [%]				61.17%				
CNG / road	NIR	338	2	NA	3	NA	NA	NA	NA
	Change NIR vs NPF [%]				-76.92%				
	Attainment [%]				66.67%				
LNG / road	NIR	NA	NA	NA	1	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	NA	1	NA	2	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]				50.00%				
LPG / road	NIR	61,558	557	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.11.3.1 Road transport

The Croatian NIR provides no vehicle estimates for the next decade and, concerning infrastructure, it presents quantitative AFI targets for electricity CNG, LNG and hydrogen only for the year 2020.

The HR NIR states that Croatia had set aside a dedicated budget until 2030 in order to reach the minimum share of AF vehicles, which is 1% of all vehicles registered. This includes vehicles powered by electricity, CNG/CBG, LNG/LBG and hydrogen, and the funds to reach the goal will be distributed by co-financing mechanisms.

5.11.3.1.1 Electricity

Vehicles

Croatia recorded 792 battery-electric and plug-in hybrid electric vehicles in use in 2018 (see Table 5.11.3-1), of which 693 were passenger cars, 96 LCVs and 3 battery-electric buses and coaches. There are no electric HCVs recorded in Croatia in 2018. Similarly to the NPF, the Croatian NIR does not provide EV estimates for any vehicle category for 2020, 2025 or 2030. The EV numbers available for 2016, 2017 and 2018 show a moderate positive trend in the new EVs in the national fleet mix, however, still very low compared to the overall fleet, with only 0.04% in 2018.

As the NIR did not provide future vehicle estimates, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Croatia recorded 315 public recharging points in 2018 (Table 2), of which 45 normal power (≤22kW) and 270 high power (>22kW) recharging points (>22kW). This is more than the NPF target of 296 for 2020. The new NIR target of 515 publicly accessible recharging points for 2020 is almost 74% higher than the NPF target. While the NPF had set targets for both 2025 and 2030, which were 602 and 806 public recharging points respectively, the NIR does not state 2025 and 2030 targets.

The 2018 ***attainment*** of future public recharging infrastructure targets is 61.17% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Croatia is equal to 54%.

Ratio

Based on the HR NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. Since there are no estimates provided for the future, the sufficiency index could only be computed for the 2016 - 2018 period. It is considered adequate since it is inferior to the threshold value of 10.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	4.23	2.95	2.51			

Information on charging efficiency

Information is not available in the HR NIR.

5.11.3.1.2 CNG

Vehicles

Croatia reported 338 CNG vehicles in use in 2018, of which 133 were passenger cars, 96 LCVs, 9 HCVs and 100 buses and coaches. As in the NPF, there are no estimates in the HR NIR for 2020, 2025 and 2030 on CNG vehicles. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Croatian NIR indicates that two publicly accessible CNG refuelling points were in use in 2018. The NPF had CNG AFI targets for 2020 and 2025, while the HR NIR shows only the 2020 target (three publicly accessible CNG refuelling points for 2020, which is nearly 77%% lower than in the NPF, plus two private) but no targets for 2025 or 2030, thus reflecting a decreased ambition.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 66.67% for 2020. According to the assessment methodology described in Section 2.1, the 2018 level of ***progress*** cannot be evaluated, because the future 2020 target is only one unit above the number of CNG refuelling points in 2016. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible CNG refuelling infrastructure evolution planned by Croatia is equal to 11%.

Ratio

Based on the Croatian NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. Since there are no estimates provided for the future, only 2016-2018 sufficiency index can be calculated, and it is considered adequate since it is inferior to the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	133.00	162.00	169.00			

5.11.3.1.3 LNG

Vehicles

Similarly to the Croatian NPF, there is no information provided about LNG vehicles in the Croatian NIR. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Croatian NIR provides no information about 2016 to 2018 public refuelling points but presents a target of one LNG refuelling station for 2020. This represents a different scenario compared to the NPF that had not provided a target for 2020, but had provided targets for 2025 and 2030, of two and seven LNG refuelling points respectively, with a possibility of increasing facilities if a higher demand was present.

Since at the end of 2018 there are no road LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Since there are no LNG vehicles in the HR NIR, either recorded or estimated, it is not possible to compute the sufficiency index.

5.11.3.1.4 Hydrogen

Vehicles

There were no hydrogen vehicles recorded in Croatia in 2018. The Croatian NIR mentions that for 2030 all AF vehicles will reach at least 1% of the total fleet, including vehicles running on hydrogen. In relation to this goal, the Croatian NIR clarifies that no concrete actions have yet been taken specifically on hydrogen vehicles. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Croatian NIR reports one publicly accessible hydrogen refuelling point in use in 2018. The target for 2020 is equal to two, while no 2025 or 2030 targets are provided. The NPF had not provided targets for 2020 or 2025, however it had provided a target for 2030, which could have been 1 or 2, depending on the demand.

The 2018 ***attainment*** of future publicly accessible hydrogen refuelling infrastructure targets is 50% for 2020. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Croatia for publicly accessible hydrogen refuelling infrastructure deployment from 2016 until 2018 versus the period 2016-2030 could not be computed because the 2030 target is not provided.

Ratio

Since there are no hydrogen vehicles in the HR NIR, either recorded or estimated, it was not possible to compute the sufficiency index.

5.11.3.1.5 Biofuels

The creation of a plan to develop the market for biofuels until 2030 affecting both AFI and AFV has been announced, and a significant effort in the research of third generation biofuels is noted.

Vehicles

Information is not available in the Croatian NIR.

Infrastructure

Information is not available in the Croatian NIR.

5.11.3.1.6 LPG

Vehicles

Croatia reported 61,558 LPG vehicles in use in 2018 (Table 5.11.3-1), of which 60,527 were passenger cars and 1,031 LCVs. There are no future estimates for the LPG vehicles. The HR NIR does not mention LPG as a desirable AF in the national fuel mix by the year 2030.

Due to the lack of future estimates, the 2018 ***progress*** and ***attainment*** could not be computed.

Infrastructure

Croatia reported 557 publicly accessible LPG refuelling points in use in 2018. According to EAFO, Croatia recorded 550 LPG refuelling points in 2016. No future targets are provided in terms of publicly accessible LPG refuelling points and, therefore, the 2018 ***progress*** and ***attainment*** could not be computed. The HR NIR does not mention LPG as a desirable AF in the national fuel mix by 2030.

Ratio

Based on the HR NIR and EAFO, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road. The sufficiency index could only be computed for 2016 and 2018.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	108.46*		110.52			

* Value of LPG AFI taken from EAFO

5.11.3.2 Rail transport

5.11.3.2.1 Electricity

Vehicles

Information is not available in the Croatian NIR.

Infrastructure

Information is not available in the Croatian NIR.

5.11.3.3 Waterborne transport (maritime)

No specific AF vessels estimates are provided for the future years, however a dedicated measure implies the conversion of obsolete fossil fuel vessels to different AF propulsion systems both in maritime and inland waterways by 2030.

5.11.3.3.1 Electricity

Vessels

The HR NIR reported one electric seagoing ship in 2018. Similarly to the NPF, the NIR does not provide any specific numerical estimates for the next decade.

Infrastructure

Information is not available in the Croatian NIR. The NPF had provided a target of three shore-sided electricity supplies for seagoing ships in maritime ports by 2025, but this is absent in the HR NIR.

5.11.3.3.2 LNG

Vessels

Information is not available in the Croatian NIR.

Infrastructure

The Croatian NIR explains that the LNG terminal mentioned earlier under the road/LNG section and targeted for 2020, will be used by both maritime and road transport. The NPF had presented a target of one refuelling point for 2025 and seven for 2030, but the NIR does not provide confirmation of this plan.

5.11.3.4 Waterborne transport (inland)

5.11.3.4.1 Electricity

As already mentioned in Section 5.11.3.3, the HR NIR mentions a dedicated measure concerning the conversion of obsolete fossil fuel vessels to different AF propulsion systems both in maritime and inland waterways by 2030.

Vessels

Croatia reported two electric vessels in 2018, used for touristic purposes in inland waterborne transport. No specific estimates are provided for the future years.

Infrastructure

The HR NIR does not state any current numbers or future targets regarding shore-side electricity supply. The NPF had reported two shore-side electricity supplies in inland ports in 2016, and a target of four for 2020, bur these numbers have not been confirmed in the HR NIR.

5.11.3.4.2 LNG

Vessels

Information is not available in the Croatian NIR.

Infrastructure

The NPF had presented a target of two refuelling points for 2030, but the NIR does not provide confirmation of this plan.

5.11.3.5 Air transport

5.11.3.5.1 Electricity

No specific information on electric airplanes/infrastructure was found in the Croatian NIR.

5.11.3.5.2 Biofuels

The Croatian NIR does not provide specific information related to the use of biofuels in aviation.

5.11.4 *Measures assessment*

The Croatian NIR provides a portfolio of measures with a long list of legal initiatives, addressing different modes of transport and all the major alternative fuels to a certain degree. They cover a wide variety of combinations AF/transport mode, however they mostly focus on electricity and road transport. Noteworthy is the special attention of RTD&D measures towards advanced biofuels.

5.11.4.1 Legal measures

The Croatian NIR provides information on the national legal framework for the deployment of alternative fuels infrastructure by listing the relevant existing legislation elements (16 legal acts, 71 implementing regulations) and by mentioning seven strategic documents (national plans and strategies). Additionally, the HR NIR goes in details regarding three areas in which future legislation is foreseen (described in the next section) and five administrative measures. The three legislative & regulatory measures were also covered by the NPF, however the NIR provides an updated version and continuation of them, increasing their level of ambition.

5.11.4.1.1 Legislative & Regulatory

The three legal measures described in details in the Croatian NIR belong to the legislative & regulatory category and cover different transport modes. One measure addresses the overall integration of renewable energy sources in the 10-year national energy and climate plan, with the RES reaching the share of 13.2% in the overall Croatian transportation final energy consumption by 2030, following the legal restrictions laid down in the plan.

The second legal measure aims at legislative adjustments to increase the development of AFI and to promote the deployment of clean and energy efficient vehicles in all transport modes. In particular, for road transport, it aims to achieve a share of energy efficient purchased vehicles of 37% light commercial vehicles, 13% heavy commercial vehicles and 65% buses, achieved under the sustainable procurement act at a national level. The HR NIR mentions the intention to transpose in national legislation parts of several EU Directives (i.e. Directive 2018/2001/EU on the promotion of the use of energy from renewable sources, Directive 2019/1161/EU on the promotion of clean and energy-efficient road transport vehicles, Directive 2018/844/EU amending the Energy Performance of Buildings Directive).

The third measure aims at providing an action plan that lays down a policy for the promotion and use of biofuels in Croatia: assessment of the current situation, long-term objectives, targeted biofuels market and further measures to promote production and use of biofuels until 2020.

5.11.4.1.2 Administrative

The Croatian NIR contains five administrative measures, all applicable at national level. Out of these five measures, three measures are related to road transport and two concern a combination of different modes. Mostly, they are addressing the compliance with relevant EU and international standards and producing different plans and acts for classifications of the AFV performances. It is important to note that one measure is currently existing and four measures are either planned or in the process of adoption. These four measures address directly the AFs and AFVs, while the one measure currently existing is not directly related, as it deals with the training of truck drivers on eco-driving.

5.11.4.2 Policy measures

The Croatian NIR reports 19 policy measures intended to foster alternative fuels in Croatia. This is an improvement compared to the NPF, which contained nine policy measures. Most policy measures in the Croatian NIR are financial incentives.

5.11.4.2.1 Measures to ensure national targets and objectives

All the 19 policy measures in the Croatian NIR are measures that aim to ensure national targets and objectives.

Nine measures target AFVs, two target AFI, two target AFs and the rest target combinations of AF/transport modes. Road transport is the most covered, and to a lesser extent waterborne transport inland and other combinations. One of the most significant measures to directly incentivise the purchase of EVs and the construction of recharging infrastructure saw a considerable increase of budget, compared to the same measure in the NPF, which shows a positive ambition towards electrification of road vehicles.

Some measures from the NPF appear to be implemented in the NIR. They include purchasing of a smaller amount of AFVs and installing AFIs in national parks, nature parks, small islands etc. When assessed as single measures they do not significantly contribute to the overall target achievement, but are in themselves an indicator of good ambition and positive trend towards electro-mobility in touristic areas and areas of specific nature reserves.

Out of the 19 measures, two measures listed in the Croatian NIR can be seen as exceptions as they do not directly address AFI or AFV, but are rather indirect measures that aim to promote different modes of transport, increase fluidity of traffic by better optimising ICT solutions and an incentive programme for combined goods transport in order to decrease GHG, fuel consumption and increase safety.

5.11.4.2.2 Measures that can promote AFI in public transport services

The Croatian NIR does not list any measure to promote AFI in public transport services.

5.11.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The Croatian NIR does not list any measure to promote the deployment of private electro-mobility infrastructure.

5.11.4.3 Deployment and manufacturing support

5.11.4.3.1 AFI deployment

The Croatian NIR lists five measures to support the deployment and manufacturing of alternative fuels. All these five measures are listed under a specific cluster in the NIR, which started the implementation in 2017 with a dedicated budget of approximately €663,000 and aims at the deployment of AFI for electricity. They are related to the construction of fast recharging stations/points at the following localities: municipality of Pisarovina, municipality of Radoboj, town of Rab, island of Ugljan and the city of Zagreb. Since no end year was provided, it is fair to assume the construction of these stations has been finalised and the stations are in use. These measures are present only in NIR and this is considered to show a positive ambition towards electro-mobility in small, medium and large cities, along with the availability of publicly recharging stations on the remote islands of Ugljan and Rab.

The Croatian NIR does not consider any other alternative fuel besides electricity in this section.

5.11.4.3.2 Support of manufacturing plants for AF technologies

No measures regarding the support of manufacturing plants for AF technologies are present in the Croatian NIR.

5.11.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

The Croatian NIR highlights the need for financial incentives in the initial phase of AFI deployment. It is clear from the NIR that a dedicated measure and budget mark the necessary first step for the development of the market, foreseeing the co-financing of the AFI construction in order to reach at least the minimum coverage criteria laid down by the main text of the Directive. The measure is set to last from 2019 until 2030 with a budget of approximately 49 million € in that period.

5.11.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.11.4-1 presents an overview of the analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. In total, seven clusters of measures were identified, of which five resulted assessable. No clusters of measures have emerged for LNG for inland waterborne transport, nor for rail or air transport.

All the five assessable clusters of measures get a high overall score, but only the one for the pair electricity/road results to be comprehensive. The clusters for the pairs electricity /water (both maritime and inland) are not assessable. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the partial or total lack of future targets and estimates does not allow putting this assessment into perspective. Based on the impact seen during the implementation period, for the future it can be said that the measures for the pair electricity/road might have a high impact, those for the pairs CNG/road, LNG/road, LNG/water-maritime and hydrogen/road might have a medium impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has generally increased for all the identified clusters.

Table 5.11.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	H	N	**M**	+
LNG	Road	H	N	**M**	+
	Water - maritime	H	N	**M**	=
	Water-inland				
H2	Road	H	N	**M**	+
Electricity	Water - maritime	X			+
	Water - inland	X			+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'.

5.11.4.5 Research, Technological Development & Demonstration

The Croatian NIR lists four RTD&D measures/projects. Since all of the measures are newly introduced in the NIR, it is not possible to compare the nature of the projects with the three RTD&D projects that were presented in the NPF. Out of these four new RTD&D projects, three are targeting biofuels production while the other is a promotional research project/campaign concerning solar powered vehicles. Two RTD&D measures are already in place with dedicated staff and budget. Both are addressing advanced biofuels (third generation biofuels) production in Croatia: one research project investigates the potential of Adriatic algae in third generation biofuel production, while the second one is broader and targets to produce 3.5% of advanced biofuels in transport from domestic feedstock by the year 2030. Finally, the third measure is planned to start in 2021 and aims to develop the market for advanced biofuels and to put in place the corresponding legal acts. The end result of this final measure is to set up a model for promoting and developing the market for biofuels in transport and designing funding instruments for projects regarding biofuels.

5.11.5 *Additional information on alternative fuels infrastructure developments*

The Croatian NIR provided (partial) information suggesting that, until 2018, the percentage of the AFs in the total national fuel mix was 3.10%. The NIR does not provide past or future data on electricity, biofuels or hydrogen. The NIR estimates that CNG in road transport will grow from 0.10% in 2018 to 1% in 2025 and then to 3% in 2030. LNG for road use will increase from 0% in 2018 to 0.1% in 2020, to 1.5% in 2025, and up to 5% in 2030. Unlike CNG and LNG, the NIR foresees for LPG a constant share 3% from 2018 until 2030 (Table 5.11.5-1).

Table 5.11.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline						
	Diesel						
	Electricity						
	CNG	0.10%	0.10%	0.10%	0.10%	1.00%	3.00%
	LPG	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
	Other AF (LNG)	0.00%	0.00%	0.00%	0.10%	1.50%	5.00%
	Total Road	**3.10%**	**3.10%**	**3.10%**	**3.20%**	**5.50%**	**11.00%**
Maritime	Marine diesel oil	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

5.11.6 *Summary of the assessment*

Tabular overview

Table 5.11.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	389	266	NA	NA	NA	NA	59,652
		Situation (2018)	792	338	NA	NA	NA	NA	61,558
		Estimate (2030)	NA	NA	NA	NA	NA	NA	NA
		Future share (2030) [%]							
		Estimate attainment (2018 vs 2030) [%]							
		Progress (2018)							
Publicly accessible AF Infrastructure		Past situation (2016)	92	2	NA	NA	NA	0	550*
		Situation (2018)	315	2	NA	NA	NA	1	557
		Target (2030)	NA	NA	NA	NA	NA	NA	NA
		Target attainment (2018 vs 2030) [%]							
		Progress (2018)	fast						
Sufficiency Index		2016	4.23	133.00					
		2018	2.51	169.00					110.52
		2020							
		2025							
		2030							
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	=			
	Policy measures + Deployment & manufacturing	Score	H	H	H	H		H	
		Comprehensiveness	C	N	N	N		N	
		Impact	H	M	M	M		M	
		Ambition (NIR vs NPF)	+	+	+	=		+	
	RTD&D	Ambition (NIR vs NPF)	+						

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Value taken from EAFO (absent in NIR)

The Croatian NIR contains a sufficient description of the policy direction towards the introduction of alternative fuels in Croatia. The NIR however completely lacks the estimation of the number of AFVs for 2020, 2025 and 2030, similarly to the NPF. It does establish the 2020 targets for the AFI in detail for the majority of AFs, but it does not provide any targets for 2025 and 2030, unlike the NPF report that indeed had provided targets for the majority of AFs in 2020, 2025 and in 2030. Most of the measures address electricity in detail, with other AFs being covered in a 10-year plan, except LPG. The plan is rather generic, but it contains budget description and the authorities responsible for enforcing the deployment of AFs, signalling a positive ambition towards the achievement of the national plan.

The main outcomes of the technical assessment of the Croatian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Croatia recorded 792 battery-electric and plug-in hybrid electric vehicles in use in 2018, of which 693 were passenger cars, 96 LCVs and 3 battery-electric buses and coaches. There were no electric HCVs recorded in Croatia in 2018. The Croatian NIR does not estimate the EVs for any vehicle category for 2020, 2025 or 2030, thus the progress and attainment could not be computed. Croatia recorded 315 publicly accessible recharging points in 2018, out of which 45 were normal power (≤22kW) and 270 high power points (>22kW). The NPF had set targets for 2020, 2025 and 2030, but the NIR does not mention any 2025 and 2030 targets. As for 2020, the NIR target of 515 for publicly accessible recharging points is 74% higher than the NPF target of 296 recharging points. The 2018 progress for AFI was fast, the sufficiency index in 2018 was adequate.

- **CNG** – Croatia reported 338 CNG vehicles were in use in 2018, out of which 133 were passenger cars, 96 LCVs, 9 HCVs and 100 buses and coaches. There are no estimates in the NPF nor in the NIR for 2020, 2025 and 2030 of CNG vehicles. The Croatian NIR indicates that two publicly accessible CNG refuelling points were in use in 2018. It also reports a target of three CNG publicly accessible refuelling points for 2020, but no targets for 2025 or 2030. The NPF had CNG AFI targets for 2020 and 2025, while the HR NIR shows only the 2020 target, which is 77 % lower than in the NPF, thus reflecting a decreased ambition.
- **LNG** – Like in the NPF, there is no information about LNG vehicles in the HR NIR, which also provides no information about 2016 to 2018 AFI, but does provide the target for 2020, which is one LNG refuelling station. The NPF target for 2020 had not been provided, however the 2025 target was of two LNG refuelling points and the 2030 target was of seven refuelling points.
- **Hydrogen** – The Croatian NIR does not report any information on existing or future hydrogen vehicles; it only mentions that, as a part of a global 2030 target, all AFVs will reach 1% of the total fleet, including vehicles running on hydrogen. The HR NIR informs that there was one hydrogen publicly accessible refuelling point in use in 2018. The target for 2020 is equal to two, while no 2025 or 2030 targets are provided. The NPF had no targets for 2020 nor 2025 publicly accessible hydrogen refuelling points, however it did provide a tentative target for 2030 which was stated to be one or two, depending on the demand.
- **Biofuels** – The Croatian NIR only mentions that, as a part of a global 2030 target, all AFVs will reach 1% of the total fleet, including vehicles running on biofuels, but it is not specified which biofuels and in what amount. The preparation of a plan to develop the market for biofuels is envisaged until 2030, and will affect both the AFI and AFV.
- **LPG** – Croatia reported 61,558 LPG road vehicles in use in 2018, of which 60,527 were passenger cars, and 1,031 LCVs. No future estimates for the LPG vehicles are reported in the HR NIR. Croatia reported 557 publicly accessible LPG refuelling points in use in 2018. No future targets are provided in terms of publicly accessible LPG refuelling points.

Rail transport

- **Electricity** – The HR NIR does not address rail electrification.

Waterborne transport (maritime and inland waterway)

- **Electricity** – Croatia reported three electric vessels in service in 2018, used for touristic purposes. No specific targets are provided for the future years, however a dedicated measure implies the conversion of obsolete fossil fuel vessels to different AF propulsion systems both in maritime and inland waterways by 2030, including electricity. The Croatian NIR does not provide any information on shore-side electricity supply. The NPF had reported two shore-sided electricity supplies in 2016 in inland ports, and for 2020 a target of four supplies in inland ports and of three shore-sided electricity supplies in maritime ports.
- **LNG** – The Croatian NIR does not provide any LNG vessel estimate. It presents a target of one LNG terminal that will be used by maritime and road transport from 2020. While the NPF had presented a target of one maritime refuelling point for 2025, and of seven refuelling points in maritime ports and two in inland ports in 2030, the NIR does not provide any targets in that aspect.

Air transport

- **Electricity/Biofuels** - The Croatian NIR does not specifically provide targets.

The Croatian NIR provides a list of **measures** related to road transport and all the major alternative fuels (to a certain degree), however mostly focusing on electricity and road transport. Waterborne transport (both maritime and inland) is also covered. The portfolio consists of a total of 33 assessable measures addressing several, but not all, provisions of the Annex 1 of the Directive. A significant number of the measures in place target either AFV public procurement, national co-funding scheme for electricity, or recharging infrastructure deployment. Furthermore, the Croatian government emphasises two general measures with dedicated budget addressing the deployment of AFI and AFV until 2030. These measures provide significant budget and aim to reach 2030 target set by the Croatian energy and climate plan. Concerning the Policy and Deployment & Manufacturing measures, seven clusters were identified, of which five were assessable. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the partial or total lack of future targets and estimates does not allow putting this assessment into perspective. Based on the impact seen during the implementation period, it can be said that future measures for the pair electricity/road might have a high impact, those for the pairs CNG/road, LNG/road, LNG/water-maritime and hydrogen/road might have a medium impact.
There are four RTD&D measures addressing the research for AFs, in particular advanced biofuels production in Croatia, showing a positive ambition towards a national target of 3.5% biofuels production from the domestic feedstock.

5.11.7 *Final remarks*

The Croatian NIR provides a rather limited report on the efforts to implement the Directive. It partially meets the requirements of Annex I to the Directive and lacks information regarding vehicles and vessel estimates while providing infrastructure targets for road transport with regard to electricity, natural gas and hydrogen for 2020. In terms of measures, the Croatian NIR provides a rather comprehensive portfolio related to road transports, however mostly focusing on electricity. Waterborne maritime transport is also covered, but in a more discrete manner, while waterborne inland transport is not covered. With regard to air transport, Croatia announces the elaboration of a plan to decarbonise air transport. In future reports, Croatia should strengthen information on targets and measures promoting uptake of zero-emission vehicles infrastructures. The targets for the required coverage of publicly accessible infrastructure need to be established, where the number of alternative fuels vehicles and infrastructure are adequately quantified and reported for the different modes of transport.

Regarding electricity, Croatia recorded 792 battery-electric and plug-in hybrid electric vehicles in use in 2018. The NIR does not estimate the electric vehicles for any vehicle category for the target years of 2020, 2025 and 2030. As for infrastructure, Croatia recorded 315 publicly accessible recharging points in 2018. The NPF had set targets for 2020, 2025 and 2030, but the NIR does not mention any targets for 2025 and 2030. Croatia has considerably increased its ambitions for 2020 in the NIR compared to the NPF, but the lack of data prevents the assessment of ambition for 2030. Croatia should provide more information in future reporting in this regard. No information on charging efficiency is provided. Concerning waterborne transport, Croatia reported two electric vessels in service in 2018 used for touristic purposes and one electric seagoing ship. No specific targets nor information on shore-side electricity supply are provided for the target years of 2025 and 2030. However, a measure conveys the intention to promote different alternative fuel propulsion systems both in maritime and inland waterways by 2030, including electricity supply. The NIR does neither provide information on the supply of electricity to stationary aircraft nor on the further electrification of railways.

For hydrogen, the NIR does not report any information on existing or future deployment of FCHVs. It reports one hydrogen refuelling point for 2018 and another one planned for 2020. Although hydrogen is not binding under the Directive, it would be relevant that Croatia provides more information on how to ensure EU-wide connectivity for HCEV.

Croatia reported 338 CNG vehicles in use in 2018, without estimates in the NIR nor in the NPF for 2020, 2025 and 2030. In terms of infrastructure, the NIR indicates that two publicly accessible CNG refuelling points were in use in 2018 and sets a target of three CNG publicly accessible refuelling points for 2020. The NIR does not set targets for 2025 or 2030 and shows a decreased ambition in comparison to the NPF. Regarding LNG, the NIR does not contain information on vehicle and vessels estimates nor on infrastructure. For 2020, the NIR only foresees one LNG refuelling point. In this respect, Croatia needs to provide further information on its future planning.

On LPG, Croatia reported 61,558 vehicles and 557 refuelling points in 2018. No future vehicle estimates or infrastructure targets were provided.

Further information should be provided on the consumption of biofuels in road and air transport. Croatia should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.11.8 *ANNEX - Description of the Member State*

On a surface area of 56,600 km², Croatia has a population of 4.105 million people in 2018, which makes up for a population density of 73 inhabitants/km².

Number of main urban agglomerations

- 7 urban agglomerations > 50,000 inhabitants

In 2018, Croatia achieves a per capita gross domestic product at market prices of €12,620, which represents a per capita gross domestic product in purchasing power standards of 63 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Croatia is 1,107 km. The total road network length is 17,800 km, of which 1,310 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Croatia: 6% (315 km) of the Mediterranean Corridor.

Through the TEN-T Road Corridors, Croatia is connected with the following Member States:
- Hungary (through the Mediterranean Corridor),
- Slovenia (through the Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Croatia accounts for 2,007,817 registered road vehicles of which 1,666,413 are categorized as passenger cars, 137,049 as light goods vehicles, 44,355 as heavy goods vehicles and 5,700 as buses and coaches. The motorisation rate is 406 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 1 maritime port in the TEN-T Core Network (Rijeka)
- 6 maritime ports in the TEN-T Comprehensive Network
- 2 inland ports in the TEN-T Core Network (Slavonski Brod, Vukovar)
- 2 inland ports in the TEN-T Comprehensive Network

Through the 541 km inland waterways TEN-T Core Network, Croatia is connected with Hungary by the Rhine – Danube Corridor.

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Zagreb)
- 6 airports in the TEN-T Comprehensive Network

5.12 Italy (IT)

5.12.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Italian NPF, the Commission concluded:

The Italian NPF fully addresses the requirements of Article 3. It contains an extensive discussion of the current state and future scenarios for alternative fuels in the transport sector. However, not for all fuels and modes it establishes hard targets, because the NPF uses scenario dependent projections relying on 'expected trends' or 'evolution' rather than real quantitative targets.

For electric vehicles, the Italian NPF adopts a very conservative approach. For 2020, low shares of new sales (1% - 3%) and of electric vehicles on the road (0.1% - 0.3%) are estimated, and the NPF does not contain any estimates beyond 2020. The Italian NPF has established sufficient 2020 targets for recharging points accessible to the public consistent with the rather low estimates for EV for the same year. The NPF ensures appropriate coverage of the TEN-T Core Network with high power recharging points. Regarding electricity supply for stationary airplanes the Italian NPF refers to ongoing cost-benefit analyses. No concrete targets are established. For shore-side electricity the situation is similar, although there seems to be a general consensus on its decisive role to reduce air pollution.

The Italian NPF puts a lot of emphasis on CNG, for which Italy has already today a dense network of public refuelling points, especially in the northern regions. Nevertheless, on a country level, Italy does not currently nor will in the future meet a level of at least one CNG refuelling point per 600 CNG vehicles on the road. According to the Italian NPF, CNG vehicles can contribute a lot to reduce CO_2 emissions in transport. The aim is to increase the share of the CNG vehicle park on the road from 2% to 3.3% in 2020 and 6% in 2025. Considering the leading position of Italy in relation to CNG vehicles, it could be explored if more ambitious targets could be set for its development beyond 2025.

A number of 5 dual-use LNG refuelling points for heavy-duty trucks are proposed in the NPF along the TEN-T Core Network by 2025. This would not guarantee that the maximum distance requirement for LNG refuelling points along the road TEN-T Core Network would be fulfilled on Italian territory.

The Italian NPF considers the development of a LNG infrastructure for maritime applications as strategic and critical in the context of the implementation of the Directive. Plan for its development, including designing of storage quantities in all 14 maritime TEN-T Core Network ports and beyond is part of the NPF and can be considered exemplary.

A very comprehensive plan has been developed for the deployment of hydrogen technologies (hydrogen production, distribution and fuel cell vehicles). Targets have been set up to 2050 and the amount of public funding needed to achieve the targets has been calculated. However, the Italian NPF states that the financial coverage for this hydrogen roll-out could not be provided, so that the plan has to be considered a 'potential scenario'. In essence, the targets for hydrogen technologies appear too ambitious vis-à-vis the lack of financial coverage considered essential for their achievement. It is therefore expected that the only evolution, which will take place in the near term, will be local, and related to the inter-MS corridor linking Italy with Austria.

The Italian NPF contains a comprehensive list of measures, partially already in place in the case of CNG. Most of them can be considered as having a medium impact on market actor's decisions. Since the Italian NPF is a law, it guarantees long periods of validity which could provide certainty for market actors and hence increase the likelihood that the national targets and objectives of the NPF can be reached. The NPF report identifies additional technical and administrative bottlenecks which need to be eliminated to enable the expected developments. However, in some cases, it is not clear if and which practical measures have been / will be taken to achieve the goal (for example, the facilitations of the present requirement for CNG refuelling point to be at not more than 1,000 meters from the CNG distribution grid, or the mentioned still existing difficulties related to the permitting procedures for LNG in ports).

Regional and local interests have been considered in the evaluation of the measures, as well as industrial and public R&D stakeholders. In fact, regional authorities and municipalities play a critical role in ensuring the implementation of the actions, having jurisdiction on infrastructure for highways, respectively for local infrastructure. A particular attention in the Italian NPF has been dedicated to the island Sardinia, which at the moment is the only region of Italy deprived of a NG distribution infrastructure.

Evidence of collaboration of Italy with other Member States has been found mainly in the frame of EU projects, especially of the TEN-T family.

5.12.2 ***Overview of requirements' fulfilment from Annex I of the Directive***

Table 5.12.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne, rail / electricity, CNG, LNG, hydrogen	Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne, rail / electricity, CNG, LNG, hydrogen	Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, waterborne / electricity, CNG, LNG, hydrogen	Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Road / electricity, CNG, LNG, hydrogen	Y
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.		N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Air / biofuels	Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / electricity, CNG, LNG, hydrogen, LPG	Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)		N
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes		N
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)		N

The checklist shows the requirements of Annex I from the Directive that are covered in the Italian NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for road transport and partially covered for waterborne transport. CNG, hydrogen and LPG are partially covered for road transport, LNG for road and waterborne transport. All the other combinations are either absent or not applicable.

The Italian NIR reports around 30 measures. Under the policy and deployment & manufacturing sections it was possible to identify seven AF/transport mode clusters of measures, of which five were assessable.

5.12.3 *Quantitative assessment: Vehicles and infrastructure*

Disclaimer

The Italian NIR did not follow the requirements of Annex I to the Directive but provided a series of data/information in a different order that was not compatible with the assessment methodology applied to all the other NIRs (and designed according to the structure of Annex I). Nevertheless, the data/information has been treated in order to be evaluated following the same methodology applied to all the other NIRs. It is recommended that the next Italian NIR be structured in accordance with the provisions of the Directive.

In terms of data completeness, the IT NIR did not report vehicle estimates and infrastructure targets for 2020, 2025 and 2030, for several AFs. When this information was available in the IT NPF (and still applicable), it has been considered valid also in the NIR.

Finally, the IT NIR did not report the historical data regarding AF vehicles and infrastructure in 2016, 2017 and 2018, but provided more recent data that were not comparable with the data reported by the large majority of the other MSs. Therefore, the EAFO database was used to source the missing data.

Table 5.12.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	26,160*	3,433*	87,500**	13,720	NA	NA	6,000,000	117,000
	Change NIR vs NPF [%]			0.00%	7.61%				
	Attainment [%]			29.90%	25.02%			0.44%	2.93%
CNG / road	NIR	1,051,316*	1,211*	1,350,000**	1350**	2,050,000**	1,750**	NA	2,400
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%		
	Attainment [%]			77.88%	89.70%	51.28%	69.20%		50.46%
LNG / road	NIR	1,111*	28*	2,000	74	NA	113	32,500**	800**
	Change NIR vs NPF [%]				362.50%		41.25%	0.00%	0.00%
	Attainment [%]			55.55%	37.84%		24.78%	3.42%	3.50%
LNG / water (maritime + inland)	NIR	NA	NA	7**	10**	40**	12**	60**	20**
	Change NIR vs NPF [%]				0.00%		0.00%		0.00%
	Attainment [%]								
H2 / road	NIR	24*	3*	1,100**	20***	28,100**	196***	2,903,700**	446***
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Attainment [%]			2.18%	15.00%	0.09%	1.53%	0.00%	0.67%
LPG / road	NIR	2,414,840*	4120*	NA	NA	2,400,000**	NA	2,500,000**	NA
	Change NIR vs NPF [%]					0.00%		0.00%	
	Attainment [%]					100.62%		96.59%	

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Values taken from EAFO (absent in both NPF and NIR).
** Values taken from the IT NPF.
*** Values taken from the IT NPF and referred to the total (public + private) hydrogen AFI.

5.12.3.1 Road transport

5.12.3.1.1 Electricity

Vehicles

EAFO reported 26,160 battery-electric and plug-in hybrid electric vehicles in Italy in 2018 (see Table 5.12.3-1), of which 23,157 were passenger cars (12,337 BEV), 2,915 were LCVs (all BEV), 16 HCVs (all BEV) and 72 were buses and coaches (all BEV). Additionally, EAFO reported 3,320 electric PTWs in 2018. Regarding the next decade, the Italian NIR only estimates around 6 million EVs for 2030. On the other hand, the NPF had only provided an estimate for 2020, i.e. a range between 45,000 and 130,000 EVs (in Table 5.12.3-1 the average value has been reported in order to be able to calculate the sufficiency index). There is no estimate for 2025, nor any information regarding the heavy-duty sector.

The 2018 ***attainment*** of future EV estimates is 29.90% for 2020 and 0.44% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Italy is equal to 55%.

Infrastructure

EAFO reported 3,433 publicly accessible recharging points in Italy in 2018 (Table 5.12.3-1), of which 573 were high power recharging points. The IT NIR reported the presence of 13,720 publicly accessible recharging points in Italy in February 2020. This is already slightly more than the average value of the range provided in the NPF as target for 2020 (i.e. between 6,500 and 19,000). It seems reasonable to assume that by the end of 2020 the number of publicly accessible recharging points will be higher than 13,720. There is no information for 2025, while for 2030 the IT NIR presents a target between 26,000 and 40,000 publicly accessible high power recharging points and between 57,000 and 111,000 normal power recharging points. The value of 117,000 total public recharging points reported in Table 5.12.3-1 is obtained by adding the average values of those two ranges.

The 2018 ***attainment*** of the future public recharging infrastructure targets is 25.02% for 2020 and 2.93% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Italy is equal to 31%.

Ratio

The following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. While until 2020 the sufficiency index is adequate, in 2030 the foreseen number of publicly accessible recharging points is largely inadequate.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**Electricity**	5.29*		7.62*	6.38		51.28

* Calculated from EAFO values.

Information on charging efficiency

Information is not available in the Italian NIR.

5.12.3.1.2 CNG

Vehicles

In 2018, EAFO reported 1,051,316 CNG vehicles in use in Italy (Table 5.12.3-1), of which 945,184 were passenger cars, 99,351 LCVs, 2,550 HCVs and 4,231 buses and coaches. The IT NIR did not provide any estimate for the next decade, but the NPF had presented an estimate of 1,350,000 CNG vehicles for 2020 and 2,050,000 CNG vehicles for 2025. There is no estimate for 2030, nor any information regarding the heavy-duty sector.

The 2018 ***attainment*** of future CNG vehicles estimates is 77.88% for 2020 and 51.28% for 2025. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Italy is equal to 8%.

Infrastructure

EAFO reported 1,211 publicly accessible CNG refuelling points in Italy in 2018. Regarding the next decade, the IT NIR provides only a target of 2,400 public CNG refuelling points for 2030. For 2025 the IT NIR has no data, therefore the NPF target of 1,750 CNG refuelling points has been retained. For 2020, the IT NIR reported 1,100 public CNG refuelling points in February, but EAFO shows a number above 1,400 at the end of the year. For this reason, Table 5.12.3-1 reports the NPF targeted value of 1,350 that still seems the most representative.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 89.70% for 2020 and 50.46% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible CNG refuelling infrastructure evolution planned by Italy is equal to 6%.

Ratio

Based on the available information, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the computed sufficiency index is always above the indicative value of 600 (see Section 2.1.5), however in the NPF Italy had declared that they had never experienced any problem of fuel supply to road vehicles and did not see the need to decrease their sufficiency index for the pair CNG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	961.33*		868.14*	1,000.00	1,171.43	

* Calculated from EAFO values.

5.12.3.1.3 LNG

Vehicles

EAFO reported 1,111 LNG vehicles in Italy in 2018, all HCVs. The Italian NIR only provided an estimate of 2,000 LNG vehicles in 2020. There is no information for 2025, while for 2030 the IT NPF had presented an estimated range between 30,000 and 35,000 (average equal to 32,500) LNG vehicles that is considered still valid in the present assessment.

The 2018 ***attainment*** of future LNG vehicles estimates is 55.55% for 2020 and 3.42% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Italy from 2016 until 2018 for LNG vehicles deployment is 3.25% of the overall planned deployment during the period 2016-2030.

Infrastructure

EAFO reported 28 LNG public refuelling points in Italy in 2018. Regarding the next decade, the IT NIR declared that 74 LNG refuelling points/stations were in operation in September 2020 and other 39 points/stations were under construction. This would mean at least 113 LNG refuelling points in 2025. For 2030, the IT NIR does not provide any target, but the NPF had a target of 800 refuelling points, which is considered still valid.

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 37.84% for 2020 and 3.50% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Italy from 2016 until 2018 for public LNG refuelling infrastructure deployment is 3.14% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the available information, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LNG**	18.66*		39.68*	27.03		40.63

* Calculated from EAFO values.

5.12.3.1.4 Hydrogen

Vehicles

EAFO reported 24 hydrogen vehicles in Italy in 2018, of which 11 passenger cars and 13 buses and coaches. For the next decade, in the absence of any information in the IT NIR, the NPF estimates are reported in Table 5.12.3-1, consisting in 1,100 hydrogen vehicles in 2020 and 28,100 vehicles in 2025. For 2030, the IT NPF had provided an estimate of 2,903,700 vehicles, all passenger cars, with the exception of 3,700 buses and coaches.

The 2018 ***attainment*** of future hydrogen vehicles estimates is 2.18% for 2020 and less than 0.01% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Italy from 2016 until 2018 for hydrogen vehicles deployment is less than 0.01% of the overall planned deployment during the period 2016-2030.

Infrastructure

EAFO reported three hydrogen refuelling points in Italy in 2018. For the next decade, in the absence of any information in the IT NIR, the NPF targets are reported in Table 5.12.3-1, consisting in 20 hydrogen refuelling points in 2020, 196 refuelling points in 2025 and 446 refuelling points in 2030. The NPF had not specified which was the number of public versus private refuelling points but did provide the type of refuelling pressure. For example, in 2030 the NPF foresaw 96 hydrogen refuelling points at 350 bar, while the remaining 350 points should be at 700 bar.

The 2018 ***attainment*** of future (public + private) hydrogen refuelling infrastructure targets is 15.00% for 2020 and 0.67% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Italy from 2016 until 2018 for (public + private) hydrogen refuelling infrastructure deployment is -0.23% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the available information, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	H2	2.75*		8.00*	55.00	143.37	6,510.54

* Calculated from EAFO values.

5.12.3.1.5 Biofuels

Vehicles

Information is not available in the Italian NIR.

Infrastructure

Information is not available in the Italian NIR.

5.12.3.1.6 LPG

Vehicles

EAFO reported 2,414,840 LPG vehicles in Italy in 2018, of which 2,409,840 passenger cars and 5,000 LCVs. For the next decade, in the absence of any information in the IT NIR, the NPF estimates are reported in Table 5.12.3-1, consisting in 2,400,000 LPG vehicles in 2025 and 2,500,000 vehicles in 2030.

The 2018 ***attainment*** of future LPG vehicles estimates is 96.59% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Italy from 2016 until 2018 for LPG vehicles deployment is 76.53% of the overall planned deployment during the period 2016-2030.

Infrastructure

The IT NIR did not report any information on LPG refuelling points, similarly to the NPF. The only available information comes from EAFO that reported the presence of 4,120 publicly accessible LPG refuelling points in Italy in 2018.

Because there are no numerical targets for LPG refuelling points in the Italian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the available information, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LPG	567.32*		586.13*			

* Calculated from EAFO values.

5.12.3.2 Rail transport

5.12.3.2.1 Electricity

Vehicles

Information is not available in the Italian NIR.

Infrastructure

The IT NIR listed a series of legislative initiatives aimed at the modernisation and development of the public transport infrastructure (underground, tramways), with special attention to cities with more than 100,000 inhabitants and to smaller cities where there has been an infringement due to poor air quality levels in the past years. The sum of all these initiatives, to be realised between 2017 and 2030 is of almost 7 billion €.

5.12.3.2.2 Hydrogen

Vehicles

The IT NIR highlighted the strategic importance given by Italy to hydrogen in the decarbonisation of the economy. One of the possible applications for the use of hydrogen in transport is to fuel trains on non-electrified railways. There are a few projects and initiatives on this but the IT NIR did not provide information regarding the potential number of locomotives that could become hydrogen-fuelled in the next decade.

Infrastructure

Similarly to the vehicle situation, the IT NIR showed great interest toward the possibility to develop a hydrogen infrastructure to support its use in the rail transport but did not provide any quantitative information.

5.12.3.3 Waterborne transport (maritime)

5.12.3.3.1 Electricity

Vessels

The IT NIR did not provide any direct reference to electrified vessels, however in the infrastructure part it was mentioned the construction of a shore-side electricity supply for an electric ship providing public and goods transport between the ports of Napoli and Ischia.

Because there are no numerical estimates of electric vessels to be deployed in the maritime ports in the Italian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The IT NIR listed a series of initiatives regarding shore-side electricity supply, ranging from requests of authorisation, to development projects and actual deployment. In the first group there was the port of Augusta. Instead, for the ports of Bari, Brindisi, Barletta, Manfredonia, Taranto, Trieste, Napoli, Ravenna, Palermo, Trapani and Livorno there were projects being developed for the construction of SSE supply. Finally, the IT NIR reported that the ports of Spezia, Genova and Ancona were already equipped with SSE supply.

Because there are no numerical targets for shore-side electricity supply in the maritime ports in the Italian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

5.12.3.3.2 LNG (maritime & inland)

Vessels

The IT NIR did not report any new information regarding LNG vessels estimates. For this reason, the estimates presented in the NPF for 2020, 2025 and 2030 have been retained here (7, 40 and 60 LNG vessels, respectively). In the IT NPF there was no distinction between maritime and inland transport.

Due to the lack of 2018 data in the Italian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The IT NIR reported that there were six concrete projects related to maritime LNG infrastructure. Three of these had been already authorised (and two of them were under construction at the ports of Oristano and Ravenna); three other projects were at an advanced stage in the authorization procedure. Furthermore, two more projects have recently been started. As for the next decade, the IT NIR did not provide numerical targets, thus the targets provided in the NPF have been considered still valid. These were: 10 LNG terminals in 2020, 12 in 2025 and 20 in 2030. It is necessary to clarify that these numbers refer to both maritime and inland waterborne transport.

Due to the lack of 2018 data in the Italian NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

5.12.3.4 Waterborne transport (inland)

5.12.3.4.1 Electricity

Specific information on inland waterborne electric vessels and/or SSE supply is not available in the Italian NIR.

5.12.3.4.2 LNG

Specific information on inland waterborne LNG vessels and/or LNG terminals is not available in the Italian NIR.

5.12.3.5 Air transport

5.12.3.5.1 Electricity

The IT NIR did not provide any update to the situation described in the NPF.

5.12.3.5.2 Biofuels

Similarly to the NPF, the IT NIR did not provide any information regarding the use of biofuels in aviation, with the only exception of a RTD&D project for the production of bio-jet fuel from micro-algae (see Section 5.12.4.5).

5.12.4 *Measures assessment*

Disclaimer

Similarly to the historical data and future objectives regarding vehicles and infrastructure, the Italian NIR did not follow the requirements of Annex I to the Directive to report about Measures but provided a long list of legislative initiatives in a different order. Nevertheless, this information has been processed in order to be evaluated following the same methodology applied to all the other NIRs. Also in this case, it is recommended that the next Italian NIR be structured in accordance with the provisions of the Directive.

On the basis of the provisions of Annex I to the Directive and of the Guidelines provided by the Commission to the Member States, the allocation of all the legislative initiatives, measures and projects presented in the IT NIR to the four Measure categories (i.e. Legal, Policy, Deployment & Manufacturing, RTD&D) has brought to the following outcome:

- Three Legal measures
- Ten Policy measures
- Sixteen AFI Deployment and one Manufacturing support measures
- One RTD&D measure

In general, the IT NIR does not present a change of strategy compared to the NPF. In several cases, measures announced in the NPF have been concretised by legislative initiatives that have followed the main Legal act, namely the Legislative Decree n. 257 of 16 December 2016, by which Italy has adopted the AFI Directive.

5.12.4.1 Legal measures

The three Legal measures included in the IT NIR belong to the Legislative and Regulatory sub-category. Overall, they show the same level of ambition presented in the NPF.

5.12.4.1.1 Legislative & Regulatory

The first and most important Legal measure is the Legislative Decree n. 257 of 16 December 2016, by which Italy has adopted the AFI Directive at national level. Due to the Italian administrative system, this Decree has to be implemented at Regional level too. According to the IT NIR, in July 2020, out of the 20 Italian Regions, 6 of them and the Autonomous Province of Bolzano had not yet implemented the Decree.

The second legislative measure is related to setting up the Single National Platform on Alternative Fuels Infrastructure that among other things will provide the necessary information to allow owners of electric vehicles to know the charging fees of the different suppliers.

The third legislative initiative presents the safety rules to be adopted to prevent fires in hydrogen refuelling stations. According to the IT NIR, this represents the actual green light to the deployment of a hydrogen refuelling network in Italy for road vehicles.

5.12.4.1.2 Administrative

There is no measure in the Italian NIR that appears to belong to this sub-category.

5.12.4.2 Policy measures

The Policy measures included in the Italian NIR cover four alternative fuels (i.e. electricity, CNG, LNG and hydrogen) and provide financial and non-financial support to both AFV and AFI mostly at national level. As for the transport mode, they are all focussed on road transport, with the exception of one Policy measure for rail transport. The IT NIR does not deviate from the strategy presented in the NPF, but reports the concretisation of a series of measures announced in the NPF. It has to be highlighted though that in most cases the plans are described in a generic way and the budget allocated to each measure is not accompanied by an accurate planning of either the infrastructure or the vehicle deployment, which jeopardises the robustness of the quantitative assessment of these measures.

5.12.4.2.1 Measures to ensure national targets and objectives

Of all the national policy measures described in the Italian NIR, six can be categorised as measures to ensure national targets and objectives. Two of these measures also cover the promotion of AFI for public transport services while another measure also includes incentives for the deployment of domestic recharging points.

Road transport

The first Policy measure included in the IT NIR represents phase 1 of the uptake of a recharging infrastructure in Italy, with a budget of 4.5 million € that has brought to the construction of 700 recharging points until 2017 in more than 100 cities.

The second Policy measure has been presented as the phase 2 of this uptake process (thus from 2018 onward), but has extended both the budget (up to 70 million €) and the scope, to include also public refuelling points and domestic recharging points.

The third measure was under discussion and foresaw the obligation for public administrations to buy at least 30% of AF vehicles by 2022 when procuring new vehicles, at least 50% by 2025 and at least 80% by 2030. Such obligation is foreseen also for public or private entities providing public transportation services.

The fourth measure presents an incentive scheme that has started already in 2015 and should last until at least 2021. This scheme is to provide financial support for the replacement of old HCVs with new ones running with alternative fuels (electricity, CNG or LNG). The sum of money already spent in the past years and foreseen until end of 2021 is around 83 million €, however there is no indication regarding the number of HCVs involved in this scheme.

The fifth Policy measure was not listed in the IT NIT but is quite known and popular, i.e. the so called "Ecobonus". It is a financial incentive to replace existing ICE vehicles with BEV or PHEV vehicles. In case of scrappage of old vehicles (up to Euro 4 emission limits and older than 10 years) the incentive is higher. The Ecobonus campaign started in 2019 and will last until at least 2021. A total budget of almost 600 million € has been allocated, with a maximum incentive per vehicle (in case of scrappage) of up to €10,000 for BEVs and up to €4,500 for PHEVs.

The sixth measure, like the third one, is also related to public transport and foresees a total budget of around 3.7 billion € until 2033, for the replacement of old-technology buses and coaches with AF vehicles, and the development of the corresponding recharging/refuelling infrastructure. About two thirds of the budget are dedicated to the replacement of buses and coaches, the remaining one third is for the infrastructure.

5.12.4.2.2 Measures that can promote AFI in public transport services

The Italian NIR presented six Policy measures that can be classified as measures to promote AFI in public transport services, either directly or indirectly, either financial or non-financial. Five measures are dedicated to public transport on road (two of them have been presented in the previous section), one to public transport on rail.

Road transport

In addition to the two measures mentioned in the previous section (because they might have an impact also on the achievement of national targets and objectives), the IT NIR presented three indirect measures:

- Incentives (20 million €, for the years 2019 and 2020) for the replacement of old school buses with electric vehicles. This indirect measure to promote AFI in public transport services is for the moment reserved to cities with more than 50,000 inhabitants that have exceeded the air quality standards in the past years.
- Incentives reserved to the northern regions of Piedmont, Lombardy, Veneto and Emilia Romagna for the replacement of old-technology buses and coaches with AF vehicles, and the development of the corresponding recharging/refuelling infrastructure. The total budget is 180 million €, starting from 2020 (end year is not specified).
- Incentives for the scrappage of very old vehicles (up to €1,500) and motorcycles (up to €500) for a total budget of 255 million €, from 2019 until 2024. The incentives are given as credits to buy public transport annual passes.

Rail transport

The IT NIR presented also a measure with a total budget of around 6.8 billion €, to restructure and extend the public transport system based on electrified vehicles (urban trains, underground, tramways) in cities with more than 100,000 inhabitants.

5.12.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

One of the measures described as Policy measure to ensure national targets and objectives, in addition to providing support to the uptake of publicly accessible recharging/refuelling points, foresees that part of the total budget of up to 70 million € be dedicated to incentivising the development of domestic recharging points. There is however not detail on how/when/how much is for this part.

5.12.4.3 Deployment and manufacturing support

5.12.4.3.1 AFI deployment

The Italian NIR contains a long list of Deployment projects, of which 13 are related to road transports, 2 focus on waterborne transport and 1 covers both road and waterborne transport. They are all linked to the CEF programme.

The road-related projects are mainly addressing electric recharging points, but CNG, LNG and hydrogen refuelling points are being developed as well. The waterborne-related projects address both shore-side electricity supply and LNG terminals/refuelling points.

Road transport

Regarding electric recharging points, around 2,200 normal power and 115 high power recharging points are being deployed. In parallel to that, around 50 CNG/LNG refuelling points are under construction or the projects have been approved. There is also a project for the construction of a hydrogen refuelling station in Italy, as part of an overall scheme with similar hydrogen refuelling stations in Germany, Netherlands and UK.

Waterborne transport

Regarding shore-side electricity supply, the IT NIR mentioned one big project (called "Cold Ironing") involving a series of maritime and inland ports (see Section Y.X.3.3.1). There is however no detail about the overall budget, time span and number of SSE supply points, therefore this measure is not assessable.

The IT NIR reported two Deployment projects for the installation of LNG terminals for waterborne transport, one in Oristano (Sardinia), the other in Venice and Leghorn.

5.12.4.3.2 Support of manufacturing plants for AF technologies

The Italian NIR reported a measure that can be classified as support of manufacturing plants for AF technologies. This measure, included in the Law n. 232 of 2016, foresaw an amount of 102 million € to support manufacturers of AF buses and intelligent transport systems in the period 2017 - 2019.

5.12.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Italian NIR.

5.12.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.12.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2.

As it can be seen, seven clusters of measures have been identified, for as many pairs AF/transport mode (waterborne maritime and inland transport modes have been put together because there was no clear distinction in the IT NIR), of which five were assessable. Despite the general availability of the overall budget for almost all the measures reported in the IT NIR, the lack of the necessary details on the link between the budget and the AFV and/or AFI objectives makes the quantitative assessment poorly substantiated. With this caveat in mind, we report the results of the application of the assessment methodology. The electricity/road, CNG/road, LNG/road and LNG/waterborne (maritime and inland) obtain a medium score; the hydrogen/road pair obtains a low score. Four of the five assessable clusters can be considered to be comprehensive. In terms of the expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, it can be said that the measures for the pairs electricity/road, CNG/road and LNG/road have a medium impact. LNG/waterborne and hydrogen/road have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures can be considered similar for all the assessable pairs.

Table 5.12.4-1 Quantitative assessment of policy and deployment & manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	=
CNG	Road	M	C	**M**	=
LNG	Road	M	C	**M**	=
	Waterborne (maritime & inland)	M	N	**L**	=
H2	Road	L	C	**L**	=
Electricity	Rail	X			
	Waterborne (maritime & inland)	X			

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.12.4.5 Research, Technological Development & Demonstration

The IT NPF had listed a series of projects (within the CEF programme) which were considered at RTD&D stage. In the IT NIR most of those projects have been presented as Deployment projects, leaving only one RTD&D project on the production of renewable jet fuel from micro-algae, with a budget of 4 million € for the years 2019 and 2020.

5.12.5 *Additional information on alternative fuels infrastructure developments*

Information is not available in the Italian NIR.

5.12.6 *Summary of the assessment*

Tabular overview

Table 5.12.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime & inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	11,663*	1,057,461*	56*	NA	11*	2,137,078*
		Situation (2018)	26,160*	1,051,316*	1,111*	NA	24*	2,414,840*
		Estimate (2030)	6,000,000	NA	32,500**	60**	2,903,700**	2,500,000**
		Future share (2030) [%]	13.30%		2.96%		6.44%	5.54%
		Estimate attainment (2018 vs 2030) [%]	0.44%		3.42%		0.00%	96.59%
		Progress (2018)	slow	slow	3.25%		0.00%	
Publicly accessible AF Infrastructure		Past situation (2016)	2,205*	1,100*	3*	NA	4*	3,767*
		Situation (2018)	3,433*	1,211*	28*	NA	3*	4,120*
		Target (2030)	117,000	2,400	800**	20**	446***	NA
		Target attainment (2018 vs 2030) [%]	2.93%	50.46%	3.50%			
		Progress (2018)	slow	slow	3.10%		-0.23%	
Sufficiency Index		2016	5.29	961.33	18.66		2.75	567.32
		2018	7.62	868.14	39.68		8.00	8.00
		2020	6.38	1,000.00	27.03		55.00	
		2025		1,171.43			143.37	
		2030	51.28		40.63		6,510.54	
Measures	**Legal measures**	Ambition (NIR vs NPF)	=	=	=		=	
	Policy measures + Deployment & manufacturing support	Score	M	M	M	M	L	
		Comprehensiveness	C	C	C	N	C	
		Impact	M	M	M	L	L	
		Ambition (NIR vs NPF)	=	=	=	=	=	
	RTD&D	Ambition (NIR vs NPF)						

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Values taken from EAFO (absent in both NPF and NIR).
** Values taken from the IT NPF.
*** Values taken from the IT NPF and referred to the total (public + private) hydrogen AFI.

The NIR described Italy's efforts carried out to increase the use of alternative fuels in transport since the release of its NPF. However, the implementation report did not fulfil several provisions of Annex I to the Directive. In particular, the IT NIR lacked any information on historical data (2016 - 2018) related to AFV and AFI and provided very limited information regarding AFV estimates and AFI targets for the next decade. In order to provide the most possibly complete assessment of the Italian NIR, the historical data have been retrieved from the EAFO database, while the AFV estimates and AFI targets have been complemented with the information contained in the IT NPF, when we deemed they were still applicable.

The main outcomes of the technical assessment of the Italian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – EAFO reported 26,160 battery-electric and plug-in hybrid electric vehicles in Italy in 2018, of which 23,157 were passenger cars (12,337 BEV), 2,915 were LCVs (all BEV), 16 HCVs (all BEV) and 72 were buses and coaches (all BEV). For the next decade, the Italian NIR estimated around 6 million EVs for 2030 (with no detail on the heavy-duty sector). Regarding recharging infrastructure, EAFO reported 3,433 publicly accessible recharging points in Italy in 2018, of which 573 were high power recharging points. For 2030, the IT NIR presented a target between 26,000 and 40,000 publicly accessible high power recharging points and between 57,000 and 111,000 normal power recharging points. The value of 117,000 total public recharging points reported in Table 5.12.6-1 was obtained by adding the average values of those two ranges. The progress in 2018 resulted to be slow, both in terms of AFV and in terms of AFI deployment, while the sufficiency index appears adequate until after 2020, but for 2030 a strong unbalance between AFV and AFI is foreseen that could jeopardise the uptake of electrification of road transport.
- **CNG** – In 2018, EAFO reported 1,051,316 CNG vehicles in use in Italy, of which 945,184 were passenger cars, 99,351 LCVs, 2,550 HCVs and 4,231 buses and coaches. The IT NIR did not provide any estimate for the next decade, but the NPF had presented an estimate 1,350,000 CNG vehicles for 2020, of 2,050,000 CNG vehicles for 2025 and no estimate for 2030, nor any information regarding the heavy-duty sector. On the CNG refuelling infrastructure, EAFO reported 1,211 publicly accessible refuelling points in Italy in 2018. For the next decade, the IT NPF had presented a target of 1,350 publicly accessible refuelling points for 2020 and of 1,750 refuelling points for 2025. The IT NIR completes this set of targets with 2,400 publicly accessible refuelling points foreseen in 2030. Similarly to the pair electricity/road, the progress in 2018 resulted to be slow for both AFV and AFI, while the sufficiency index is constantly above the indicative threshold of 600, but the Italian authorities do not report any problem with that.
- **LNG** – EAFO reported 1,111 LNG vehicles in Italy in 2018, all HCVs. For the next decade the IT NIR only provided an estimate of 2,000 LNG vehicles for 2020, while for 2030 we have retained the NPF estimated range between 30,000 and 35,000 (average equal to 32,500) LNG vehicles that is considered still valid. Regarding LNG infrastructure, EAFO reported 28 public refuelling points in Italy in 2018. For the next decade, the IT NIR does not provide any target (it only mentions the presence of 74 LNG refuelling points in 2020 and the plan to build other 39 refuelling points in the following years), but the NPF had a target of 800 refuelling points, which has been retained for this assessment.
- **Hydrogen** – EAFO reported 24 hydrogen vehicles in Italy in 2018, of which 11 passenger cars and 13 buses and coaches. For the next decade, the IT NIR did not provide any estimate, therefore the NPF estimates have been considered still valid, consisting in 1,100 hydrogen

vehicles in 2020, 28,100 vehicles in 2025 and 2.903.700 vehicles in 2030. EAFO reported three hydrogen refuelling points in Italy in 2018. For the next decade, in the absence of any information in the IT NIR, the NPF targets (that included both public and private refuelling points) have been retained, i.e. 20 refuelling points in 2020, 196 in 2025 and 446 in 2030.

- **Biofuels** – Information is not available in the IT NIR.
- **LPG** – EAFO reported 2,414,840 LPG vehicles in Italy in 2018, of which 2,409,840 passenger cars and 5,000 LCVs. For the next decade, in the absence of any information in the IT NIR, the NPF estimates have been considered still valid, consisting in 2,400,000 LPG vehicles in 2025 and 2,500,000 vehicles in 2030. The IT NIR did not report any information on LPG refuelling points, similarly to the NPF. The only available information comes again from EAFO that reported the presence of 4,120 publicly accessible LPG refuelling points in Italy in 2018.

Rail transport

- **Electricity** – The IT NIR listed a series of legislative initiatives (with a total budget of almost 7 billion € for the period between 2017 and 2030) aimed at the modernisation and development of the rail infrastructure for public transport (underground, tramways), with priority given to cities with more than 100,000 inhabitants and/or to those with repeated air quality limit infringements.
- **Hydrogen** – The IT NIR highlighted that one of the possible applications for the use of hydrogen in transport is to fuel trains on non-electrified railways. There are a few projects and initiatives on this but the IT NIR did not provide information regarding the potential number of locomotives that could become hydrogen-fuelled in the next decade.

Waterborne transport (maritime & inland)

- **Electricity** – The IT NIR listed a series of initiatives regarding shore-side electricity supply, ranging from requests of authorisation, to development projects and to actual deployment. In the first group there was the port of Augusta. Instead, for the ports of Bari, Brindisi, Barletta, Manfredonia, Taranto, Trieste, Napoli, Ravenna, Palermo, Trapani and Livorno there were projects being developed for the construction of SSE supply. Finally, the IT NIR reported that the ports of Spezia, Genova and Ancona were already equipped with SSE supply.
- **LNG** – The IT NIR did not report any new information regarding LNG vessels estimates. For this reason, the estimates presented in the NPF for 2020, 2025 and 2030 have been retained (7, 40 and 60 LNG vessels, respectively). In the IT NPF there was no distinction between maritime and inland transport. Regarding LNG infrastructure, the IT NIR reported that there were six concrete projects, of which three had been already authorised (and two of them were under construction at the ports of Oristano and Ravenna), three other projects were at an advanced stage in the authorization procedure. As for the next decade, the IT NIR did not provide numerical targets, thus the targets provided in the NPF have been considered still valid. These were: 10 LNG terminals in 2020, 12 in 2025 and 20 in 2030. Again, it is necessary to clarify that these numbers refer to both maritime and inland waterborne transport.

Air transport

The IT NIR did not provide any update to the situation described in the NPF.

The Italian NIR listed a series of Measures under a different categorisation than the one requested in the Annex I to the Directive. Thus, in order to be able to assess them, it has been necessary to reorder them, which has led to counting 3 Legal measures, 10 Policy measures, 16 Deployment and Manufacturing support measures and 1 RTD&D measure. Similarly to the AFV estimates and AFI targets, the measures presented in the IT NIR follow the route indicated in the NPF, with no evident change of ambition, but a substantial confirmation of all the NPF objectives.
With reference to the Policy and Deployment & Manufacturing measures in particular, seven clusters of measures have been identified, of which five were assessable. Despite the general availability of the overall budget for almost all the measures reported in the IT NIR, the lack of the necessary information on the link between the budget and the AFV and/or AFI objectives does not facilitate the task of putting this assessment into perspective. With this caveat in mind, we report the results of the application of the assessment methodology. The electricity/road, CNG/road, LNG/road and LNG/waterborne (maritime and inland) obtain a medium score; the hydrogen/road pair obtains a low score. Four of the five assessable clusters can be considered comprehensive. In terms of the expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and confirmed in the NIR, it can be said that the measures for the pairs electricity/road, CNG/road and LNG/road have a medium impact while the ones for LNG/waterborne and hydrogen/road have a low impact.
The IT NIR presented only one RTD&D project on the production of renewable jet fuel from micro-algae, with a budget of 4 million € for the years 2019 and 2020.

5.12.7 *Final remarks*

The collection of data from the Italian NIR, NPF and EAFO allows for the following conclusions: Italy expects the number of electric passenger vehicles, hydrogen fuel cell vehicles, CNG vehicles and heavy-duty LNG vehicles to grow significantly over the current decade. On the other hand, the number of LPG vehicles will remain very high compared to the number of these vehicles in other Member States. The policy measures included in the Italian NIR cover electricity, CNG and hydrogen for road transport as well as LNG for road and maritime transport. Measures to promote the use of electricity in waterborne transport are not reported. The Italian NIR presents also a measure with a total budget of around 6.8 billion € to restructure and extend the public rail transport system (urban trains, underground, tramways) in cities with more than 100,000 inhabitants.

With regard to electricity, the Italian NIR expects up to six million electric vehicles on the roads by 2030, representing around 13.3% of the vehicle fleet by that time. Taking into account the current situation and the expected trend developments, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. For 2030, 117,000 recharging points are planned, which seem insufficient (one recharging point per 50 vehicles) for the estimated fleet of 6 million of electric vehicles in that year. The ports of La Spezia, Genova and Ancona are already equipped with shore side electricity supply facilities and it is foreseen to also equip the ports of

Augusta, Bari, Brindisi, Barletta, Manfredonia, Taranto, Trieste, Napoli, Ravenna, Palermo, Trapani and Livorno. The Italian NIR should provide further information on the electricity supply facilities for stationary aircraft.

Regarding hydrogen, the NIR does not provide updated estimates compared to the NPF, which foresaw a strong ambition for hydrogen: almost three million hydrogen vehicles and 446 hydrogen filling stations are planned for 2030.

Concerning natural gas, there were 1,051,000 CNG vehicles and 1,211refuelling points by 2018. The NIR does not provide updated estimates compared to the NPF, which foresaw 2,050,000 CNG vehicles by 2025 as well as 1,750 refuelling points by 2025 and 2,400 refuelling points by 2030. Furthermore, the NPF anticipated a major growth of the number of LNG vehicles from 1,128 in 2018 to 32, 500 vehicles by 2030 and an increase in the number of LNG refuelling points from 28 in 2018 to 800 by 2030. This figure seems sufficient taking into account the length of Italian TEN-T Core network. Moreover, in the Italian NPF it was estimated that 10 terminal in ports would be in a position of supplying LNG by 2020, 12 by 2025 and 20 by 2030. The Italian NIR should have provided further information on the state of play of the existing and planned LNG infrastructure for ports. Moreover, it should have presented information on inland and maritime ports separately.

There were 2,414,000 LPG vehicles by 2018. Around 2,500,000 LPG vehicles are estimated for the year 2030. The number of LPG refuelling points was 4,200 in 2018. Although no estimates are provided by 2025 and 2030, the existing number of LPG refuelling points seems sufficient for the estimated LPG fleet by 2030.

Future reporting should also inform about efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.12.8 *ANNEX - Description of the Member State*

On a surface area of 301,300 km², Italy has a population of 60.484 million people in 2018, which makes up for a population density of 201 inhabitants/km².

Number of main urban agglomerations

- 88 urban agglomerations > 50,000 inhabitants

In 2018, Italy achieves a per capita gross domestic product at market prices of €29,210, which represents a per capita gross domestic product in purchasing power standards of 96 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Italy is 4,145 km. The total road network length is 182,976 km, of which 6,943 km are motorways.

The following lengths of the TEN-T Road Corridor network are present in Italy: 13% (480 km) of the Baltic - Adriatic Corridor, 15% (839 km) of the Mediterranean Corridor, 38% (2,403 km) of the Scandinavian- Mediterranean Corridor, 13% (1,794 km) of the Rhine - Alpine Corridor.

Through the TEN-T Road Corridors, Italy is connected with the following member states:
- Austria (through the Baltic - Adriatic and the Scandinavian - Mediterranean Corridor)
- Slovenia (through the Baltic - Adriatic and the Mediterranean Corridor)
- France (through the Mediterranean Corridor)
- Switzerland (through the Rhine- Alpine Corridor)
- Malta (through the Scandinavian-Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Italy accounts for 52,650,365 registered road vehicles of which 39,018,000 are categorized as passenger cars, 3,556,816 as light goods vehicles, 757,207 as heavy goods vehicles and 100,042 as buses and coaches. The motorisation rate is 645 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 14 maritime ports in the TEN-T Core Network (Ancona, Augusta, Bari, Cagliari-Porto Foxi, Genova, Gioia Tauro, La Spezia, Livorno, Napoli, Palermo, Ravenna, Taranto, Trieste, Venezia)
- 25 maritime ports in the TEN-T Comprehensive Network
- 5 inland ports in the TEN-T Core Network (Cremona, Mantova, Ravenna, Trieste, Venezia)
- 6 inland ports in the TEN-T Comprehensive Network

The inland waterways TEN-T Core Network in Italy is 916 km long.

Number of airports in the TEN-T Core Network

- 11 airports in the TEN-T Core Network (Bologna, Cagliari, Genova, Milano-Linate, Milano-Malpensa, Milano-Bergamo Orio al Serio, Napoli-Capodichino, Palermo, Roma-Fiumicino, Roma-Torino, Venezia)
- 22 airports in the TEN-T Comprehensive Network

5.13 Cyprus (CY)

5.13.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Cypriot NPF the Commission concluded:

From the Cyprus NPF, it is transparent that alternative fuels are at an early deployment stage in Cyprus. The Cyprus NPF addresses only a small part of the requirements of Article 3 of the Directive, mainly electro-mobility. For the future development and further penetration of alternative fuels in transport, a study entitled 'Technical Assistance in order to assess and formulate recommendations for the promotion and penetration of alternative fuels in the transport sector' has been commissioned. The purpose of the ongoing study is to present a comprehensive proposal regarding future penetration scenarios for various alternative fuels in the transport sector in Cyprus, as well as promotion policies and measures, taking account of the specific characteristics of Cyprus, to achieve the climate and energy targets related to the transport sector.

In the case of electricity for road transport, which constitutes the focus of the Cyprus NPF, the requirements of the Directive were fulfilled and details were given about the targeted recharging infrastructure for 2020 in terms of number and placement. Even though the future estimates of electric vehicle stock are rather modest, being situated in the range of 0.02% to 0.32% of the future vehicle stock, the proposed set of measures can support reaching the declared objectives since it was evaluated as being comprehensive and having a medium assessment score. In the case of electricity supply at airports and shore-side supply in its maritime ports, the Cypriot authorities are currently examining the situation and studies are carried out. The decision of setting targets and support measures is foreseen for the future.

Besides electro-mobility, the national strategy for the other alternative fuels is briefly or inadequately treated in the Cyprus NPF, being dependent on the results of currently ongoing studies. For CNG and LNG fuels, the NPF contains neither future estimates for vehicles nor targets for refuelling infrastructure. The lack of ambition for natural gas can be partially explained by the small market size in Cyprus and the lack of interconnections with other natural gas networks. However, the Cypriot NPF declares intentions to foster LNG use in maritime transport, also in cooperation with Greece and Italy

The Cyprus NPF does not contain any targets for hydrogen in transport.

The Cyprus NPF contains a medium size portfolio of support measures, many being currently discussed and planned and receiving in consequence the status 'under consideration'. The majority of the proposed measures necessary to ensure national targets concern electricity for road transport, this cluster that contains 7 assessable measures received a medium overall assessment score. The use of alternative fuels for public transport activity is too vaguely addressed and additional concrete details would have been desirable.

Regarding the cooperation with other Member States, the NPF states that Cyprus cooperates with Greece and Italy in the frame of the EU funded POSEIDON-MED II LNG project. A study *regarding the future deployment and placement of LNG refuelling infrastructure at Cypriot ports will be carried out within this project.*

5.13.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.13.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road / electricity, LPG, biofuels	Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road / Electricity, hydrogen, AF combination	Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / Electricity	Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.		N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.		N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, water-maritime / electricity, LNG, AF combination	N
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity	Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / electricity, LPG	Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road / electricity, LPG	Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, water-maritime / All	Y

The checklist shows that only a limited part of the requirements of Annex I from the Directive are covered in the Cypriot NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is well documented for road transport; CNG, LNG and LPG are covered for road transport only in terms of AFI; shore-side electricity supply is covered for maritime water transport, and also LNG but only in terms of AFI; all the other combinations are either absent or not applicable.

The CY NIR reports around 25 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify four AF/transport mode clusters of measures, of which only two were assessable.

5.13.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.13.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	28	36	71	42	140	81	700	100
	Change NIR vs NPF [%]			-29.00%	-58.00%	0.00%	-19.00%	0.00%	0.00%
	Attainment [%]			39.44%	85.71%	20.00%	44.44%	4.00%	36.00%
CNG / road	NIR	0	0	NA	0	NA	7	NA	40
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / road	NIR	0	0	NA	0	NA	3	NA	3
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	0	NA	0	NA	1	NA	1
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	205	2	NA	8	NA	NA	NA	NA
	Change NIR vs NPF [%]				-60.00%				
	Attainment [%]				25.00%				
Shore-side electricity supply / water (maritime)	NIR		0		0		1		1
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.13.3.1 Road transport

5.13.3.1.1 Electricity

Vehicles

Cyprus recorded 28 battery-electric and plug-in hybrid electric vehicles in use in 2018 (all of which are passenger cars) (see Table 5.13.3-1) and 73 electric powered two wheelers. The CY NIR provides revised estimates for the EVs expected to be registered in 2020, and new estimates for 2025 and 2030 (71, 140 and 700, respectively). Concerning the EV estimates for 2020, the NIR values are 29% lower than the most pessimistic NPF value, where a wide interval of 100-2000 was provided. It is worth mentioning that the NIR also shows estimates for electric powered two-wheelers (100, 200 and 300 respectively for 2020, 2025 and 2030), which were not reported in the NPF.

The 2018 ***attainment*** of future EV estimates is 39.44% for 2020 and 4.00% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Cyprus is equal to 27%.

Infrastructure

Cyprus recorded 36 publicly accessible recharging points in 2018, all of which are normal power (≤22kW) ones. As for the next decade, Table 5.13.3-1 shows that the recharging points targets for 2020, 2025 and 2030 have been reduced by the CY NIR to 42, 81 and 100 respectively. In the NPF, the initial targets were 100 publicly accessible recharging points by 2020, and more than 100 by 2025 and 2030. DC fast recharging points are only targeted to be introduced by 2025 when they are foreseen to represent 32% of the total points, but no further details about their status in 2030 is provided.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 85.71% for 2020 and 36.00% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Cyprus is equal to 9%.

Ratio

Based on the CY NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. The foreseen sufficiency index is inferior to the value of 10 and thus can be regarded as adequate for the next decade.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	0.63	1.38	0.78	1.69	1.73	7.00

Information on charging efficiency

Information is unavailable in the Cypriot NIR.

5.13.3.1.2 CNG

Vehicles

The CY NIR does not provide any past or future quantitative information concerning CNG vehicles. The report states that the technology is currently not in use in the transport sector.

Infrastructure

Due to the geographical isolation of Cyprus, there is currently no natural gas market and interconnections with international gas networks are lacking. According to both the NIR and EAFO's reported numbers, no CNG refuelling points were installed in Cyprus in 2018. The Cypriot NPF did not mention any CNG refuelling points targets. The Cypriot NIR, on the other hand, sets targets of 7 and 40 CNG refuelling points by 2025 and 2030, respectively. Introducing natural gas to meet the needs of the domestic market is an energy strategy priority for the Cypriot decision-makers.

Since at the end of 2018, there were no CNG refuelling points deployed, the 2018 ***attainment*** and ***average annual growth rate*** could not be computed. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the CNG refuelling infrastructure envisaged targets.

Ratio

Since there are no CNG vehicle estimates in the Cypriot NIR, it is not possible to compute the sufficiency index.

5.13.3.1.3 LNG

Vehicles

The Cypriot NIR provides no LNG vehicle estimates for the future. At the end of 2018, there were no LNG vehicles in use.

Infrastructure

The Cypriot NIR introduced a new target of three publicly accessible LNG refuelling points for road vehicles by 2025/2030, up from no LNG refuelling infrastructure at the end of 2018. Additionally, a tender for medium/long-term LNG supply in Cyprus is expected to be announced in 2020. Consequently, the necessary LNG infrastructure is expected to be completed and natural gas supply to the Cypriot domestic market to be launched in early 2022.

Since at the end of 2018 there were no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Since there are no LNG vehicle estimates in the Cypriot NIR, it is not possible to compute the sufficiency index.

5.13.3.1.4 Hydrogen

Vehicles

The Cypriot NIR does not offer any estimates for hydrogen vehicles. At the end of 2018, there were no hydrogen vehicles in use.

Infrastructure

The Cypriot NIR does not commit to any targets for hydrogen refuelling points. At the end of 2018, there was no hydrogen refuelling infrastructure deployed.

Ratio

Since there is no quantitative information on hydrogen vehicles and infrastructure in the Cypriot NIR, it is not possible to compute the sufficiency index.

5.13.3.1.5 Biofuels

Vehicles

Information is unavailable in the Cypriot NIR.

Infrastructure

Although the Cypriot NIR does not commit to biofuels infrastructure targets, it mentions blending mandates for biofuels in diesel and petrol fuels in place (see Section 5.13.4.1.2).

Ratio

Since there is no quantitative information on biofuels vehicles and infrastructure in the Cypriot NIR, it is not possible to compute the sufficiency index.

5.13.3.1.6 LPG

Vehicles

The Cypriot NIR reports that motor LPG consumption remains at very low levels. There are no future estimates for LPG vehicles. In 2018, there were 205 LPG vehicles on Cypriot roads; more than double the amount of LPG vehicles (87) in 2016.

Infrastructure

The Cypriot NIR has a reduced target for LPG refuelling points compared to the NPF. The target was re-defined to 8 refuelling points in 2020, down from more than 20. The member state reports two existing LPG refuelling points in 2018. Although the target has been reduced, Cyprus reported in its NIR that 20 applications have been submitted seeking planning permission to install LPG refuelling points.

Since only a target corresponding to 2020 was provided, only the 2018 ***attainment*** of future LPG refuelling infrastructure target for 2020 could be calculated and is equal to 25%.

Ratio

Since there are no LPG vehicle estimates in the Cypriot NIR, it is not possible to compute the sufficiency index.

5.13.3.2 Rail transport

5.13.3.2.1 Electricity

Vehicles

Information is unavailable in the CY NIR.

Infrastructure

Information is unavailable in the CY NIR.

5.13.3.3 Waterborne transport (maritime)

5.13.3.3.1 Electricity

Vessels

Information is unavailable in the CY NIR.

Infrastructure

As an update to the 2016 NPF that did not contain any target, the Cypriot NIR introduced a target for shore-side electricity supply for seagoing ships in one maritime port in 2025 and 2030 (see Table 5.13.3-1).

5.13.3.3.2 LNG

Vessels

Information is unavailable in the CY NIR.

Infrastructure

As an update to the 2016 NPF that did not contain any target, the Cypriot NIR reports a target of one maritime port to be equipped with LNG refuelling infrastructure by 2025. The studies anticipated in the NPF seem to have been conducted and used to determine the NIR committed targets.

5.13.3.4 Waterborne transport (inland)

Not applicable since Cyprus has no inland ports in the TEN-T Core Network.

(NOTE: The Cypriot NIR reports a target of one inland port to be equipped with LNG refuelling infrastructure by 2025 but, as Cyprus has no inland ports in the TEN-T Network, this information has not been treated).

5.13.3.5 Air transport

5.13.3.5.1 Electricity

Airplanes

Information is unavailable in the CY NIR.

Infrastructure (for stationary airplanes)

The target number of two airports offering electricity supply for stationary airplanes by 2020 from the NPF seems to have been revised due to the absence of any target information in the Cypriot NIR.

5.13.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is not available in the Cypriot NIR.

Infrastructure

Information is unavailable in the CY NIR.

5.13.4 *Measures assessment*

As in the NPF, the Cypriot NIR mentions a limited number of measures. However, the situation has evolved in the NIR in the sense that measures that were already in place have been continued/improved, those under discussion have become more concrete and others were newly introduced.

5.13.4.1 Legal measures

The Cypriot NIR contains 11 legal measures to promote AF. Of those, four measures were mentioned in both the NIR and the NPF, while seven measures are exclusively reported in the NIR. The Cypriot NPF contained other four legal measures no longer in the NIR. Overall, the level of ambition of the legal measures is considered to have increased in the NIR, in comparison with the NPF.

5.13.4.1.1 Legislative & Regulatory

The legislative & regulatory category of the Cypriot NIR contains eight legal measures, five of which are exclusively reported in the NIR, while the other three are reported in both NIR and NPF. Except for one legal measure concerning LPG/road, all legal measures are part of the electricity/road cluster. Legal measures supporting the promotion of electric recharging infrastructure are mainly focusing on proper signage for recharging points and mandates for new buildings concerning the introduction of dedicated parking spots equipped with recharging points.

5.13.4.1.2 Administrative

The Cypriot NIR offers three administrative measures, two of which were only reported in the NIR and not in the NPF. Cyprus implemented Directives 2009/28/EC and 2009/30/EC with regards to increasing blending mandates for biofuels in diesel and petrol fuels. Cyprus also implemented an EU Support Programme for fuel price comparison for consumers and accepted Decision No 87.649 of the Council of Ministers. The Council decided to exercise its right to apply specific derogations with reference to Cyprus being an emergent natural gas market due to its geographical isolation. Further, Cyprus appointed the public natural gas company, DEFA, as the distribution system, transmission system and LNG facility operator.

5.13.4.2 Policy measures

The Cypriot NIR reports nine policy measures of which four have already been reported in the NPF and five are new. All the policy measures concern the road as transport mode and focus mainly on electricity as alternative fuel.

5.13.4.2.1 Measures to ensure national targets and objectives

Road transport

Of the nine policy measures reported, seven were categorised as measures to ensure national targets and objectives. The most impactful measures reported are financial incentives. The registration tax and annual road tax are based on CO_2 emissions, thus favouring electric vehicles. Additionally, EVs receive a waiver for the vehicle registration fee of €150 and various municipalities and communities in Cyprus allow free EVs parking in public parking areas. The most promising plan, which became more concrete compared to the NPF, was in the process of adoption and represented a vehicle subsidy scheme worth 3 million €. However, only €500,000 were allocated to subsidising the purchase of fully electric vehicles with a €5,000 grant per vehicle. The remaining 2.5 million € are invested to subsidise the purchase of new low carbon vehicles when withdrawing old and polluting vehicles. This policy measure would be applicable to cars older than 15 years to be scrapped and to newly registered cars with less than 160 gCO_2/km.

5.13.4.2.2 Measures that can promote AFI in public transport services

The Cypriot NIR lists one policy measure for the promotion of alternative fuel usage in public transport services.

Buses

The Cypriot NIR reports one measure for the integration of innovating green technologies in the existing public transport service. The plan foresees the introduction of hydrogen vehicles in the fleet of public diesel buses. The measure is projected to account for 5 to 30% fuel savings. The total estimated budget is €82.266 million between 2019 and 2022.

5.13.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The Cypriot NIR provides one policy measure that is under consideration concerning the provision of grants for installing/extending photovoltaic systems and for domestic installation of smart meters for recharging electric vehicles.

5.13.4.3 Deployment and manufacturing support

5.13.4.3.1 AFI deployment

The Cypriot NIR lists only one deployment and manufacturing support measure, which is already a small improvement compared to the NPF. The Electrical and Mechanical Services Department has launched a call for tenders for the installation of 20 public recharging points worth 1 million € in the period 2019-2020.

5.13.4.3.2 Support of manufacturing plants for AF technologies

The Cypriot NIR does not provide measures regarding the support of manufacturing plants for AF technologies.

5.13.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructure

The Cypriot NIR provides no information on this subject.

5.13.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.13.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, only clusters of measures on road transport could be identified in the Cypriot NIR, of which only the ones related to electricity and hydrogen contained dedicated measures to the respective fuels. Most of the assessable measures are targeting the pair electricity/road, which is the main focus of the CY NIR set of measures and resulted to have a medium score and to be comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road result to have a medium impact, while those for the pair hydrogen/road have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all identified clusters (electricity/road, CNG/road, LNG/road and hydrogen/road).

Table 5.13.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	X	N		+
LNG	Road	X	N		+
	Water - maritime				
H2	Road	L	N	**L**	+

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.13.4.5 Research, Technological Development & Demonstration

The Cypriot NIR lists five RTD&D measures, four of which are new and only reported in the NIR. All measures mentioned can be categorised as studies conducting research on implementation scenarios for different alternative fuels and the respective expected demands. Three studies were performed in the frame of the EU project "CYnergy" co-financed by CEF and are dedicated to the adoption of natural gas in Cyprus (two studies specifically target the LNG use for maritime transport).

5.13.5 *Additional information on alternative fuels infrastructure developments*

The Cypriot NIR provides information on the changes in fuel use, see Table 5.13.5-1. Diesel and gasoline are expected to play a dominating role, with a combined share of 91% in 2030. The share of electricity as an alternative fuel in the transport sector is expected to be 3% in 2030, whereas biofuels are estimated to have an almost constant share of 4 to 5% between 2020 and 2030. Increases in CNG and LNG shares in the transport fuel mix are not expected to be significant until 2030.

Table 5.13.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	55.20%	53.20%	51.30%	50.30%	55.70%	49.00%
	Diesel	43.20%	45.30%	47.15%	44.80%	40.00%	42.40%
	Electricity	0.00%	0.00%	0.00%	0.00%	0.10%	3.20%
	Biofuels	1.60%	1.50%	1.50%	4.80%	4.10%	5.20%
	LPG	0.00%	0.00%	0.05%	0.10%	0.10%	0.20%
	Other AF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Total Road	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**
Maritime	Marine diesel oil	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

5.13.6 *Summary of the assessment*

Tabular overview

Table 5.13.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode			
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)
AF Vehicles / Vessels		Past situation (2016)	20	0	0	NA
		Situation (2018)	28	0	0	NA
		Estimate (2030)	700	NA	NA	NA
		Future share (2030) [%]	0.11%			
		Estimate attainment (2018 vs 2030) [%]	4.00%			
		Progress (2018)	slow			
Publicly accessible AF Infrastructure		Past situation (2016)	32	0	0	0
		Situation (2018)	36	0	0	0
		Target (2030)	100	40	3	1
		Target attainment (2018 vs 2030) [%]	36.00%			
		Progress (2018)	slow	slow		
Sufficiency Index		2016	0.63			
		2018	0.78			
		2020	1.69			
		2025	1.73			
		2030	7.00			
Measures	Legal measures	Ambition (NIR vs NPF)	+		+	+
	Policy measures + Deployment & manufacturing support	Score	M	X	X	
		Comprehensiveness	C	N	N	
		Impact	M			
		Ambition (NIR vs NPF)	+	+	+	
	RTD&D	Ambition (NIR vs NPF)		+	+	+

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

Not all the requirements of Annex I of the Directive are covered by the Cypriot NIR as outlined in the checklist of Table 5.13.2-1.

With regards to the combination of AF/AFV/AFI with transport mode, electricity is well covered for road transport; CNG, LNG and LPG are also covered for road transport in terms of AFI; maritime water transport is covered for shore-side electricity supply and LNG in terms of AFI; all the other combinations are either absent or not applicable. The NIR has improved in terms of AFI target definition since it contains, contrary to the NPF, future targets for the pair CNG/road, LNG/road and LNG/water (maritime).

The main outcomes of the technical assessment of the Cypriot NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Concerning EVs, Cyprus recorded a total of 28 electric passenger cars and 73 electric powered two-wheelers in 2018. In contrast with the NPF where only a wide interval of 100-2000 was mentioned for 2020, the Cypriot NIR reports concrete quantitative vehicle estimates of 71, 140 and 700 for 2020, 2025 and 2030, respectively (all the values refer to passenger cars). Compared with the NPF, the recharging infrastructure targets in the CY NIR also became more concrete but have been reduced to 42, 81 and 100 respectively for 2020, 2025 and 2030. According to our methodology, the 2018 progress to achieve their objectives in 2030 is considered slow both for EVs and recharging infrastructure, while the sufficiency index is regarded as adequate for the next decade.
- **CNG** – The CY NIR states that CNG is currently not in use in the transport sector but introduces targets for CNG refuelling points in the future that were absent in the NPF (7 in 2025 and 40 in 2030). According to our methodology, the 2018 progress to achieve their objectives in 2030 is considered slow for CNG refuelling infrastructure.
- **LNG** – Cyprus does not record any LNG vehicles or refuelling infrastructure at the end of 2018. However, the CY NIR provides new LNG refuelling points targets that were absent in the NPF (3 in 2025 and 2030).
- **Hydrogen** – Similarly to the NPF, the CY NIR does not provide any quantitative future objective related to hydrogen vehicles or infrastructure. The intention of introducing hydrogen buses in the fleet of public transport is mentioned.
- **Biofuels** – The NIR only mentions that Cyprus implemented the EU Directives regarding increasing blending mandates for biofuels in diesel and petrol fuels.
- **LPG** – The Cypriot NIR shows only the situation in 2018 (205 passenger cars fuelled by LPG and gasoline), but does not report any LPG vehicle estimate for the future. The LPG infrastructure target for 2020 in the CY NIR has been reduced compared to the NPF by 60%, from 20 to 8 refuelling points.

Rail transport

Information is unavailable in the Cypriot NIR.

Waterborne transport (maritime)

- **Electricity** – As an update to the NPF that did not contain any target, the CY NIR introduced targets for shore-side electricity supply for seagoing ships in one maritime port in 2025 and 2030.
- **LNG** – The CY NIR presents the intention to have one maritime port equipped with LNG refuelling infrastructure by 2025, which was absent in the NPF.

Air transport

- **Electricity –** The NIR does not confirm the NPF target of two airports offering electricity supply for stationary airplanes by 2020.

As for the **measures**, the Cypriot NIR shows more focus on the development of electro-mobility. To a lower extent, also measures related to CNG, LNG, and hydrogen are present. The situation has evolved in the NIR compared with the NPF in the sense that there are measures that have been either continued/improved, became more concrete, or were newly introduced.

The Legal measures are mainly dedicated to allowing the development of electro-mobility. Overall, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR. Based on the available information, their level of ambition can be considered to have increased between the NPF and the implementation report.

The Policy and Deployment & Manufacturing measures target only road as transport mode, in particular electro-mobility. Taken singularly, all these measures score low or medium and appear to show the same or higher level of ambition compared to the NPF. The most complete and numerous cluster of measures is for the pair electricity/road, followed by the pair hydrogen/road. The other pairs of alternative fuel and transport mode did not contain dedicated measures, thus their score could not be computed. In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, those for the pair electricity/road result to have a medium impact, those for the pair hydrogen/road have a low impact, while all the others were not assessable.

Concerning the RTD&D measures, the CY NIR shows a larger set of activities that translates in a higher ambition compared with the NPF. The measures presented relate to studies on implementation scenarios for different alternative fuels and the respective expected demands, with three studies dedicated to the introduction of natural gas (CNG and LNG) in the Cypriot transport.

The CY NIR states that the natural gas market is the subject of the Cypriot AF strategy. The Council of Ministers decision to treat the Cypriot natural gas market as emerging and geographically isolated market sets the base for further measures.

5.13.7 *Final remarks*

The Cypriot NIR presents a relatively comprehensive report on the efforts to implement the Directive. The NIR partially meets the requirements of Annex I to the Directive, but shows a quite limited level of ambition. The NIR provides the targets for electric recharging points and the estimates of electric vehicles for 2020, 2025 and 2030, whereas for CNG and LNG only the targets for road refuelling points but no estimates are given for vehicles. The NIR includes measures to support the electrification of road transport. To a lower extent, measures related to CNG, LNG, and hydrogen are also included. In general, in view of the overall objective of achieving climate-neutrality in the EU by 2050, Cyprus should continue to increase its efforts to develop a comprehensive approach on promoting zero-emission vehicles. In this perspective, a higher level of ambition is required beyond road transport, where all transport modes are further considered, including air transport, towards the 2030 milestone.

Regarding electricity, the NIR estimates that 700 electric vehicles could be on the road by 2030, representing about 0.11% of the future fleet. Taking into account the current situation and expected trends, this level of ambition appears too low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. No information on charging efficiency is provided. The Cyprus maritime port in the TEN-T Core Network will be equipped with shore-side electricity supply for seagoing ships. Furthermore, the NIR does not address electricity supply in the Larnaca airport. Future reporting should provide further information on electricity supply for stationary airplanes.

Regarding hydrogen for road transport, the NIR, similarly to the NPF, does not provide any quantitative objective related to hydrogen vehicles or infrastructure. The NIR notes one measure devoted to introducing hydrogen buses in public bus fleets.

With regard to natural gas for transport, the NIR plans for seven CNG refuelling stations in 2025 and 40 in 2030. Three LNG refuelling points are foreseen from 2025 onwards. This appears to be sufficient taking into account the length of the TEN-T Core Network in Cyprus, provided that the refuelling stations are widely distributed along the network. In 2025, the port of Limassol will be equipped with one LNG refuelling point.

As regards LPG in road transport, the NIR only reports 205 LPG vehicles and two refuelling stations in 2018 and the revised infrastructure target for 2020. The LPG infrastructure target has been reduced compared to the NPF by 60%, from 20 to eight refuelling points.

As far as biofuels are concerned, further information should be provided on the consumption of biofuels. Cyprus should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.13.8 *ANNEX - Description of the Member State*

On a surface area of 9,300 km², Cyprus has a population of 864,000 people in 2018, which makes up for a population density of 93 inhabitants/km².

Number of main urban agglomerations

- 2 urban agglomerations > 50,000 inhabitants

In 2018, Cyprus achieves a per capita gross domestic product at market prices of €24,290, which represents a per capita gross domestic product in purchasing power standards of 89 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Cyprus is 156 km. The total road network length is 4,789 km, of which 257 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Cyprus: 3% (138 km) of the Orient - East Mediterranean Corridor.

Number of registered road vehicles

At the end of 2018, Cyprus accounts for 704,221 registered road vehicles of which 550,695 are categorized as passenger cars, 98,533 as light goods vehicles, 12,509 as heavy goods vehicles and 3,084 as buses and coaches. The motorisation rate is 638 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 1 maritime port in TEN-T Core Network (Limassol)
- 1 maritime port in the TEN-T Comprehensive Network (Larnaca)
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Larnaca)
- 1 airport in the TEN-T Comprehensive Network (Paphos)

5.14 Latvia (LV)

5.14.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Latvian NPF the Commission concluded:

The Latvian NPF addresses only part of the requirements of Article 3 of the Directive. It does not contain any target for LNG refuelling points to be put in place along the TEN-T Core Network, neither for heavy-duty vehicles nor for its two maritime ports in the core network.

The Latvian NPF considers that the deployment of an appropriate EV recharging infrastructure has a high priority for fostering electro-mobility. Latvia centres on deploying a comprehensive publicly accessible high power recharging infrastructure. The NPF lacks sufficient information on electricity supply for stationary airplanes. For vessels, two studies were carried out, concluding that the costs for the deployment of shore-side electricity supply for the ports of Riga and Ventspils outweigh the benefits.

The Latvian NPF admits that the absence of a national policy plan has jeopardised the use of natural gas and hydrogen in transport. The NPF does not provide future estimates thereof. The Latvian NPF indicates that a revision of the excise duty would be a candidate measure to promote natural gas use. It has established targets for the deployment of CNG refuelling points accessible to the public. The targeted number of CNG refuelling points could support a significant increase of CNG vehicles. The coverage of the TEN-T network with CNG refuelling points is unclear.

As indicated in the NPF, Latvia has no plans for the deployment of LNG refuelling points in its ports.

The NPF does not consider hydrogen for transport.

The Latvian NPF expects that the purchase price of 'green' vehicles will remain in the near-term higher than that of conventional vehicles. However, the government of Latvia considers it has "few instruments available to influence this". Notwithstanding, the NPF mentions the possibility of financial support between 2018 and 2020 to reduce the current 7,000 EUR financial differential between internal combustion engine vehicles and EVs on sale in Latvia. Three levels of support are under discussion: 7,000 EUR for 2018, 5,000 EUR for 2019 and 3,000 EUR for 2020.

5.14.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.14.2-1 Checklist Table

Part of the Directive 2014/94/EU	**Requirement**	**Mode of Transport / Alternative Fuel (provided in the NIR)**	**Yes / No**
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, combination / Electricity, combination	Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, water-maritime / Electricity, CNG, LNG	Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / Electricity, CNG	Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.		N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.		N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.		N
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity	Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG, LNG, LPG	Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, water-maritime / Electricity	Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, water-maritime / All	Y

The checklist shows that the LV NIR covers only some of the requirements of Annex I from the Directive and mostly for electricity as fuel and road as transport mode. All the other AF and transport modes are either absent in the report or the level of information provided is such that it does not allow any assessment.

The Latvian NIR reports 29 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify six AF/transport mode clusters of measures, of which three were assessable.

5.14.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.14.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	549	231	980	379	2,650	466	7,200	466
	Change NIR vs NPF [%]			31.19%	152.67%				
	Attainment [%]			56.02%	60.95%	20.72%	49.57%	7.63%	49.57%
CNG / road	NIR	187	0	NA	2	NA	NA	NA	NA
	Change NIR vs NPF [%]				-60.00%				
	Attainment [%]								
LNG / road	NIR	11	0	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	NA	NA	1*	NA	2*	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Shore-side electricity supply / water (maritime)	NIR	NA	2	NA	2	NA	3	NA	4
	Change NIR vs NPF [%]								
	Attainment [%]				100.00%		66.67%		50.00%
LPG / road	NIR	18,202	240**	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

*The values with asterisks are reported as such in the LV NIR without explanation why there is the asterisk; ** Value taken from EAFO

5.14.3.1 Road transport

5.14.3.1.1 Electricity

Vehicles

Latvia recorded 549 battery-electric and plug-in hybrid vehicles in use in 2018 (of which 531 were passenger cars, 13 LCVs and 5 buses and coaches). The LV NIR provides for 2020 a new and higher estimate of electric vehicles compared to the NPF (980 vs. 747) and presents for the first time EV estimates for 2025 and 2030 (2,650 and 7,200 EVs, respectively). These estimates for 2025 and 2030 seem to refer only to the passenger cars, as the values for LCVs and buses and coaches are indicated only for the 2020 (i.e. 14 LCVs and 6 buses and coaches). There is no mention of electrified Heavy Commercial Vehicles in the LV NIR.

The 2018 ***attainment*** of future EV estimates is 56.02% for 2020 and 7.63% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the EV fleet evolution is equal to 26%.

Infrastructure

Latvia recorded 231 publicly accessible recharging points in 2018 (see Table 5.14.3-1). Like for the electrified vehicles, the LV NIR provides for 2020 a new and higher AFI target compared to the NPF (379 vs. 150) and presents for the first time AFI targets for 2025 (466 recharging points) and 2030 (the same value of 466 is reported in the LV NIR, but with the clarification that the number refers only to the approved and known projects) . The LV NIR clearly states that all these values of recharging points refer to the number of connectors, not to the number of recharging points, which therefore will probably be lower. It also states that the reported numbers of recharging points might not be comprehensive because "*owners of these points are not obliged to provide the Road Safety Directorate with information on station deployment*". Concerning the recharging power, the LV NIR reports that those with a power below 22 kW will remain limited to a total of 30 recharging points until 2030, while those with higher power will increase (141 AC recharging points below 44 kW, 293 DC below 100 kW and 2 DC above 100 kW are foreseen in 2030).

Although the most relevant effort made by Latvia for the uptake of AF vehicles and infrastructure is for the pair electricity/road, the LV NIR still declares that "*the existing measures are not yet sufficient to ensure rapid increase in EVs in Latvia*".

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 60.95% for 2020 and 49.57% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Latvia is equal to 23%.

Ratio

Based on the LV NIR, the following table shows the ratio between number of vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. As it can be seen, the number of recharging points was insufficient in 2016 and 2017 (and the sufficiency index was inadequate), but has grown considerably in 2018. Although the sufficiency index increases again above 10 in 2030, it can be considered adequate, because more than 90% of the recharging points are planned to be high power (>22kW) ones.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	15.50	18.24	2.38	2.59	5.69	15.45

Information on charging efficiency

Information is not available in the Latvian NIR.

5.14.3.1.2 CNG

Vehicles

Latvia recorded 187 CNG vehicles in use in 2018 of which 177 were passenger cars, 8 LCVs and 2 HCVs. The Latvian NIR does not report any CNG vehicle estimate for 2020, 2025 and 2030, thus it is not possible to calculate the ***attainment,*** the ***progress*** or the ***average annual growth rate*** until 2030.

Infrastructure

Concerning CNG refuelling infrastructure (Table 2), the Latvian NIR reports nothing in 2018, but presents a target of two public refuelling points for 2020, which represents a decrease of 60% compared to the NPF target of five refuelling points. The NIR also mentions the plan to build a third public CNG refuelling point within 2020 and the presence of one private CNG refuelling point already in service. Like in the NPF, the Latvian NIR does not provide any target for 2025 and 2030.

As there was no CNG refuelling point in use in 2018, the ***attainment*** of future publicly accessible CNG infrastructure targets has not been computed. According to the assessment methodology described in in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible refuelling infrastructure could not be computed due to the zero value from 2016 to 2018.

Ratio

Due to the lack of data, it is not possible to calculate the sufficiency index for the pair CNG/road.

5.14.3.1.3 LNG

Vehicles

Latvia recorded 11 LNG vehicles in use in 2018 (of which eight were LCVs, two HCVs and one bus/coach). The Latvian NIR does not report any LNG vehicle estimate for 2020, 2025 and

2030. For this reason, it is not possible to calculate the ***attainment,*** the ***progress*** or the ***average annual growth rate*** until 2030.

Infrastructure

The Latvian NIR does not report any information on infrastructure for the pair LNG/road in 2018, nor any target for 2020, 2025 and 2030, thus it is not possible to calculate the ***attainment,*** the ***progress*** or the ***average annual growth rate*** until 2030.

Ratio

Due to the lack of data, it is not possible to calculate the sufficiency index for the pair LNG/road.

5.14.3.1.4 Hydrogen

Vehicles

Similarly to the NPF, the Latvian NIR does not report any information related to hydrogen-fuelled vehicles.

Infrastructure

Although the Latvian NIR mentions hydrogen refuelling points as being in the scope of some measures, there is no specific information on hydrogen infrastructure target until 2030.

Ratio

Since there are no vehicle estimates nor infrastructure targets in the Latvian NIR, it is not possible to calculate the sufficiency index for the pair hydrogen/road.

5.14.3.1.5 Biofuels

Vehicles

Information is unavailable in the LV NIR.

Infrastructure

Information is unavailable in the LV NIR.

5.14.3.1.6 LPG

Vehicles

Latvia recorded 18,202 LPG vehicles in use in 2018 of which 17,749 were passenger cars, 373 were LCVs and 80 were HCVs. The Latvian NIR does not report any LPG vehicle estimate for 2020, 2025 and 2030. For this reason, it is not possible to calculate the ***attainment,*** the ***progress*** or the ***average annual growth rate*** until 2030.

Infrastructure

Although there are clearly LPG refuelling points in Latvia (for example EAFO reports 220 LPG refuelling points for 2016 and 240 for 2018), the Latvian NIR does not provide any information regarding LPG infrastructure in 2018, nor any target for 2020, 2025 and 2030, thus it is not possible to calculate the ***attainment,*** the ***progress*** or the ***average annual growth rate*** until 2030.

Ratio

The following table shows the ratio between vehicles and publicly accessible LPG refuelling points (i.e. sufficiency index) for the pair LPG/road. The sufficiency index could only be computed for 2016 and 2018 by using data from EAFO.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	34.09*		75.84*			

* Calculated from EAFO values

5.14.3.1.7 Rail transport

5.14.3.1.8 Electricity

Vehicles

Information is unavailable in the LV NIR.

Infrastructure

The Latvian NIR confirms the plan, already presented in the NPF, to complete the electrification of railway lines Daugavpils - Krustpils, Rezekne - Krustpils and Krustpils - Riga by 2023. The LV NIR also mentions the plan to construct the European standard gauge rail line "Rail Baltica", but does not provide any further information.

5.14.3.2 Waterborne transport (maritime)

5.14.3.2.1 Electricity

Vessels

Information is unavailable in the LV NIR.

Infrastructure

According to the LV NIR, two shore-side electricity supply installations were available in 2018 for use by vessels. The NIR also reports the target of one additional shore-side electricity supply installation in 2025 and one in 2030, but it states that this plan is subject to the outcome of the ongoing assessment of the necessity and economic feasibility of setting up shore-side electricity supply, due to be completed by 31 December 2020.

The 2018 ***attainment*** of future targets for shore-side electricity supply for seagoing ships in maritime ports is 100% for 2020 and 50% for 2030 (if the plan to build two additional installations is confirmed). According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Latvia from 2016 until 2018 for the deployment of shore-side electricity supply in maritime ports is 50% of the overall planned deployment during the period 2016-2030.

5.14.3.2.2 LNG

Vessels

Information is not available in the Latvian NIR, apart from a generic mention of the development of shipbuilding with engines using only LNG as fuel (it is not clear whether this mention refers to Latvia specifically or to the EU in general).

Infrastructure

As it can be seen in Table 5.14.3-1, the LV NIR reports the target of one LNG refuelling point in 2020 and another one in 2025, but it specifies that this plan is subject to the outcome of the ongoing assessment of the necessity and economic feasibility of setting up LNG refuelling points in ports (in TEN-T Core Network), due for completion by 31 December 2020. This could be the reason for the presence of the asterisk next to the numbers.

5.14.3.3 Waterborne transport (inland)

Not applicable since Latvia has no inland ports in the TEN-T Core Network.

5.14.3.4 Air transport

5.14.3.4.1 Electricity

Airplanes

Information is not available in the LV NIR.

Infrastructure (for stationary airplanes)

The LV NIR reports that *"most of the aircraft parking lots at Riga Airport that serve commercial passenger flights already have Fixed Power Units (FPUs), which provide power to aircraft systems during ground-handling services…. In the future, Riga Airport will also provide the construction of fixed power supply connection points".*

5.14.3.4.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is unavailable in the Latvian NIR.

Infrastructure

Information is not available in the LV NIR.

5.14.4 *Measures assessment*

As a general statement, it has to be anticipated that the description of the measures in the LV NIR is not sufficient to allow a complete assessment according to the methodology described in Section 2.2. In many instances the description is not clear as to what it applies to, furthermore the Policy and Deployment & Manufacturing measures do not provide quantitative information (budget per AF/vehicle/infrastructure) which makes the results of the assessment and of the clustering quite uncertain.

5.14.4.1 Legal measures

The LV NIR presents a list of 11 Legal measures, however only four of them can be considered strictly as Legal measures, while the other 7 are either Policy or Deployment & Manufacturing measures (and some of them are actually repeated in the Policy measures section). Overall, the Legal measures listed in the LV NIR do not appear to bring a different level of ambition compared to the NPF.

5.14.4.1.1 Legislative & Regulatory

The first and probably most important Legal measure is the Transport Energy Law, which will regulate the future transport sector in Latvia. Due to its importance, however, this measure is subject to a very lengthy procedure (presented to the LV Parliament in May 2018, expected to be adopted by December 2020), so it is currently still under discussion.

The second Legal measure is the Cabinet Regulation No 78 of 6 February 2018, laying down requirements for electric vehicle recharging points, natural gas refuelling points, hydrogen refuelling points and shore-side electricity supply facilities. The other two Legal measures, both adopted in 2017, amend respectively the previous law on circulation tax and company car tax, and the previous law on excise tax.

5.14.4.1.2 Administrative

The LV NPF does not provide specific information on administrative measures.

5.14.4.2 Policy measures

The LV NIR lists a series of 16 measures under the heading “Policy Measures”, however according to the classification adopted in the Guidelines for the reporting of the national implementation reports, only 13 measures can be considered Policy measures while the other three are Deployment measures and are described in the corresponding section.

5.14.4.2.1 Measures to ensure national targets and objectives

Ten out of the 13 Policy measures are intended to ensure the achievement of national targets and objectives. Eight measures focus on road transport and two on waterborne transport.

Road transport

Compared to the Policy measures already present in the NPF (and still in place), the new Policy measures presented in the NIR refer to studies and analysis that are seen as the necessary basis for future decisions. For example, two measures aim to "*conduct, in accordance with the 'Tax Policy Guidelines 2017-2021', an evaluation of tax incentives for CNG, LNG and FCEV, biofuel, paraffinic and synthetic fuels from RES, and the possibility of changing the excise tax rate for diesel to approximate the currently highest rate for gasoline*". One measure aims to "*conduct an assessment in accordance with the Tax Policy Guidelines 2017-2021 of options for reducing the tax burden on eco-friendly vehicles (PHEV, FCEV, vehicles using biofuels, paraffinized and synthetic fuels derived from RES, hybrid vehicles, low-carbon vehicles, etc.) emitting less than 50 gCO_2/km*". Another measure is under discussion (deadline 31 December 2020) to "*examine options to facilitate purchases of EVs*". Another measure is under discussion (deadline 31 December 2020) to discuss "*the possibility of increasing taxes on new non-ecological vehicles and, if necessary, amending laws and regulations*".

Waterborne transport

Two Policy measures in the LV NIR address waterborne transport, one concerning the assessment of the potential use of LNG in ports, the other dedicated to studying the economics of shore-side electricity supply. The deadline for the conclusion of these analyses is 31 December 2020.

5.14.4.2.2 Measures that can promote AFI in public transport services

Two Policy measures are aimed at promoting AFI in public transport service. The first relates to supporting the deployment of environmentally friendly buses. This measure mentions six projects with a total budget (2018-2025) of around 16 million €, but there is no indication of the number of buses to incentivise. On the other hand, in the AFV Estimate section, there is only a mention of 6 Buses (BEV) for 2020 and no other type of bus. This however would be quite strange, because the average cost of an E-Bus is between €300,000 and €500,000, thus the budget would largely exceed the total cost.

The second measure is dedicated to the rail sector in cities (replacement of trams, rail lines, rolling stock). Total budget for the period 2017-2025 is slightly above 30 million €, but there is no indication regarding the number AFV nor AFI, so once again the measure is not assessable.

5.14.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The LV NIR presents a measure to support the deployment of private electro-mobility infrastructure, i.e. "*consider simplifying administrative procedures for the deployment of EV recharging points that are not publicly accessible*". The outcome of this analysis is expected by end of 2020.

5.14.4.3 Deployment and manufacturing support

5.14.4.3.1 AFI deployment

The Latvian NIR contains 5 AFI deployment support measures. One is a planning document developed between 2014 and 2016 that was the basis for the first round of deployment of EV recharging points. Three other Deployment measures relate to the actual construction of recharging points, firstly on the TEN-T roads or near them (total budget 3.75 million €), secondly on urban areas with more than 5,000 inhabitants and on secondary roads (total budget 7.80 million €). As these three measures have achieved the objective in 2018 of more than 50% of the infrastructure target for 2020, they get a score of high according to the assessment methodology (see Section 2.2). The fifth Deployment measure is related to the construction of the first three CNG refuelling points in Latvia (no indication of the budget in the LV NIR).

5.14.4.3.2 Support of manufacturing plants for AF technologies

Information is not available in the Latvian NIR.

5.14.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Latvian NIR.

5.14.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.14.4-1 presents an overview of the analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, six clusters of measures could be identified, of which only three were assessable. The pair electricity/road is the only one having a score of high and can be considered to be comprehensive. Support measures get a low/medium score for CNG/road and low score for LNG/road and are not comprehensive. Those for the pairs electricity/water, LNG/water and electricity/rail are not assessable, although for the last pair a budget is mentioned (around 30 million € for the period 2016-2025). In terms of the expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of future targets and estimates for several pairs coupled with the lack of information related to the measures makes the assessment almost impossible, with the only exception of the pair electricity/road, for which the expected impact is high.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures is substantially the same.

Table 5.14.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	H	C		**H**		=
CNG	Road	L/M	N		**L**		-
LNG	Road	L	N		**L**		=
	Water-maritime	X					=
Electricity	Water-maritime	X					=
	Rail	X					=

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: ‘+’ means ‘higher’; ‘=’ means ‘comparable’; ‘-‘ means ‘lower’.

5.14.4.5 Research, Technological Development & Demonstration

The Latvian NIR does not mention any RTD&D measure. It should be noted though that several measures presented in the LV NIR as either Legal or Policy measures could be considered as RTD&D measures (i.e. studies and analyses).

5.14.5 *Additional information on alternative fuels infrastructure developments*

The Latvian NIR provides information on the changes in fuel use (see Table 5.14.5-1). As it can be seen, LPG, CNG and LNG are expected to play a role in 2030, however this forecast is not accompanied by vehicle estimates and infrastructure targets for these fuels. No real increase in LNG use in maritime transport is expected.

Table 5.14.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	20%	19%	17%	21%	18%	16%
	Diesel	69%	73%	72%	69%	65%	58%
	Electricity*	0%	0%	0%	1%	1%	2%
	CNG			0%	0%	4%	7%
	LNG				0%	1%	2%
	LPG	6%	6%	5%	7%	10%	14%
	Biofuels	1%	1%	3%	2%	1%	1%
	Other AF	3%	2%	2%			
	Total Road	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Maritime	Marine gas oil						
	Marine diesel oil	97%	97%	99%			
	LNG						

*Note: including trolleybuses and trams

5.14.6 *Summary of the assessment*

Tabular overview

Table 5.14.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	Electricity / shore-side (maritime)
AF Vehicles / Vessels		Past situation (2016)	279	84	3	NA	NA
		Situation (2018)	549	187	11	NA	NA
		Estimate (2030)	7,200	NA	NA	NA	NA
		Future share (2030) [%]	0.81%				
		Estimate attainment (2018 vs 2030) [%]	7.63%				
		Progress (2018)	adequate				
Publicly accessible AF Infrastructure		Past situation (2016)	18	0*	NA	NA	NA
		Situation (2018)	231	0	0	NA	2
		Target (2030)	466	NA	NA	NA	4
		Target attainment (2018 vs 2030) [%]	49.57%				50.00%
		Progress (2018)	fast	slow			
Sufficiency Index		2016	15.50				
		2018	2.38				
		2020	2.59				
		2025	5.69				
		2030	15.45				
Measures	Legal measures	Ambition (NIR vs NPF)	=	=	=		
	Policy measures + Deployment & manufacturing support	Score	H	L/M	L	X	X
		Comprehensiveness	C	N	N		
		Impact	H	L	L		
		Ambition (NIR vs NPF)	=	-	=	=	=
	RTD&D	Ambition (NIR vs NPF)	-	-	-		

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken or calculated from LV NPF.

With the only exception of the pair electricity/road, for which both vehicle estimates and infrastructure targets are provided until 2030, the Latvian NIR does not provide assessable information concerning the strategy for the uptake of alternative fuels for transport in the next decade. Several studies and analyses are being carried out, most of them with an expected deadline of December 2020, which will constitute the basis of the Latvian strategy for transport for the following years. This, on the other hand, implies that the NIR brings limited progress compared to the NPF and only for the pair electricity/road. Also, the Latvian NIR does not provide information on the methodology applied to take account of the charging efficiency of high power recharging points or on any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Latvian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – With 549 electric vehicles and 231 publicly accessible recharging points recorded in 2018, Latvia's progress is adequate for the deployment of EVs and fast in terms of recharging infrastructure. The sufficiency index indicating the ratio between number of EVs and number of recharging points, which was quite low in 2018 (2.38), increases progressively over time but in 2030 it can be still considered adequate, thanks to the relevant share of high power recharging points compared to the normal power recharging points. As for the heavy-duty sector, the LV NIR does not present any estimate for 2025 and 2030.
- **CNG** – There were 187 CNG vehicles in Latvia in 2018, the vast majority being passenger cars (plus 8 LCVs and 2 HCVs) and zero refuelling infrastructure. The Latvian NIR does not provide road vehicle estimates for the period 2020 – 2030. As for CNG refuelling points there is a target only for 2020, which is 60% lower than in the NPF (two versus five). The progress of infrastructure deployment results slow.
- **LNG** – The Latvian NIR only reported 11 LNG vehicles in use in 2018 (of which eight LCVs, two HCVs and one bus/coach) and zero refuelling points, but does not provide road vehicle estimates or LNG infrastructure targets for the period 2020 – 2030
- **Hydrogen** – The Latvian NIR does not provide road vehicle estimates or hydrogen road infrastructure targets for the period 2020 – 2030.
- **Biofuels** – The Latvian NIR foresees a decrease of biofuels market share from 3% in 2018 to 1% in 2030, but does not provide any specific information on biofuels for road transport.
- **LPG** – Despite the presence of an important number of LPG vehicles in Latvia in 2018 (17,749 passenger cars, 373 LCVs and 80 HCVs) and of the relevant forecast regarding the LPG market share as fuel in 2030 (14%), the Latvian NIR does not provide the infrastructure state of play in 2018 nor vehicle estimates/infrastructure targets for the period 2020 – 2030. According to EAFO there were 240 LPG refuelling points in use in 2018.

Rail transport

- **Electricity** - The Latvian NIR confirms the plan, already presented in the NPF, to complete the electrification of railway lines Daugavpils - Krustpils, Rezekne - Krustpils and Krustpils - Riga by 2023.

Waterborne transport (maritime)

- **Electricity** - In addition to the existing two shore-side electricity supply, two more shore-side electricity supply points are foreseen by 2030.
- **LNG** - There is a provisional plan to build two LNG refuelling points at maritime ports, one in 2020 and one in 2025, but this plan has to be confirmed by the outcome of an ongoing analysis of its economic feasibility.

Air transport

- **Biofuels** – The Latvian NIR does not provide information related to the need of renewable jet fuel refuelling points in airports within the TEN-T Core Network.

As regards to the **measures**, their description in the LV NIR is not sufficient to allow a complete assessment according to the methodology described in Section 2.2. Furthermore the Policy and Deployment & Manufacturing measures do not provide quantitative information (budget per

AF/vehicle/infrastructure) which makes the results of the assessment and of the clustering quite uncertain. Six clusters of measures could be identified, of which only three were assessable. Tangible results during the implementation period and potentially high impact for the future could be seen only for the pair electricity/road, while for all the other fuels and transport modes the concretisation and quantification of supporting measures will depend on the outcome of the several studies and analyses on tax, incentives, feasibility, etc., undertaken by the Latvian authorities.

5.14.7 *Final remarks*

The Latvian NIR provides a rather limited report on the efforts to implement the Directive. The NIR complies, to a certain extent, with the requirements of Annex I to the Directive. However, the report does not provide estimates on CNG vehicles and LNG vehicles and vessels. Furthermore, targets on natural gas infrastructures are only provided for CNG refuelling points in 2020 and LNG infrastructure in ports by 2025 and 2030. A certain number of the measures included in the Latvian NIR are not well described in terms of their objectives and timelines for policy implementation, in particular for waterborne transport.

With regard to electricity for road transport, the NIR estimates that approximately 7,200 electric vehicles could be on the roads by 2030, representing about 0.81% of the fleet by that time. Taking into account the current situation and expected trends, this level of ambition appears very low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. Further, in line with the low estimates for electric vehicles take up, there are only 466 recharging points estimated by 2030. An increase in ambition would contribute to better meeting the needs of realising a dense, wide-spread and easy to use network of recharging and refuelling infrastructure throughout the EU. No information on charging efficiency is provided. The NIR reports that the four major ports of Latvia will supply shore - side electricity by 2030. The report states that electricity is already supplied to stationary aircraft in the Riga airport. Further information should be provided on the current and future planned share of electrified rail network.

For hydrogen, the NIR does not report any information on existing or future FCHVs and the relevant infrastructure. It would be relevant that Latvia provides more information on how to ensure EU-wide connectivity for HCEV.

With regard to natural gas, the NIR shows that Latvia already had fleets of 187 CNG vehicles and 11 LNG vehicles in 2018. The NIR does not provide any estimates for natural gas vehicles for 2020, 2025 and 2030 and has only reported two public CNG refuelling points in 2020 and no information on LNG on roads. Two Latvian ports in the TEN-T Core Network might have LNG refuelling points by 2025 and thus complying, in this respect, with the requirements of the Directive.

With regard to LPG, the NIR shows that Latvia already had a medium LPG vehicle fleet and infrastructure, but the Latvian NIR does not provide any estimates of vehicles and infrastructure targets by 2020, 2025 and 2030. In this respect, Latvia should provide information on whether it intends to support LPG as a vehicle fuel in the future.

Further information should be provided on biofuels consumption in Latvia in road and air transport. Latvia should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.14.8 *ANNEX - Description of the Member State*

On a surface area of 64,600 km², Latvia has a population of 1.934 million people in 2018, which makes up for a population density of 30 inhabitants/km².

Number of main urban agglomerations

- 4 urban agglomerations > 50,000 inhabitants

In 2018, Latvia achieves a per capita gross domestic product at market prices of €15,080, which represents a per capita gross domestic product in purchasing power standards of 69 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Latvia is 835 km. The total road network length is 7,130 km.

The following lengths of the TEN-T Road Corridors are present in Latvia: 9% (378 km) of the North Sea - Baltic Corridor.

Through the TEN-T Road Corridors, Latvia is connected with the following Member States:
- Estonia (through the North Sea - Baltic Corridor),
- Lithuania (through the North Sea - Baltic Corridor)

Number of registered road vehicles

At the end of 2018, Latvia accounts for 854,737 registered road vehicles of which 707,841 are categorized as passenger cars, 57,146 as light goods vehicles, 32,065 as heavy goods vehicles and 4,885 as buses and coaches. The motorisation rate is 366 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 2 maritime ports in the TEN-T Core Network (Riga, Ventspils)
- 1 maritime port in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Riga)
- 3 airports in the TEN-T Comprehensive Network

5.15 Lithuania (LT)

5.15.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Lithuanian NPF the Commission concluded:

The Lithuanian NPF does not fully address the requirements of Article 3. A short discussion on the current state and future scenarios for alternative fuels in the transport sector in Lithuania is presented in the NPF. Targets as required by Article 3 of the Directive were established for CNG, LNG, and electricity for vehicles.

The Lithuanian NPF places attention on electric vehicles without possessing currently a dense network of publicly accessible recharging points. The spatial distribution of recharging points does not currently cover the needs of vehicles in terms of distance requirements; the ratio of only one public recharging point per 12 electric vehicles estimated for 2020 may be seen as a risk to the further market deployment of electric vehicles. It may be important to closely monitor this development and correct infrastructure targets in line with the market developments. Lithuania, today, has 10 hybrid buses (electricity + CNG). Bicycles as well as their infrastructure also receive support. The NPF neither contains any targets for increasing the availability of electricity supply for stationary airplanes nor for shore-side electricity.

Lithuania currently has a sufficient network of CNG refuelling points. Targets for an increase of the number of CNG refuelling points by 2020 and 2025 are foreseen. However, as the NPF does not provide estimates for the future deployment of CNG vehicles, their CNG infrastructure sufficiency for 2020 cannot be assessed.

Despite an existing fleet of 161 public transport buses with engines fuelled by LNG, no publicly accessible road LNG refuelling points are mentioned in the Lithuanian NPF. One LNG refuelling point for heavy-duty vehicles is targeted for 2025.

According to the Lithuanian NPF, there are no further plans for an extension of LNG refuelling points in ports, besides the already existing LNG refuelling point in Klaipėda, Lithuania's only maritime port in the TEN-T Core Network.

The NPF does not cover hydrogen for transport.

The Lithuanian NPF contains a list of measures, most of them, however, still under consideration with little details revealed in the NPF. Most of them can be considered having a low or medium impact on market actor's decisions. Their low implementation status could create uncertainty for market actors and hence decrease the likelihood that the national targets and objectives of the NPF could be reached.

The interests of regional and local authorities, as well as stakeholders have been considered during the drafting of the Lithuanian NPF. Further coordination is planned in order to ensure follow-up of the implementation actions, collaboration among authorities and advice from stakeholders.

Lithuania is actively involved in coordinating its plans on rail infrastructure with other Member States as well as collaborating with them in this field. Beyond that, the NPF does not mention any cooperation or coordination in the field of alternative fuels.

5.15.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.15.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / Electricity, CNG, LNG, H2, biofuels	Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, rail, waterborne / Electricity, CNG, LNG, H2, biofuels	Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, waterborne, air / electricity, CNG, LNG, H2	Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.		No
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.		No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, waterborne / electricity, LNG, CNG	Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, waterborne / electricity, LNG, CNG	Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, waterborne / electricity, LNG, CNG, LPG	Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, waterborne / electricity, LNG, CNG, LPG	Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points		No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / CNG, biofuels, LPG	Yes

The checklist shows the requirements of Annex I from the Directive that are covered in the LT NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all transport modes; CNG, LNG, hydrogen and LPG are covered for road transport (but LPG only in terms of AFI); LNG is covered also for waterborne transport (both inland and maritime); all the other combinations are either absent or not applicable.

The LT NIR reports 44 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify nine AF/transport mode clusters of measures, of which eight were assessable.

5.15.3 *Quantitative assessment: Vehicles and infrastructure*

The Lithuanian NIR signals that "*It should be noted that the previously planned targets and measures are currently being reviewed in the light of the EU's GHG reduction targets for the transport sector*". National objectives and targets according to the National Energy and Climate Action Plan of the Republic of Lithuania for 2021-2030 are also mentioned: "*The transport sector is aiming at a gradual shift towards cleaner fuels and electricity, and therefore, in line with the EU's commitments, the aim is to achieve a 10 per cent RES share by 2020 and a 15 percent RES share by 2030. However, Lithuania, like other Member States, is struggling to achieve the RES-T target for 2020 due to relatively high investment in the renewal of the vehicle fleet, which consists mainly of almost 1.5 million cars, 69% of which are diesel cars, with an average age of 15 years. For this reason, it is likely that the 2020 target will not be achieved by 2020 and the share of RES-T will be around 5 per cent.*"

Table 5.15.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	1,556	212	3,011	298	51,535	310	248,563	15,055
	Change NIR vs NPF [%]			150.92%	198.00%		210.00%		
	Attainment [%]			51.68%	71.14%	3.02%	68.39%	0.63%	1.41%
CNG / road	NIR	405	4	565	8	1,500	13	12,300	28
	Change NIR vs NPF [%]				-20.00%		30.00%		
	Attainment [%]			71.68%	50.00%	27.00%	30.77%	3.29%	14.29%
LNG / road	NIR	207	2	NA	NA	310	3	1,075	5
	Change NIR vs NPF [%]						200.00%		
	Attainment [%]					66.77%	66.67%	19.26%	40.00%
LNG / water (maritime)	NIR	1	1	1	1	1	1	1	1
	Change NIR vs NPF [%]				0.00%		0.00%		
	Attainment [%]			100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
LNG / water (inland)	NIR	0	0	0	0	1	1	6	1
	Change IR vs NPF [%]						0.00%		
	Attainment [%]								
Shore-side electricity supply / water (inland)	IR		0		0		0		3
	Change NIR vs NPF [%]								
	Attainment [%]								
Electricity supply / air (stationary airplanes)	NIR		37		44		45		45
	Change NIR vs NPF [%]								
	Attainment [%]				84.09%		82.22%		82.22%
H2 / road	NIR	0	0	1	0	65	2	1,250	10
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	109,575	664	NA	559	NA	555	NA	545
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.15.3.1 Road transport

5.15.3.1.1 Electricity

Vehicles

Lituania reported a total of 1,556 electric vehicles in use in 2018 (Table 5.15.3-1), of which 1,539 were passenger cars, 16 LCVs and one HCV. On top of that, the LT NIR reports 406 electric buses and coaches, but this number probably includes also trolleybuses, which do not fall under the scope of this assessment. The LT NIR reports also 132 PTWs in use in 2018. The Lithuanian NIR presents a new plan with increased ambition compared to the NPF and almost triples the EV estimates for 2020 (3,011 vs. 1,200 in the NPF). For the years 2025 and 2030, new estimates have been set (not given in NPF) for a total of 46,066 passenger cars and 5,469 LCVs by 2025, and a total of 230,332 passenger cars and 18,231 LCVs by 2030. The heavy-duty sector is excluded from future estimates in the LT NIR[48]. The report mentions that registration of ICE vehicles after 2030 will not be possible.

Therefore the level of ambition in the Lithuanian NIR has increased in comparison to the NPF.

The 2018 ***attainment*** of future electric light-duty vehicles estimates is 51.68% for 2020 and 0.63% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for electric light-duty vehicles fleet evolution planned by Lithuania is equal to 61%.

Infrastructure

Lithuania reported 212 publicly accessible recharging points, of which 192 were high power (>22kW) recharging points and 20 normal power (≤22kW) recharging points. The Lithuanian NIR significantly increased the targets and ambition for public infrastructure in 2020 and 2025 compared to the NPF, as well as provided a new target for 2030. The revised targets of publicly accessible recharging points for 2020 and 2025 are 198% and 210% higher than those presented in NPF, however the revised target for 2025 does not seem sufficient to cope with the vehicle estimate for the same year. For 2030, Lithuania plans to have 15,055 public recharging points. The LT NIR also highlights the plan to have 60,000 private recharging points in 2030.

The 2018 ***attainment*** of future public recharging infrastructure targets is 71.14% for 2020 and 1.41% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Lithuania is equal to 66%.

Ratio

Based on the LT NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. As it can be

[48] Since the estimates indicated for the next decade in the LT NIR address only the M1 and N1 categories of electric vehicles, the progress and attainment calculations only refer to light-duty vehicles. This implies also that the uncertainty about inclusion of trolleybuses in the number given for electric buses in 2018 by the LT NIR does not influence the progress and attainment results since the heavy-duty vehicles were not considered.

seen, the sufficiency index was very high (and inadequate) in 2016, but has adjusted in 2018. Also for 2020 the sufficiency index is close to the value of 10 and adequate. A big unbalance between EVs and public recharging points is foreseen in 2025, which, according to LT NIR data, should be mostly solved until 2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Electricity	road	72.60	21.79	7.33	10.10	166.24	16.51

Information on charging efficiency

Lithuanian NIR did not provide direct information on charging efficiency of high power (>22kW) recharging points, but it reported the following: "*There are currently 25 combined charging stations along national roads (three types:* AC, DC CHAdeMO and DC Combo*). Two electric vehicles can be charged at the same time at one station (AC and DC connectors). The number of connections to individual stations ranges between 195 and 40,533 per month (as observed in the period from May 2019 to October 2019); for October, for instance, the average number of connections was 5,095 and the average electricity consumption was 2,217 Kwh*."

5.15.3.1.2 CNG

Vehicles

Lithuania reported that 405 CNG vehicles were in use in 2018, of which 100 were passenger cars, 3 LCVs, 2 HCVs and 300 buses and coaches.

As regards to the years 2020, 2025 and 2030, the LT NIR provides new estimates (respectively 565, 1,500 and 12,300 vehicles). These were absent in the NPF. The new estimates specify also that the biggest growth is expected in numbers of CNG passenger cars (10,000 in 2030), but 500 LCVs, 1,000 HCVs and 800 buses and coaches are also foreseen.

The 2018 ***attainment*** of future CNG vehicles estimates is 71.68% for 2020 and 3.29% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Lithuania is equal to 28%.

Infrastructure

Lithuania reported four publicly accessible CNG refuelling stations in 2018 (plus six private). The LT NIR reports that Lithuania aims to achieve 8 public CNG refuelling points in 2020 (20% less than in the NPF), 13 in 2025 (30% more than in the NPF) and 28 in 2030 (there was nothing in the NPF). The number of private CNG refuelling points is expected to decrease from the current six, to four in 2020 and two in 2025 and 2030.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 50% for 2020 and 14.29% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible CNG refuelling infrastructure evolution planned by Lithuania is equal to 14%.

Ratio

Based on the LT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. The sufficiency index is always below the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
CNG	road	88.00	94.50	101.25	70.63	115.38	439.29

5.15.3.1.3 LNG

Vehicles

Lithuania reported 207 LNG vehicles in 2018 (Table 5.15.3-1). They were mainly buses and coaches (172) and 35 passenger cars. Regarding the next decade, the LT NIR proposes new estimates for 2025 and 2030 (not present in NPF), while 2020 is not addressed. The LT NIR aims to achieve 310 LNG vehicles in 2025 and 1,075 in 2030. This estimated growth is planned mainly for the HCVs (300 in 2025 and 1,000 in 2030), but 50 LCVs and 25 buses and coaches are also expected in 2030. For the LNG vehicles the level of ambition in the LT NIR is higher than presented in NPF.

The 2018 ***attainment*** of future LNG vehicles estimates is 66.77% for 2025 and 19.26% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Lithuania from 2016 until 2018 for LNG vehicles deployment is 3.45% of the overall planned deployment during the period 2016-2030.

Infrastructure

The LT NIR reports two public LNG refuelling points in 2018. The NIR provides also increased target for 2025 (three versus one in the NPF) and a new target of 5 public refuelling points for 2030 (2020 is not addressed). Also for the LNG infrastructure the level of ambition in the LT NIR is higher than in the NPF.

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 66.67% for 2020 and 40% for 2030. According to the assessment methodology described in Section 2.1, the progress obtained by Lithuania from 2016 until 2018 for public LNG refuelling infrastructure deployment is 40% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the LT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road. The sufficiency indexes for 2016, 2017 and 2020 could not be computed as targets for infrastructure were not indicated.

Sufficiency Index		2016	2017	2018	2020	2025	2030
LNG	road			103.50		103.33	215.00

5.15.3.1.4 Hydrogen

Vehicles

Lithuania recorded no hydrogen vehicle in use in 2018, but the LT NIR reports estimates for the number of hydrogen vehicles in 2020, 2025 and 2030 (all absent in NPF), which are 1, 65 and 1,250 respectively. As for 2030, 1,000 passenger cars, 100 LCVs, 50 HCVs and 100 buses and coaches are expected.

Because at the end of 2018 there were no hydrogen vehicles deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

The LT NIR does not report nor foresees any public hydrogen refuelling point in operation for the years from 2016 until 2020. However the LT NIR provides new targets for 2025 and 2030 (not reported in NPF), of respectively 2 and 10.

Because at the end of 2018 there are no hydrogen refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the LT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road. Obviously the sufficiency indexes could be computed only for the years 2025 and 2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Hydrogen	**road**					32.50	125.00

5.15.3.1.5 Biofuels

Vehicles

The LT NIR only provides information that "*Biofuels are used for blending in petrol and diesel strictly in the manner provided for in national legislation. Lithuania aims to gradually transition to advanced biofuels produced from secondary waste. The ratios of biofuel blending in fossil fuels are increasing*".

Infrastructure

Information is not available in the Lithuanian NIR.

5.15.3.1.6 LPG

Vehicles

Lithuania reported 109,576 LPG vehicles in 2018 (Table 5.15.3-1), of which 108,565 passenger cars, 503 LCVs, 623 HCVs, and 87 buses and coaches. For the next decade, the LT NIR does not propose any estimate.

Because there are no LPG vehicle estimates, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The LT NIR reports 664 public LPG refuelling points in 2018. This number is expected to slowly decrease in the next decade, to reach a value of 545 public refuelling points in 2030.

Because the Lithuanian NIR provided decreasing targets for publicly accessible LPG refuelling infrastructure, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the LT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road. Clearly, the sufficiency index for 2020, 2025 and 2030 could not be computed as the number of vehicles was not indicated.

Sufficiency Index		2016	2017	2018	2020	2025	2030
LPG	**road**	179.31	170.83	165.02			

5.15.3.2 Rail transport

5.15.3.2.1 Electricity

Vehicles

The LT NIR reports that the implementation plan of the National Transport Development Programme (see Section 5.15.4.1) includes also the purchase of electric trains. The NIR also reports 13 electric locomotives in 2018, presumably new ones, and indicates 13 electric locomotives also for 2020, 22 for 2025 and 22 for 2030.

The 2018 ***attainment*** of future electric locomotives estimates is 100% for 2020 and 59.09% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Lithuania from 2016 until 2018 for electric locomotives deployment is 59.09% of the overall planned deployment during the period 2016-2030.

Infrastructure

With reference to rail infrastructure, the LT NIR provides no numerical information but only a reference to the plan to proceed with the further electrification of rail with a budget of 250 million € up to 2020 (see Section 5.15.4.2.2).

5.15.3.3 Waterborne transport (maritime)

5.15.3.3.1 Electricity

Vessels

Information is not available in the Lithuanian NIR.

Infrastructure

The LT NIR reports that, as Klaipėda State Seaport (KSS) is already equipped with facilities that can be used by operators of ships, no additional need of shore-side electricity supply facilities is foreseen.

5.15.3.3.2 LNG

Vessels

The LT NIR reports one LNG seagoing ship in service since 2016, which will continue until 2030.

Infrastructure

Lithuania recorded one LNG refuelling point in its TEN-T Core port of Klaipėda in 2018. This LNG terminal has been in operation since December 2014, and recently the focus is put on Liquefied Natural Gas Distribution Station (LNG DS), which is an above-ground LNG terminal operated on a third-party access basis. The LNG DS is designed to receive LNG from small-scale carriers, to store it temporarily and to transfer it to LNG tank vehicles or vessels. LNG may also be loaded in ISO-compliant standard-sized containers which can be transported by rail and road. The LT NIR confirms this infrastructure until 2030.

5.15.3.4 Waterborne transport (inland)

5.15.3.4.1 Electricity

Vessels

Information is not available in the Lithuanian NIR.

Infrastructure

Lithuania did not record any shore-side electricity supply in 2018, but the LT NIR reports the plan to have three shore-side electricity supply for inland waterway vessels or recreational crafts in inland ports by 2030. The potential locations are Kaunas Lagoon pier, Nida pier and Uostdvaris inland waterway port.

Because at the end of 2018 there are no shore-side electricity supply points deployed in the inland ports, the 2018 ***attainment*** and ***progress*** have not been computed.

5.15.3.4.2 LNG

Vessels

The LT NIR reports that the first LNG inland waterway vessels is foreseen for 2025, followed by other five by 2030.

Infrastructure

Lithuania did not record any LNG refuelling point for inland waterway vessels in 2018, but the LT NIR mentions the proposal by the Lithuanian Inland Waterway Authority to establish a LNG refuelling point in Marvele cargo pier (Kaunas).

Because at the end of 2018 there are no LNG refuelling points in inland ports, the 2018 ***attainment*** and ***progress*** have not been computed.

5.15.3.5 Air transport

5.15.3.5.1 Electricity

Airplanes

Information is not available in the Lithuanian NIR.

Infrastructure (for stationary airplanes)

Lithuania recorded 37 electric power supply points for stationary airplanes, in use since 2016. This number is expected to increase to 44 points in 2020, and 45 points in 2025 and 2030. Since, according to the LT NIR, Lithuania's international airports already have the necessary infrastructure to supply electricity to stationary airplanes, no additional need for electricity supply facilities at airports is expected.

The 2018 ***attainment*** of future targets for electricity supply points for stationary airplanes is 84.09% for 2020 and 82.22% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Lithuania from 2016 until 2018 for the deployment of electricity supply points for stationary airplanes is 0% of the overall planned deployment during the period 2016-2030.

5.15.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is unavailable in the Lithuanian NIR.

Infrastructure

Information is not available in the Lithuanian NIR.

5.15.4 *Measures assessment*

The LT NIR contains an extensive and wide-scope portfolio of measures, but it often lacks a sufficient description, which makes the assessment results less robust. The majority of the reported measures focus on electricity and CNG and on road as transport mode. In comparison to the NPF the measures in the LT NIR include hydrogen, which is an additional value to the program. Also the focus on LNG development continues to be strong in Lithuania, both for water and road transport.

5.15.4.1 Legal measures

The Lithuanian NIR contains 18 legal measures (versus 8 in the NPF) to promote AFs. The description of the measures is short and lacks relevant content.

The bases of the LT NIR legal measures are defined in the National Transport Development Programme for 2014-2022, containing policies for the development of alternative fuels and the implementation plan. The programme provides measures such as purchase of electric trains, installation of electric recharging points and the installation of LNG and CNG refuelling points.

The Law on Alternative Fuels is foreseen '*to be adopted in 2020*' to clearly regulate issues related to alternative fuels, alternative fuel vehicles and refuelling/recharging infrastructure for alternative fuels. The LT NIR reports also on the 2019 draft of Lithuanian National Energy and Climate Plan[49], and the preparation of the Lithuanian Transport Development Strategy up to 2050[50]. The latter document describes also interactions between existing and planned policies and measures.

An overall assessment of the legal measures is that the LT NIR shows an increased ambition level compared to the NPF.

5.15.4.1.1 Legislative & Regulatory

Lithuania lists ten legislative and regulatory measures in its NIR, of which six are new compared to the NPF. Reported measures are proposed on the basis of the following acts:

- *Renewable Energy Act*, indicates targets of 10% RES share in transport and biofuels blending obligation;
- *Law on Alternative Transportation*, intended to draw the main concepts of alternative transportation, giving a clear direction for the market participants. It would include biofuels, biogas and electricity use in transport, the main targets and obligations, and also requirements for refuelling stations;
- *Electricity Law of the Republic of Lithuania*;
- *Gas Law of the Republic of Lithuania*.

Other regulatory measures reported in LT NIR are tackling public guidelines for the development of electric charging infrastructure, and are also derived from the following strategic documents:

- *National Transport Development Programme 2014-2022,* where the Objective 4 of the programme is to increase energy efficiency in transport and reduce the adverse impact of transport on the environment;
- *National Energy Independence Strategy*, with the goal to achieve independence from fossil fuels in both electricity generation and heating, by taking advantages of LNG development related to transport;

[49] The National Energy and Climate Action Plans are documents EU Member States (including Lithuania) were required to submit to the European Commission until 31 December 2019 after the Energy Union Governance Regulation came into force at the end of 2018. https://ec.europa.eu/energy/sites/ener/files/documents/lt_final_necp_main_en.pdf

[50] Expected to be completed in 2020.

- *National strategy for climate change management*, tackling the mitigation in the areas of adaptation to the effects of climate change.

5.15.4.1.2 Administrative

The Lithuanian NIR reports on eight administrative measures.

- The *Law of the Republic of Lithuania on Energy from Renewable Sources* sets the basis for:
    - Guarantee of origin (GO) system, where gaseous fuels can have their origin proved and the GOs are issued electronically for each MWh of energy. The target is that 100% of biogas producers should be registered in the system by 2030;
    - Discount for biogas production infrastructure connection to the grid (40%);
    - Self-certification scheme, which is a control system establishing the compliance of biofuels with sustainability criteria;
- Within the implementation of the Directive 2014/94/EU, the following procedures have been indicated:
    - Assignment of Responsibilities and Provisions of Information on Directive 2014/94/EU[51];
    - The use of electrical equipment;
    - Changes to service station operating rules;
    - Description of the procedure for the provision of information on the fuel used by motor vehicles;
    - Requirements for installing Electro-computer Charging Infrastructure in residential and non-residential buildings with a parking space.

5.15.4.2 Policy measures

The main focus in the LT NIR is on electric vehicles, but CNG and LNG on roads are also developing. LNG for waterborne transport (inland) is being addressed as well. The available financial instruments are not clearly defined in the LT NIR, but the measures have a wider scope compared to the NPF (for example, there are incentives not only for the purchase of new alternative fuel vehicles/vessels, but (in the case of waterborne transport) also for the replacement of old engines with new ones, running on alternative fuels). In comparison to NPF, hydrogen is also acknowledged and supported in the NIR. Lithuania reports the completion of optimisation of airport infrastructure as their international airports already have the necessary infrastructure to supply electricity to stationary airplanes, and there is no additional need for electricity supply facilities at airports. Lithuania also reports that Klaipėda State Seaport (KSS) and some of the country’s inland ports are already equipped with shore-side electricity supply facilities that can be used by operators of ships berthed off shore, and there is also no need to deploy additional facilities.

The policy direction in Lithuania is presented in National Energy and Climate Action Plan of the Republic of Lithuania for 2021-2030, which focuses on addressing issues of EU’s climate change and energy policy, but amongst others presents policies and measures for increasing the

[51] provided by the Resolution of the Government of the Republic of Lithuania No 86 of 1 February 2017 amending Resolution of the Government of the Republic of Lithuania No 1253 of 18 December 2013 approving the National Transport Development Programme for 2014-2022.

use of renewables in transport and its role in decarbonisation. This Action Plan presents existing, as well as planned up to 2030 policy measures in the transport sector. Taking into consideration that this plan is not a part of the LT NIR, it has been used as a back-up source of information, but only the measures reported by Lithuania in its NIR were assessed.

5.15.4.2.1 Measures to ensure national targets and objectives

The large majority of policy measures described in the Lithuanian NIR can be categorised as measures to ensure national targets and objectives. There are 20 of them (of which 11 financial, and 9 non-financial), mainly related to road transport, but including also LNG and electricity with their applicable transport modes.

Road

Two of the financial incentives involve taxation: vehicle registration/re-registration fees related to pollution (starting from 2020) and excise duty exemption for natural gas consumed in transport (existing since 2018). Although both of them were present also in the NPF, some changes have been brought. The excise duty exemption for natural gas is planned to be modified in order to promote other alternative fuel use (but not LPG) for the development of related infrastructure. On the other hand very limited information was given on the registration fees, stating only that: "*From next year* (excel: 2020) *the registration and re-registration of polluting vehicles would be taxed. Polluting vehicles are those which have a petrol and / or gas engine with a CO_2 emissions greater than 130 g/km and a diesel engine with a CO_2 emissions above 115 g/km.*"

The LT NIR also reports policy measures dealing with subsidies, in particular:

- Support to municipalities to purchase electric and other alternative fuel buses (43 million € in the period 2017-2020);
- Installation of primary necessary infrastructure for electric recharging points near state roads and in municipalities with a population >25,000 (2 million € in 2018-2020);
- Co-financing the purchase of natural gas buses that could be fuelled also with compressed biomethane gas, only for public transportation (37 million € in 2020-2030);
- Deployment of the measures of sustainable mobility (30 million € in 2019-2020);
- Reconstruction and development of pedestrian and bicycles paths (10.3 million € in 2017-2020) – this measure was excluded from assessment and clustering, as not directly referring to the AFID deployment, but was considered in the overall Lithuanian (climate) policy goals achievement.

The LT NIR reports also about the measure implemented from the EU funds in 2017 that allows for "*no charge fees for electric cars for 5 years at electric access points near national roads and municipalities"*, but does not give any further information.

Finally the LT NIR refers about a series of measures planned for the period 2022-2030, with a total budget of 900 million € (no allocations), as for example:

- incentives / subsidies for the purchase of pure electric vehicles, for the installation of electric vehicle recharging points;
- strengthening of national legislation to promote electric mobility and infrastructure development: obligation to provide recharging points in new or refurbished buildings

and parking areas; obligation for new/refurbished conventional fuel stations adjacent to state roads to provide EV recharging access;

- widespread social dissemination, public awareness, habit building, pilot projects;
- annual taxes on internal combustion engine cars linked to pollution;
- creation of zero emission zones in cities.

Waterborne transport

The LT NIR reports two planned measures on financial incentives originating from the *Draft air pollution reduction plan*[52]. The first is to support building of new cargo vessels and barges with a budget of 50 million € for 2021-2030 period. The second refers to the replacement of current vessel engines with new, alternative fuel powered engines, and with a budget of 2 million € for 2021-2025.

Regarding shore-side electricity supply, the LT NIR states that, as Klaipėda State Seaport (KSS) and some of the inland ports are already equipped with shore-side electricity supply facilities, there is no need to deploy additional facilities.

Other transport modes

Optimisation of airport infrastructure of Lithuania's international airports is reported as completed in terms of the necessary infrastructure to supply electricity to stationary airplanes. Therefore the LT NIR declares no additional need for electricity supply facilities at airports.

5.15.4.2.2 Measures that can promote AFI in public transport services

Eight of the policy measures described in the Lithuanian NIR can be categorised also as measures that can promote AFI in public transport services. Two of them are existing measures and refer to sustainable mobility plans and incentives for municipalities to buy alternative fuel buses.
Six new measures are reported as not fully operative yet. They aim at further AFI development, AFV rollout and public awareness.

Buses

The LT NIR reports on measures applied to support public transport only in tabularised way. One measure is planned to support the purchases of natural gas buses for public transportation, which could be driven on compressed biomethane gas. Partial compensation of investment costs is foreseen for the 2021-2030 period, with a budget of 37 million €. This measure seems to be a continuation of the support to municipalities to purchase electric and other alternative fuel buses, which counted 43 million € in 2017-2020.

Rail

The LT NIR reports on further electrification of rail, as a measure being implemented from EU funds. The total estimated budget is 250 million € for 2020.

[52] National Energy and Climate Action Plan of the Republic of Lithuania for 2021-2030.

5.15.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Private electro-mobility infrastructure deployment has not been covered in the implementation period (2016-2018). However, in the package of measures under discussion for the period 2022-2030 with a total budget or 900 million € (described earlier) a measure is included regarding the obligation to provide recharging points in new or refurbished buildings.

5.15.4.3 Deployment and manufacturing support

5.15.4.3.1 AFI deployment

The Lithuanian NIR lists three Deployment measures (there were two in the NPF). The first is related to a proposal, under adoption, to build four normal power (≤22kW) and eight high power (>22kW) road recharging points, one recharging point for stationary airplanes, five CNG refuelling points and two hydrogen refuelling points. The second measure (also under adoption) relates to the construction of an LNG infrastructure at the inland port in Marvele cargo pier (Kaunas). Finally, the LT NIR reports that the biggest challenge at present remains the installation of recharging infrastructure in towns outside large cities and along national roads in commercially unattractive places (complex/expensive installation). Therefore the possibility of subsidising the installation/purchase of electric recharging points in such places is reported as under consideration.

5.15.4.3.2 Support of manufacturing plants for AF technologies

Information on support of manufacturing plants for AF technologies is unavailable in the LT NIR.

5.15.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Lithuanian NIR.

5.15.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.15.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, several clusters of measures have been identified, however it shall be remarked that the description of the measures and the level of details provided in the LT NIR are not sufficient to carry out a robust assessment. Notwithstanding this, an attempt has been made to provide some insight. Nine clusters of measures have been identified and none of them obtains an overall high score. Only the clusters for electricity/road, CNG/road, LNG/road and hydrogen/road result to be comprehensive, while all the others are not comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, keeping in mind the caveat mentioned earlier, it can be said that the measures for the pairs electricity/road and CNG/road might have a medium impact, while all the others might have a lower impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing measures support measures has increased for all pairs.

Table 5.15.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	M	C		**M**		+
CNG	Road	M	C		**M**		+
LNG	Road	L	C		**L**		+
	Water - maritime	L/M	N		**L**		+
	Water -inland	M	N		**L**		+
Electricity	Rail	X					+
H2	Road	L/M	C		**L/M**		+
Biofuel	Road	L	N		**L**		+
LPG	Road	L	N		**L**		+

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.15.4.5 Research, Technological Development & Demonstration

The LT NIR reports on three RTD&D projects versus none in the NPF. This show an increased level of ambition. The first RTD&D project is on buses powered by hydrogen-enriched natural gas (H2NG). The NIR adds that, at the time of writing, there were three CNG stations (in Ukmergė, Telšiai and Marijampolė), where natural gas was enriched with hydrogen. The second RTD&D measure is on the development of a LNG driven tugboat for shallow inland waterways, with a foreseen budget of 2.2 million € for 2021-2025. Finally, the LT NIR reports on the participation[53] in the multilateral pilot project initiated by the European Commission "*Data collection related to recharging/refuelling points for alternative fuels and the unique identification codes related to e-Mobility actors*", where the goal is to establish, at European Union level, an identification system for electric car charging access and electric car charging access operators, and an information system for consumers with information on electric car charging access. No information was provided on the financing instruments established to support RTD&D activities in Lithuania.

5.15.5 *Additional information on alternative fuels infrastructure developments*

The LT NIR provides information on the changes in fuel use but only until 2018 and only for road transport (see Table 5.15.5-1). As no future estimates were provided, one can only comment on a slight decrease in gasoline and LPG use for road and a comparable diesel increase. No growing use of biofuels or CNG is noticed, nor any noticeable consumption of electricity and LNG is reported.

[53] Together with France, the Netherlands, Poland, Austria, Belgium, Croatia, Luxembourg, Germany, Spain, Slovenia, Czechia, Portugal, Greece and Hungary

Table 5.15.5-1 Changes in fuel use in transport sector (2016-2018)

		PAST AND CURRENT STATUS OF FUELS USE IN THE TRANSPORT SECTOR		
MODE OF TRANSPORT	**FUEL**	**Percentage of different fuels use for transport [%]**		
		2016	**2017**	**2018**
Road	Gasoline	**12%**	**11%**	**11%**
	Diesel	**76%**	**77%**	**78%**
	CNG	5%	5%	5%
	LPG	6%	6%	5%
	Biofuels	1%	1%	1%
	Total Road	**100%**	**100%**	**100%**

5.15.6 *Summary of the assessment*

Tabular overview

Table 5.15.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road
AF Vehicles / Vessels		Past situation (2016)	364	352	176	1	0	0
		Situation (2018)	1,556	405	207	1	0	0
		Estimate (2030)	248,563	12,300	1,075	1	6	1,250
		Future share (2030) [%]	14.80%	0.73%	0.98%			0.07%
		Estimate attainment (2018 vs 2030) [%]	0.63%	3.29%	19.26%	100.00%		
		Progress (2018)	adequate	slow	3.45%			
Publicly accessible AF Infrastructure		Past situation (2016)	5	4	0*	1*	0*	0
		Situation (2018)	212	4	2	1	0	0
		Target (2030)	15,055	28	5	1	1	10
		Target attainment (2018 vs 2030) [%]	1.41%	14.29%	40.00%	100.00%		
		Progress (2018)	adequate	slow	40.00%			
Sufficiency Index		2016	72.80	88.00				
		2018	7.34	101.25	103.50			
		2020	10.10	70.63				
		2025	166.24	115.38	103.33			32.50
		2030	16.51	439.29	215.00			125.00
Measures	**Legal measures**	Ambition (NIR vs NPF)	+	+	+	+	+	+
	Policy measures + Deployment & manufacturing support	Score	M	M	L	L/M	M	L/M
		Comprehensiveness	C	C	C	N	N	C
		Impact	M	M	L	L	L	L/M
		Ambition (NIR vs NPF)	+	+	+	+	+	+
	RTD&D	Ambition (NIR vs NPF)	+	+			+	

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken from EAFO (absent in both NPF and NIR).

The LT NIR addresses most of the requirements of Annex I of the Directive, but only partially, and it does not provide specific information on the methodology applied to take account of the charging efficiency of high power recharging points. Also it does not provide considerations on any particular needs during the initial phase of AFI deployment.

The LT NIR contains an extensive and wide-scope portfolio of measures, but often it lacks a sufficient description, which makes the assessment results less robust. The majority of reported measures focus on electricity and CNG for road transport.

The main outcomes of the technical assessment of the Lithuanian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Lituania reported a total of 1,556 electric vehicles in use in 2018 (Table 5.15.3-1), of which 1,539 were passenger cars, 16 LCVs and 1 HCV. The Lithuanian NIR presents a new plan with increased ambition compared to the NPF, with an estimate of 230,332 passenger cars and 18,231 LCVs by 2030. The heavy-duty sector is excluded from future estimates in the LT NIR. With respect to this plan, the 2018 progress is adequate. Similarly to the vehicles, the level of ambition for infrastructure in the LT NIR is higher than presented in NPF. With 212 publically accessible recharging points recorded in 2018, Lithuania plans to have 15,055 public and 60,000 private recharging points in 2030. Also the progress towards this target is assessed as adequate in 2018. The sufficiency ratio is adequate in 2018 and in 2030, however a big unbalance exists in the foreseen progression of EVs and public recharging points between 2020 and 2025 (with a sufficiency index in 2025 equal to 166.24, thus highly inadequate).

- **CNG** – Lithuania recorded 300 CNG buses and coaches in 2018, out of a total CNG fleet of 405 vehicles. This indicates that CNG is the main alternative fuel used by public transport fleets in large cities in Lithuania. Lithuanian ambitions for the number of CNG vehicles and infrastructure in the LT NIR are again higher than presented in NPF. New estimates for CNG vehicles reveal that the biggest growth is expected in numbers of CNG passenger cars (10,000 in 2030) and HCVs (1,000 in 2030). The progress in 2018 is slow. Lithuania reported four publicly accessible CNG refuelling stations in 2018 (plus six private). The LT NIR reports that Lithuania aims to achieve 8 public CNG refuelling points in 2020 (20% less than in the NPF) and 28 in 2030 (no target was present in the NPF). Also for CNG infrastructure the 2018 progress is slow, while the sufficiency index is considered adequate for the whole period 2016-2030.

- **LNG** – Lithuania reported 207 LNG vehicles in 2018, mainly buses and coaches (172). With regard to the next decade, the LT NIR proposes new (not present in NPF) estimates for 2025 and 2030, while 2020 is not addressed. The LT NIR aims to achieve 1,075 LNG vehicles in 2030. This estimated growth is planned mainly for the HCVs (1,000), but 50 LCVs and 25 buses and coaches are also expected in 2030. As for the infrastructure, the LT NIR reports two public LNG refuelling points in 2018 and a new target of five public refuelling points for 2030.

- **Hydrogen** – There are currently no hydrogen vehicles in Lithuania but for 2030, 1,000 passenger cars, 100 LCVs, 50 HCVs and 100 buses and coaches are expected. The LT NIR does not report nor foresees any public hydrogen refuelling point in operation for the years from 2016 until 2020. However it provides new targets for 2025 and 2030 (not reported in NPF), respectively 2 and 10 refuelling points.

- **Biofuels** – LT NIR only provides the information that "*Biofuels are used for blending in petrol and diesel strictly in the manner provided for in national legislation. Lithuania aims to gradually transition to advanced biofuels produced from secondary waste. The ratios of biofuel blending in fossil fuels are increasing*".

- **LPG** – Lithuania reported 109,576 LPG vehicles in 2018, of which 108,565 passenger cars, 503 LCVs, 623 HCVs, and 87 buses and coaches. It also recorded 664 public LPG refuelling points in 2018. Regarding the next decade, the LT NIR does not propose any vehicle estimate and forecasts a slow but steady decline of LPG infrastructure.

Rail transport

The LT NIR reports the plan to have 22 new electric locomotives in 2030 and a budget of 250 million € from EU funds for electrification of railway in 2020.

Waterborne transport (maritime)

- **Electricity** – The LT NIR reports that, as Klaipėda State Seaport (KSS) is already equipped with facilities that can be used by operators of ships, no additional need of shore-side electricity supply facilities is foreseen. Similarly, no plans about electric boats were revealed.
- **LNG** - Lithuania recorded one LNG refuelling point in its TEN-T Core port of Klaipėda in 2018. This LNG terminal has been in operation since December 2014, and recently the focus is put on Liquefied Natural Gas Distribution Station (LNG DS), which is an above-ground LNG terminal operated on a third-party access basis. The LT NIR confirms this infrastructure until 2030.

Waterborne transport (inland)

- **Electricity** - Lithuania did not record any shore-side electricity supply in 2018, but the LT NIR reports the plan to have three shore-side electricity supply for inland waterway vessels or recreational crafts in inland ports. The potential locations are Kaunas Lagoon pier, Nida pier and Uostdvaris inland waterway port.
- **LNG** - The LT NIR reports that the first LNG inland waterway vessels is foreseen for 2025, followed by other five by 2030. There was no LNG refuelling point for inland waterway vessels in 2018, but the LT NIR mentions the proposal by the Lithuanian Inland Waterway Authority to establish a LNG refuelling point in Marvele cargo pier (Kaunas).

Air transport

- **Electricity** - Lithuania recorded 37 electric power supply points for stationary airplanes in use since 2016. This number is expected to increase to 44 points in 2020, and 45 points in 2025 and 2030. Since according to the LT NIR Lithuania's international airports already have the necessary infrastructure to supply electricity to stationary airplanes, no additional need for electricity supply facilities at airports is expected.

The LT NIR contains an extensive and wide-scope portfolio of **measures**, but often lacks a sufficient description, which makes the assessment results less robust. It presents 18 legal measures (versus 8 in the NPF) to promote AFs. Their description is short and mostly in the form of tables, but overall they show an increased ambition level compared to the NPF. As for the Policy and Deployment & Manufacturing support measures, the main focus in the LT NIR is on electric vehicles, but CNG and LNG on roads are developing as well and concrete plans are also presented for hydrogen/road and LNG/waterborne (inland) transport. Several clusters of measures have been identified, however their description and the level of details provided in the LT NIR are not sufficient to carry out a robust assessment. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, keeping in mind the caveat mentioned earlier, it can be said that the measures for the pairs electricity/road and CNG/road might have a medium impact, while all the others might have a lower impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing measures support measures has increased for all pairs.

The LT NIR reports on three RTD&D projects versus none in the NPF, showing an increased level of ambition also in this field. The first RTD&D project is on buses powered by hydrogen-enriched natural gas (H2NG). The second measure is on the development of a LNG driven tugboat for shallow inland waterways. The third is on the participation in the multilateral pilot project initiated by the European Commission "*Data collection related to recharging/refuelling points for alternative fuels and the unique identification codes related to e-Mobility actors*".

5.15.7 *Final remarks*

The Lithuanian NIR provides a quite comprehensive report on the efforts to implement the Directive. The NIR complies, to a large extent, with the requirements of Annex I to the Directive and provides a relevant number of measures to support the uptake of alternative fuels for transport. However, these measures lack granularity, which creates uncertainty about the impact of the overall Lithuanian approach for alternative fuels. Future reporting should provide further detail on measures planned to support ramp up of use of alternative fuels in all mode of transport.

For electricity, the NIR estimates that approximately 250,000 electric vehicles could be on the road by 2030, representing about 15% of the future fleet, as well as around 15,000 recharging points in the same year. Taking into account the current situation and expected trends, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. No direct information on charging efficiency is provided. The port of Klaipėda in the TEN-T Core Network is already equipped with shore-side electricity supply. Furthermore, Lithuania supports also the electrification for inland waterway vessels and recreational crafts in inland ports with shore-side electricity supply towards 2030. Lithuania’s international airports already have the necessary infrastructure to supply electricity to stationary airplanes. However, that the NIR outlines that the number of electricity supply to stationary aircraft should continue to grow to 45 in 2025, in an attempt to equip other airports. Future reporting should provide further information on the current and future share of electrified rail network. However, a budget of 250 million € is devoted to further electrification of rail up to 2020.

Currently there are no hydrogen vehicles in Lithuania. However, 1,000 passenger cars, 100 Light Commercial Vehicles, 50 Heavy-Duty Vehicles and 100 buses and coaches are estimated for 2030. Likewise, hydrogen infrastructure deployment by 2030 is estimated to include at least 10 refuelling points, with an initial uptake of two refuelling points in 2025.

Concerning natural gas, the NIR shows a limited ambition for CNG vehicles; it notes about 12,300 vehicles and 28 refuelling points in place by 2030. A significant growth in LNG HDV is expected (1,075 HDV by 2030). Furthermore, there will be three LNG refuelling points by 2025 and five by 2030. This seems sufficient taking into account the length of its TEN-T Road Core Network, provided that the refuelling points are widely distributed along the network. For waterborne transport, the first LNG inland waterway vessels is foreseen for 2025. In addition, Lithuania reports one LNG refuelling point in its TEN-T Core Network port of Klaipėda.

On LPG, Lithuania reported about 110.000 LPG vehicles in 2018, which corresponds to approximately 7% of its fleet. In terms of infrastructure, 664 public LPG refuelling points are reported, with a projection of 545 for 2030. Despite the lack of LPG vehicles estimates for 2030, the infrastructure targets indicate an expected steady decline of those vehicles.

Further information should be provided on the consumption of biofuels in road and air transport. Lithuania should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.15.8 *ANNEX - Description of the Member State*

On a surface area of 65,300 km², Lithuania has a population of 2.809 million people in 2018, which makes up for a population density of 43 inhabitants/km².

Number of main urban agglomerations

- 6 urban agglomerations > 50,000 inhabitants

In 2018, Lithuania achieves a per capita gross domestic product at market prices of €16,170, which represents a per capita gross domestic product in purchasing power standards of 80 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Lithuania is 665 km. The total road network length is 21,242 km, of which 324 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Lithuania: 20% (820 km) of the North Sea - Baltic Corridor.

Through the TEN-T Road Corridors, Lithuania is connected with the following Member States:
- Latvia (through the North Sea - Baltic Corridor),
- Poland (through the North Sea - Baltic Corridor)

Number of registered road vehicles

At the end of 2018, Lithuania accounts for 1,606,222 registered road vehicles of which 1,430,520 are categorized as passenger cars, 64,345 as light goods vehicles, 61,332 as heavy goods vehicles and 7,925 as buses and coaches. The motorisation rate is 509 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 1 maritime port in the TEN-T Core Network (Klaipėda)
- No maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Vilnius)
- 2 airports in the TEN-T Comprehensive Network

5.16 Luxembourg (LU)

5.16.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Luxembourgish NPF, the Commission concluded:

The Luxembourgish NPF broadly addresses the requirements of Article 3. It contains tables of the current state and future estimates for alternative fuels vehicles in the transport sector. For most fuels and modes, it establishes targets as required by Article 3 of the Directive. It does not provide a target for its inland port in the TEN-T Core Network.

The Luxembourgish NPF puts the accent on electric vehicles deployment with ambitious plans in terms of recharging infrastructure and share of electric vehicles on the road in 2020 (more than 9% from the total vehicle fleet). Bicycles and electric bikes also receive support. To be highlighted is the fact that Luxembourg has legislated a very detailed action plan for the implementation of the public recharging infrastructure for electric vehicles (including the exact number of recharging points per commune and TEN-T Core Network segments). The NPF foresees a small increase of available ground power units for stationary airplanes. The Mertert inland port does not have shore-side electricity and no targets are foreseen in the NPF.

While the spatial distribution of recharging points seems to cover appropriately the needs of electric vehicles in terms of distance requirements in Luxembourg, the ratio of more than 22 electric vehicles per one recharging point for 2020 could evolve to become a barrier for the further market deployment of electric vehicles. This could also lead to market fragmentation within the EU. It will be important to closely monitor this development and correct the infrastructure targets in line with the market developments.

In the case of CNG, the Luxembourgish government is pessimistic regarding the economic viability for this fuel. Therefore, it plans the decrease of the number of refuelling points to two CNG refuelling points considering this quantity to be sufficient in the medium term, estimating also a reduction of the CNG fleet.

Concerning LNG, the installation of a refuelling infrastructure for road transport is envisaged for 2020. Such an infrastructure will be intended to refuel apart from the LNG vehicles registered in Luxembourg the heavy-duty vehicles transiting the country. LNG-powered vessels having a high autonomy, an LNG refuelling infrastructure in the port of Mertert is not deemed as viable.

For the moment, the Luxembourgish government decided not to include in the current stage refuelling points for hydrogen accessible to the public in its NPF.

The Luxembourgish NPF contains a comprehensive list of measures, most already in place. According to the assessment methodology, a High overall assessment score is derived for electricity for vehicles, a Medium overall score for hydrogen for vehicles and a Low overall score for CNG for vehicles. This is a consequence of the government estimation that CNG will only play a marginal part in the future, the focus being placed on the promotion of electric mobility which is considered to be the most suited for the decarbonisation of the transport sector in the NPF.

Two regulations (one Grand Ducal and another Ministerial) provide evidence that the interests of local authorities and stakeholders have been considered. Luxembourg is actively involved in *coordinating its plans on alternative fuels infrastructure with the Benelux countries and has signed a collaboration agreement with them in this field. It may be advisable to extend this cooperation effort also towards other neighbouring countries such as France and Germany.*

5.16.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.16.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport / Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road / electricity, CNG, hydrogen	Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road / electricity, CNG, hydrogen	Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network		N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / electricity, CNG	Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Road / electricity (for scooters only)	Y
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.		N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, combination / electricity, AF (in general)	Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, waterborne (inland) / electricity, CNG, LNG	Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, waterborne (inland) / electricity, CNG, LNG, LPG, ethanol	Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, waterborne (inland), air / electricity, CNG, LNG, LPG	Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)		N

The checklist shows the requirements of Annex I from the Directive that are covered in the LU NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is fully covered for road and, to a lesser extent, for waterborne (inland) and air; CNG and LNG are covered for road; some other combinations are just mentioned (for example: hydrogen, LPG and biofuels for road, LNG for waterborne inland transport). All the other combinations are either absent or not applicable.

The LU NIR reports 29 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify three AF/transport mode clusters of measures, all assessable.

5.16.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.16.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	3,373	841	10,465	1,635	101,300	5,160	202,600	10,320
	Change NIR vs NPF [%]			-73.84%	-7.00%	130.23%	163.00%	322.08%	375.58%
	Attainment [%]			32.23%	51.44%	3.33%	16.30%	1.66%	8.15%
CNG / road	NIR	314	2	180	2	125	1	100	1
	Change NIR vs NPF [%]			-10.00%	100.00%	25.00%	0.00%	0.00%	
	Attainment [%]								
LNG / road	NIR	13	0	50	0	150	0	150	0
	Change NIR vs NPF [%]			66.67%	-100.00%		-100.00%		
	Attainment [%]			26.00%		8.67%		8.67%	
LNG / water (inland)	NIR	1	0	1	0	1	0	1	0
	Change NIR vs NPF [%]								
	Attainment [%]			100.00%		100.00%		100.00%	
Shore-side electricity supply / water (inland)	NIR		5		6		10		10
	Change NIR vs NPF [%]								
	Attainment [%]				83.33%		50.00%		50.00%
Electricity supply / air (stationary airplanes)	NIR		44		44		44		44
	Change NIR vs NPF [%]				57.14%				
	Attainment [%]				100.00%		100.00%		100.00%
H2 / road	NIR	NA	NA	NA	NA	NA	1	NA	1
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	377	14	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Ethanol / road	NIR	56	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.16.3.1 Road transport

5.16.3.1.1 Electricity

Vehicles

Luxembourg reported for 2018 a total number of 3,373 electric vehicles in use (Table 5.16.3-1). These electric vehicles were divided in 3,118 passenger cars (1,360 battery-electric and 1,758 plug-in hybrid electric), 192 light commercial vehicles LCVs (all battery-electric), 8 heavy commercial vehicles HCV (all battery-electric), and 55 buses and coaches (33 battery-electric and 22 plug-in hybrid electric).

Regarding the vehicle estimates for the next decade, the LU NPF had presented a scenario with a ramping up of electric passenger cars from less than 1,000 in 2016 to 40,000 in 2020, followed by a moderate increase to 44,000 and 48,000 in 2025 and 2030 respectively. The LU NIR presents a new plan with a much higher ambition: whilst the estimate is lower in 2020 with 10,465 vehicles (74% less), it is by far more than compensated by the increase to 101,300 and 202,600 vehicles in 2025 and 2030 respectively (130% and 322% more). The vast majority of the electric vehicles in 2030 will be passenger cars (200,000), but 1,000 battery-electric LCVs, 100 battery-electric HCVs, 1,400 battery-electric buses and coaches and 100 plug-in hybrid electric buses and coaches are also foreseen. Furthermore, the LU NIR provides information regarding electric powered two wheelers (PTW). From the 488 PTWs registered in 2018, future estimates in the NIR go up to 1,000, 2,500 and 5,000 for the years 2020, 2025 and 2030 respectively.

The 2018 ***attainment*** of future EV estimates is 32.23% for 2020 and 1.66% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Luxembourg is equal to 46%.

Infrastructure

Luxembourg recorded 841 publicly accessible recharging points in 2018 (Table 5.16.3-1), four times more than in 2016. The NIR targets for 2020/2025/2030 are 1,635/5,160/10,320 recharging points, of which 35/160/320 are high power (>22kW) recharging points. Compared to the NPF, the LU NIR now targets a slightly lower (-7%) number of recharging points in 2020, but much higher numbers for the years 2025 (+163%) and 2030 (+375%). These higher recharging infrastructure targets confirm the government's plan to become *"... one of the main players in electric mobility"* and the importance of road vehicle electrification in the Luxembourgish AFI development.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 51.44% for 2020 and 8.15% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Luxembourg is equal to 31%.

Ratio

Based on the LU NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that whilst until 2020 each publicly accessible charging point serves around five electric vehicles, the longer-term vehicle estimates and infrastructure targets foresee that one charging point needs to serve 20 vehicles from 2025 onwards. The LU NIR explains that the number is considered sufficient, based on a study conducted in 2011 showing that 95% of charging will be done at private charging points. However, considering the large distance to target already observed in the NPF and the very low share of high power charging points (3%) in the whole period, the future adequacy of recharging infrastructure for electric vehicles remains uncertain.

Luxembourg announced in the NIR that an inventory of private charging points should be available for the next report.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	5.27	6.76	4.01	6.40	19.63	19.63

Information on charging efficiency

Information is not available in the Luxembourgish NIR

5.16.3.1.2 CNG

Vehicles

The CNG fleet in Luxembourg counted a total of 314 vehicles in 2018 (Table 5.16.3-1), of which 195 passenger cars, 56 LCVs, 11 HCVs and 52 coaches and buses. According to the LU NIR, which broadly confirms the NPF estimates, CNG vehicle numbers in most categories will decrease to a total of 100 vehicles in 2030, with the exception of buses and coaches increasing slightly to 65 in 2030.

Because the Luxembourgish NIR provided decreasing estimates for CNG vehicles, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

The Luxembourgish NIR indicates that 2 publicly accessible (and 1 private) CNG refuelling points were available in 2018. These numbers should be stable until 2020, after which only one public and one private CNG refuelling points should remain until 2030.

Because the Luxembourgish NIR provided decreasing targets for publicly accessible CNG refuelling infrastructure, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the LU NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index is always well below the indicative value of 600 (see Section 2.1.5) for the whole 2016-2030 period.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**CNG**	49.00	53.67	157.00	90.00	125.00	100.00

5.16.3.1.3 LNG

Vehicles

Luxembourg recorded 13 LNG vehicles in total in 2018 (Table 5.16.3-1), consisting of HCVs exclusively. Concerning the estimates for the next decade, while the NPF had foreseen only an increase to 30 vehicles in 2020, the LU NIR now indicates 50 HDVs in 2020, and 150 HCVs from 2025 until 2030.

The 2018 ***attainment*** of future LNG vehicles estimates is 26% for 2020 and 8.67% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Luxembourg from 2016 until 2018 for LNG vehicles deployment is 8.05% of the overall planned deployment during the period 2016-2030.

Infrastructure

Luxembourg did not record any publicly accessible LNG refuelling point in 2018. The LU NIR does not plan to have any publicly accessible LNG refuelling point until 2030, in contrast to the NPF where a target of one was present for 2020 and 2025. The LU NIR indicates that only one private LNG refuelling point was in use in 2018 and will continue until 2030.

Since at the end of 2018 there were no publicly accessible LNG road refuelling points deployed, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

For the same reason, it is not possible to compute the sufficiency index.

5.16.3.1.4 Hydrogen

Vehicles

At this moment, hydrogen is not considered in the Luxembourg fuel mix, therefore no information was provided in the Luxembourgish NIR.

Infrastructure

There was no hydrogen infrastructure registered in 2018 and no plan for the future, however the LU NIR declares that "*the government has committed, in its coalition agreement 2018-*

2023 ([54]), to arrange for at least one hydrogen refuelling station to be installed at one of the motorway service areas". This could take place by 2025.

5.16.3.1.5 Biofuels

Vehicles

The bioethanol vehicle fleet in Luxembourg consisted of 56 vehicles in 2018, not differing much from the numbers in previous years (57 and 61 in 2016 and 2017, respectively). This fleet is made up of passenger cars, with the exception of one LCV, operational since 2017. There are no estimates for the next decade in the LU NIR. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Information is not available in the Luxembourgish NIR.

Ratio

Because of the lack of data, the sufficiency index could not be computed.

5.16.3.1.6 LPG

Vehicles

Luxembourg registered 377 LPG vehicles in 2018, of which 271 were passenger cars. Another 98 LCVs and 8 HCVs completed the LPG fleet. No estimates for the LPG fleet development in the years 2020-2030 are made in the LU NIR. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

According to the information provided by Luxembourg with the NIR, 14 public LPG refuelling points were operational in Luxembourg in 2018. No predictions for the development of the LPG refuelling points in the years 2020-2030 are made in the LU NIR. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the LU NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road for the years 2016-2018.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	25.79	27.64	26.93			

[54] https://gouvernement.lu/dam-assets/documents/actualites/2018/12-decembre/Accord-de-coalition-2018-2023.pdf, Coalition agreement 2018-2013, Luxembourg Government, December 2018.

5.16.3.2 Rail transport

Information is not available in the Luxembourgish NIR.

5.16.3.3 Waterborne transport (maritime)

Not applicable since Luxembourg has no maritime ports in the TEN-T Core Network.

5.16.3.4 Waterborne transport (inland)

5.16.3.4.1 Electricity

Vessels

The LU NIR counts one electric inland waterway vessel since 2016. This number remains constant for the period up to 2030.

Infrastructure

Luxembourg recorded five shore-side electricity supplies in 2018 and presents a target of six in 2020 and of 10 from 2025 to 2030.

The 2018 ***attainment*** of future targets for shore-side electricity supply points in inland ports is 83.33% for 2020 and 50% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Luxembourg from 2016 until 2018 for the deployment of shore-side electricity supply points in inland ports is 50% of the overall planned deployment during the period 2016-2030.

5.16.3.4.2 LNG

Vessels

The LU NIR lists one LNG powered vessel in 2018 expected to remain in service for the next decade.

Infrastructure

The Luxembourgish NIR confirms the NPF strategy that no LNG refuelling facilities for inland waterway navigation are foreseen until 2030.

5.16.3.5 Air transport

5.16.3.5.1 Electricity

Airplanes

Information on electric airplanes is not available in the LU NIR.

Infrastructure (for stationary airplanes)

The currently existing 44 electricity supply points for stationary aircraft at the TEN-T Core Luxembourg airport are considered sufficient and remain, according to the NIR, constant over coming years. The LU NIR mentions as well that 28 of the electricity supply points consist of Ground Power Units (GPUs) (diesel engines coupled to generators).

5.16.3.5.2 Biofuels

Airplanes

Information is unavailable in the Luxembourgish NIR.

Infrastructure

Information is unavailable in the Luxembourgish NIR.

5.16.4 *Measures assessment*

The Luxembourgish NIR presents an extended portfolio of measures compared to the NPF. However, the overall strategy remains the same, with almost total focus on the combination electricity/road (targeting both AFI and AFV), and only some generic reference to other AFs/transport modes.

5.16.4.1 Legal measures

The Luxembourgish NIR contains 12 legal measures, including five new measures compared to the NPF. These measures represent a step forward to create a legally solid background to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR. The level of ambition of the legal measures has increased in the NIR, compared to the NPF.

5.16.4.1.1 Legislative & Regulatory

All legal measures described in the Luxembourgish NIR fall under legislative and regulatory measures, and most of them target road transport and electrification (addressing AFV and both public and private AFI). One legal measure introduced the obligation of owning a “zero-emission taxi” (i.e. BEV or fuel cell vehicles) in order to be eligible for any future operating licence. Ten measures were already in place in 2019. The remaining two have been adopted, and present an update or extension of two other measures. The first is the Grand-Ducal Regulation of 20 December 2019, amending the Grand-Ducal Regulation of 7 March 2019 and introducing financial aid for the promotion of zero or low CO_2 emission road vehicles. The second is the Grand-Ducal Regulation of 20 December 2019, amending the Grand-Ducal Regulation of 23 December 2016 and implementing Article 104(3) of the amended Income Tax Law of 4 December 1967. The first measure addresses electric vehicles (both BEV and PHEV) and hydrogen vehicles. The second one targets all company cars with an internal combustion engine and the application of the WLTP test cycle for the type-approval of vehicles.

5.16.4.1.2 Administrative

No administrative measures are reported in the NIR of Luxembourg.

5.16.4.2 Policy measures

The Luxembourgish NIR contains eight policy measures, which were all in place in 2019, and are different from the policy measures identified in the NPF. All measures focus on road transport. Seven policy measures target electricity as fuel, two of them in combination with hydrogen. One measure is related to CNG buses and infrastructure for public transport.

5.16.4.2.1 Measures to ensure national targets and objectives

Of all the policy measures described in the Luxembourgish NIR, four are categorised as measures to ensure national targets and objectives. The measures focus on road/electricity, with hydrogen included in two of them. These are:

- A tax allowance scheme, which was initially allowed only for BEV, fuel cell vehicles and bicycles with electric pedal assistance. This measure was later extended also to PHEV emitting less than 50 gCO_2/km and was integrated with a revision of the benefit in kind, calculated on the basis of CO_2 emission, with a further penalty for diesel vehicles.
- The obligation for government services to buy only BEV or, where appropriate, PHEV from 2018. Ordinary administrative-type cars with internal combustion engines (petrol or diesel) can only be purchased in exceptional circumstances, and with the necessary authorisation.
- An information campaign to raise public awareness regarding sustainable mobility and to inform municipalities, employers and citizens about the measures and incentives in place to support the uptake of alternative fuels solutions for mobility.
- Financial incentives for the purchase of BEV and fuel cell vehicles (€5,000), PHEV emitting less than 50 gCO_2/km (€2,500) and up to €500 for battery-electric quadricycles, motorcycles and mopeds.

5.16.4.2.2 Measures that can promote AFI in public transport services

Four policy measures can be categorised as measures that can promote AFI in public transport services. They deal with the deployment of alternative fuel buses and related infrastructure by four public transport operators in Luxembourg, three focussing on BEV and PHEV buses and one on CNG buses.

5.16.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Concerning the measures that can promote the deployment of private electro-mobility infrastructure, the LU NIR mentions one measure in the Policy section, which is also included in the list of the Legal measures. It establishes obligations to install recharging point in private buildings and provide requirements to do so, however it does not report quantitative information that would allow an assessment.

5.16.4.3 Deployment and manufacturing support

The Luxembourgish NIR contains three measures in place during the implementation period to support AFI deployment and manufacturing. All were different to the one measure identified in the NPF.

5.16.4.3.1 AFI deployment

The Luxembourgish NIR reports two AFI deployment measures. One relates to the deployment of 1,600 charging points for electric vehicles by end 2020, coming with a budget of 10 million €. The second one is the modernisation of two CNG refuelling points, finished in 2018 with a budget of €100,000.

5.16.4.3.2 Support of manufacturing plants for AF technologies

The Luxembourgish NIR lists one measure to support a manufacturing plant for electric scooters. State funding in 2017 amounted to about €70,000.

5.16.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Luxembourgish NIR.

5.16.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.16.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, three clusters could be identified in the LU NIR. The electricity/road cluster is the only having a high score and being comprehensive; the clusters for the pairs CNG/road and hydrogen/road receive a medium score and are not comprehensive. No measure was mentioned in the LU NIR related to LNG. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact, those for the pairs CNG/road and hydrogen/road have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all three clusters.

Table 5.16.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	M	N	**L**	+
LNG	Road				
	Water - inland				
H2	Road	M	N	**L**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.16.4.5 Research, Technological Development & Demonstration

The Luxembourgish NIR lists four RTD&D projects. The projects are new and differ from those presented in the NPF. For this reason, it is not possible to provide a comparison in terms of ambition between the NIR and the NPF. The MERLIN ([55]) project, which is funded by the European Regional Development Fund (ERDF), aims to develop a platform for assessing the impact of the country's various mobility solutions. The eCoBus ([56]) project, funded by the Luxembourg National Research Fund (FNR), aims to develop a cooperative and integrated intelligent transport system (ITS), which will coordinate electric buses, recharging infrastructure and traffic management. The PorSi3DLIB project is a public-private cooperation, also funded by the FNR, focusing on developing new Li-ion 3D batteries. Finally, the "ID and Data Collection for Sustainable Fuels" (IDACS) project, in which Luxembourg participates with 14 other Member States of the European Union, is another very important technological development project involving alternative fuels infrastructure.

The total budget of these four projects sums up to 2.404 million €, with a portion of 1.299 million € (54%) for the two projects financed by national sources.

5.16.5 ***Additional information on alternative fuels infrastructure developments***

The Luxembourgish NIR indicates that official statistics on electricity use for private charging of electric vehicles will be available in 2020. It can also be expected that the project IDACS, carried out by Luxembourg in cooperation with additional 14 European Member States over the years 2019-2021, will deliver further information on alternative fuels infrastructure, including all fuels.

[55] https://mobilab.lu/merlin/
[56] https://ecobus.lu/

5.16.6 *Summary of the assessment*

Tabular overview

Table 5.16.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	1,118	294	1	NA	NA	361
		Situation (2018)	3,373	314	13	1	NA	377
		Estimate (2030)	202,600	100	150	1	NA	NA
		Future share (2030) [%]	34.36%	0.02%	0.65%			
		Estimate attainment (2018 vs 2030) [%]	1.66%		8.67%	100.00%		
		Progress (2018)	adequate		8.05%			
Publicly accessible AF Infrastructure		Past situation (2016)	212	6	0	0	0	14
		Situation (2018)	841	2	0	0	0	14
		Target (2030)	10,320	1	0	0	1	NA
		Target attainment (2018 vs 2030) [%]	8.15%					
		Progress (2018)	adequate					
Sufficiency Index		2016	5.27	49.00		(not applicable)		25.79
		2018	4.01	157.00		(not applicable)		26.93
		2020	6.40	90.00		(not applicable)		
		2025	19.63	125.00		(not applicable)		
		2030	19.63	100.00		(not applicable)		
Measures	**Legal measures**	Ambition (NIR vs NPF)	+	+			+	
	Policy measures + Deployment & manufacturing support	Score	H	M			M	
		Comprehensiveness	C	N			N	
		Impact	H	L			L	
		Ambition (NIR vs NPF)	+	+			+	
	RTD&D	Ambition (NIR vs NPF)						

Legend:

(grey)	not applicable
(white)	the value could not be computed
NA	no value/information provided/available in the NIR

In its NIR, Luxembourg confirms and strengthens the NPF strategy to focus on electro-mobility for road transport. Concerning CNG, the LU NIR foresees only a marginal role and specifically for public transport (where the co-existence of BEV and PHEV buses and coaches will also be relevant). Regarding LNG, the LU NIR does not present a defined strategy. For hydrogen vehicles the same type of incentives of BEV vehicles are foreseen, but this AF is currently excluded from the Luxembourgish plans on AF. Finally, biofuels and LPG are and will continue to be marginal. The measures put in place by Luxembourg are coherent with this vision.

The main outcomes of the technical assessment of the Luxembourgish NIR on vehicles estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – In 2018 Luxembourg recorded 3,373 EVs and 841 publicly accessible recharging points. EVs included 8 HCVs and 55 buses and coaches. As for the next decade, the LU NIR presents a new plan with a much higher ambition compared to the NPF: for EVs, whilst the estimate is lower in 2020, it is more than compensated by the increase until 2030 (322% more), when 202,600 EVs are foreseen (of which 1,000 LVCs, 100 HCVs and 1,500 buses and coaches). The same situation is observed for the recharging infrastructure, where the LU NIR now targets a slightly lower (-7%) number of recharging points in 2020, but much higher numbers for the years 2025 (+163%) and 2030 (+375%). With reference to this new scenario, Luxembourg is progressing adequately both in terms of EV and infrastructure. However, the calculated Luxembourgish sufficiency index is becoming potentially inadequate for the years 2025 and 2030.
- **CNG** – Luxembourg recorded a small number of 314 CNG vehicles in 2018, including 11 heavy-duty vehicles and 52 buses and coaches. The CNG fleet is expected to shrink to a total of 100 in 2030, with only the number of buses and coaches increasing slightly to 65. In line with the expected reduction in vehicles, the public infrastructure has been reduced, with two modernised refuelling stations remaining. This is considered sufficient by Luxembourg to cover current and future needs, and is confirmed by the adequate sufficiency index.
- **LNG** – The Luxembourg fleet consisted in 2018 of 13 LNG heavy-duty vehicles. An increase to 150 vehicles by 2030 is estimated, but no public LNG refuelling point is planned until 2030. There was however one private LNG refuelling point in service, which should continue until 2030.
- **Hydrogen** – At this moment hydrogen is not considered in the Luxembourgish fuel mix. There were no hydrogen vehicles/infrastructure registered in 2018 and no clear quantitative objectives provided for the future. However, the LU NIR declares that "*the government has committed, in its coalition agreement 2018-2023 ([57]), to arrange for at least one hydrogen refuelling station to be installed at one of the motorway service areas*" and this could take place by 2025.
- **Biofuels** – In Luxembourg, 56 ethanol fuelled vehicles were registered in 2018. No information on future vehicles developments and on refuelling infrastructure was provided.
- **LPG** – The LPG fleet of 377 vehicles registered in 2018 by Luxembourg included 8 heavy-duty vehicles. No assessment on LPG can be made since no information on future development and infrastructure was provided.

Rail transport

- **Electricity** – Information is unavailable in the LU NIR.

Waterborne transport (inland)

- **Electricity** – The LU NIR reports one electric vessel in service since 2016. It also recorded 5 shore-side electricity supplies in 2018 and presents a target of 6 in 2020 and of 10 from 2025 to 2030.

[57] https://gouvernement.lu/dam-assets/documents/actualites/2018/12-decembre/Accord-de-coalition-2018-2023.pdf, Coalition agreement 2018-2013, Luxembourg Government, December 2018.

- **LNG** – The LU NIR lists one LNG powered vessel in 2018 and for the next decade. Due to the large autonomy of LNG vessels, LNG refuelling infrastructure at the inland port Merter is not considered viable.

Air transport

- **Electricity supply for stationary aircraft** – The infrastructure to supply electricity for stationary aircraft at the Luxembourg airport is considered sufficient (44 units) and no increase is foreseen. The LU NIR mentions that 28 supply points consist in ground power units (diesel engines coupled to electricity generators) and no information is provided for the rest.

The Luxembourgish NIR presents an extended portfolio of **measures** compared to the NPF. However, the overall strategy remains the same, with almost total focus on the combination electricity/road (targeting both AFI and AFV), and only some generic reference to other AFs/transport modes. The Legal measures represent a step forward, and with higher ambition, to create a legally solid background to support the uptake of electro-mobility. The Policy and Deployment measures are coherently designed to realise these objectives. In terms of their expected impact to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact, while those for the pairs CNG/road and hydrogen/road have a low impact. The RTD&D measures confirm and complete the overall strategy of Luxembourg to become *"... one of the main players in electric mobility"*.

5.16.7 *Final remarks*

The Luxembourgish NIR provides a comprehensive report on efforts to implement the Directive. The NIR is in line with the provisions of Annex I to the Directive. All alternative fuels are addressed in the NIR. However, the focus is on electro-mobility, as confirmed also by the measures included in the NIR.

As regards electricity, the NIR estimates that there could be around 203,000 electric vehicles on the roads by 2030, representing about 34% of the future fleet by that time, as well as around 10,300 recharging points in the same year. Taking into account the current situation and expected trends, this level of ambition appears to be fully consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. No information on charging efficiency is provided. Five shore-side electricity supply facilities have been installed in Luxembourg's inland ports already. This number is noted to increase to 10 by 2025. Luxembourg's national airport has already installed 44 electricity supply points for stationary aircraft. Further information should be provided on the current and planned electrification of the rail network.

Regarding hydrogen for transport, the NIR estimates one hydrogen refuelling station planned for 2025. No information was provided on the number of future FCHVs. It would be relevant that Luxembourg provides more information on how to ensure EU-wide connectivity for this alternative fuel.

Concerning natural gas, there were 314 CNG vehicles in Luxemburg. A significant decrease in the existing CNG – mainly public fleet – is expected (100 CNG vehicles by 2030). The number of LNG vehicles is anticipated to increase from 13 in 2018 to 150 by 2030. However, the NIR does not provide any indication on the planned LNG refuelling points for road transport. The NIR reports one LNG-powered vessel. No targets are provided for LNG refuelling points in inland ports. In this respect, Luxembourg needs to provide more information in future reporting.

There was already a small fleet of 377 LPG vehicles in Luxembourg by 2018. The fact that no estimates are provided for the next decade indicates a lack of interest by Luxembourg in this vehicle's technology.

Further information should be provided on the consumption of biofuels for road and air transport. Luxembourg should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.16.8 *ANNEX - Description of the Member State*

On a surface area of 2,600 km², Luxembourg has a population of 602,000 people in 2018, which makes up for a population density of 232 inhabitants/km².

Number of main urban agglomerations

- 1 urban agglomeration > 50,000 inhabitants

In 2018, Luxembourg achieves a per capita gross domestic product at market prices of €98,640, which represents a per capita gross domestic product in purchasing power standards of 261 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Luxembourg is 69 km. The total road network length is 2,889 km, of which 165 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Luxembourg: 1% (32 km) of the North Sea - Mediterranean Corridor.

Through the TEN-T Road Corridors, Luxembourg is connected with the following Member States:
- Belgium (through the North Sea - Mediterranean Corridor),
- France (through the North Sea - Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Luxembourg accounts for 492,481 registered road vehicles of which 415,145 are categorized as passenger cars, 34,833 as light goods vehicles, 10,161 as heavy goods vehicles and 2,042 as buses and coaches. The motorisation rate is 690 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- No maritime ports
- 1 inland port in the TEN-T Core Network (Luxembourg-Mertert)
- No inland ports in the TEN-T Comprehensive Network

Through the 37 km inland waterways TEN-T Core Network, Luxembourg is connected with Germany by the Rhine – Alpine and the North Sea – Mediterranean Corridor, and with France by the North Sea – Mediterranean Corridor.

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Luxembourg)
- No airports in the TEN-T Comprehensive Network

5.17 Hungary (HU)

5.17.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Hungarian NPF the Commission concluded:

The Hungarian NPF addresses most of the requirements of Article 3. It contains a comprehensive discussion of the current state and future scenarios for most alternative fuels in the transport sector. For all fuels and some modes, it establishes targets as required by Article 3 of the Directive.

It contains a large bandwidth of estimates for the future deployment of EV ranging for the 2 extreme EV penetration scenarios from 0.3% to 1.4% electric vehicles on the road in 2020. The given recharging points target and especially high power recharging infrastructure seems to cover the needs of electric vehicles in terms of number of publicly accessible recharging points as well as distance requirements in Hungary. The NPF mentions that new gates at the Liszt Ferenc International Airport will feature ground power units, but no quantitative targets are provided. For shore-side electricity it targets a modest growth at its ports.

For CNG cars, the estimated shares are slightly higher than for EV. Hungary currently does not meet the threshold of at least one CNG refuelling point per 600 CNG vehicles on the road. The NPF states very high estimates for CNG vehicles that would also for the future lead to a sufficiency index of less than one refuelling point per 600 CNG vehicles. Regarding the 2025 minimum coverage target in terms of distance requirements, the existing measure for the deployment of CNG refuelling points seems sufficient. Hungary already counts a high number of CNG trucks and buses and the NPF contains very ambitious estimates for 2020.

The Hungarian NPF has firm plans for building 5 LNG road refuelling points for 2020. Beyond, for 2025 it targets, between 36 and 182 LNG refuelling points for heavy-duty vehicles in road transport and plans a pilot liquefaction plant for vessels and heavy-duty trucks. It also describes a project for an LNG ship-to-ship bunkering vessel. Moreover, the NPF states that Hungary should already in 2020 appropriately cover with LNG infrastructure, both the TEN-T Corridors and the Comprehensive Network, for road and inland waterways.

Hungary, in its NPF, has established targets for the deployment of a hydrogen refuelling infrastructure, accessible to the public.

The Hungarian NPF contains a comprehensive list of measures that could have a medium impact on overcoming deployment barriers, especially in electro-mobility. Most of the existing or planned measures end in 2018 or earlier, with no prolongation foreseen. It may be challenging to achieve NPF targets and corresponding vehicle deployment estimates for electricity until 2020 even in the low penetration scenario. For CNG, the described measures may create a too low impact vis-à-vis the high estimates. The NPF does not list any measures in support of LNG refuelling point deployment.

Cooperation with neighbouring Member States is not mentioned in the NPF. It may be advisable for Hungary to coordinate its NPF with neighbouring Member States.

5.17.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.17.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)	Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne (inland) /electricity, biofuels, LNG	Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne (inland) /electricity, LNG, CNG	Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network		N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road/electricity	Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.		N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.	All / All	Y
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, waterborne (inland)/ LNG, CNG	Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, waterborne (inland), rail /electricity, CNG, LNG, H2, LPG	Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, waterborne (inland), rail /electricity, CNG, LNG, H2, LPG	Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, waterborne (inland), rail, air /electricity, CNG, LNG, H2, LPG	Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points		N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / All	Y

The checklist shows the requirements of Annex I from the Directive that are covered in the HU NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, LNG, hydrogen and LPG are covered for road transport; LNG also for waterborne inland transport; all the other combinations are either absent or not applicable.

The Hungarian NIR reports 22 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify five AF/transport mode clusters of measures, of which four were assessable.

5.17.3 *Quantitative assessment: Vehicles and infrastructure*

It is important to note that the Hungarian NIR provides two different scenarios in terms of AFV estimates and AFI targets: the WEM scenario ("with existing measures") and WAM scenario ("with additional measures"). These two scenarios show different outcomes for each AFI/AFV development and market penetration in 2025 and 2030. WEM presents a more realistic scenario considering the measures implemented, and WAM presents a slightly more ambitious scenario in AFV/AFI deployment with anticipated measures. In this assessment report, the WEM ("with existing measures") scenario is the only one used in the quantitative assessment as well as the measure assessment.

Table 5.17.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	9,240	671	23,260	1,500	193,700	14,600	389,800	35,000
	Change NIR vs NPF [%]			9.72%	-33.33%	137.38%	80.25%	114.29%	93.37%
	Attainment [%]			39.72%	44.73%	4.77%	4.60%	2.37%	1.92%
CNG / road	NIR	3,233	13	7,000	12	15,100	25	40,000	66
	Change NIR vs NPF [%]			-82.50%	-81.11%	-92.94%	-82.99%	-87.76%	-76.94%
	Attainment [%]			46.19%	111.00%	21.41%	52.72%	8.08%	19.71%
LNG / road	NIR	0	0	0	1	2,020	15	8,030	40
	Change NIR vs NPF [%]				-95.65%	-67.94%	-81.93%	-43.45%	-82.14%
	Attainment [%]								
LNG / water (inland)	NIR	0	0	0	1	1	9	1	10
	Change NIR vs NPF [%]				0.00%		50.00%		25.00%
	Attainment [%]								
Shore-side electricity supply / water (inland)	NIR		28		36		36		36
	Change NIR vs NPF [%]				0.00%				
	Attainment [%]				77.78%		77.78%		77.78%
Electricity supply / air (stationary airplanes)	NIR		52		NA		NA		NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	0	0	0	0	330	6	1,460	26
	Change NIR vs NPF [%]					340.00%	20.00%	873.33%	85.71%
	Attainment [%]								
LPG / road	NIR	28,528	529	26,000	529	19,000	500	14,000	460
	Change NIR vs NPF [%]			18.18%	-16.03%	-45.71%	-23.08%	-68.89%	-34.29%
	Attainment [%]								

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.17.3.1 Road transport

5.17.3.1.1 Electricity

Vehicles

Hungary recorded 9,240 electric vehicles in use in 2018 (Table 5.17.3-1), of which 8,844 were passenger cars (3,781 BEV), 372 LCVs (all BEV), 1 battery-electric HCV and 23 buses and coaches (all BEV). The HU NIR reports an estimate of 23,260 EVs in 2020, 193,700 EVs in 2025, and 389,800 EVs in 2030, of which 320,000 passenger cars (135,000 BEV), 60,000 LCVs (30,000 BEV), 8,500 HCVs (all BEV) and 1,300 buses and coaches (all BEV). Compared to the NPF, the Hungarian NIR reflects a higher policy ambition – the 2020 estimate is 14.43% higher, the 2025 estimate is nearly 140% higher and the 2030 estimate is almost 115% higher than the NPF estimates.

The 2018 ***attainment*** of the EV estimates set for 2020 and 2030 is 39.72% and 2.37% respectively. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Hungary is equal to 47%.

Infrastructure

Hungary recorded 671 public recharging points in 2018 (Table 5.17.3-1), of which 630 normal power (≤22kW) recharging points and 41 high power (>22kW). The NIR targets for the public recharging points are 1,500 for 2020 and 14,600 for 2025. For 2030, the NIR reports a target of 35,000 publicly accessible recharging points, of which 26,200 normal power and 8,800 high power recharging points. Compared to the NPF, the 2020 NIR target reflects a 33% lower ambition, however, the ambition grows considerably in 2025, with an 80,25% increase and in 2030, with a 93,37% increase.

The 2018 ***attainment*** of the publicly accessible recharging infrastructure targets set for 2020 and 2030 is 44.73% and 1.92% respectively. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Hungary is equal to 45%.

Ratio

Based on the HU NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. The 2016 sufficiency index is based on the number of public recharging points taken from EAFO, as the HU NIR has not provided any value. It can be seen that the sufficiency index is above 10 from 2018 until 2030, but with a decreasing trend from 2020 onward. In the light of the non-negligible share of high power charging points in the next decade (25% in 2030) the sufficiency index can be considered adequate.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	8.27		13.77	15.51	13.27	11.14

Information on charging efficiency

Information is not available in the HU NIR.

5.17.3.1.2 CNG

Vehicles

Hungary reported that 3,233 CNG vehicles were in use in 2018, of which 2,259 were passenger cars, 603 LCVs, 104 HCVs and 267 buses and coaches. For the next decade the Hungarian NIR reports an estimate of 7,000 CNG vehicles in 2020, 15,100 CNG vehicles in 2025 and 40,000 CNG vehicle estimate, of which 39,000 passenger cars, 700 LCVs, 100 HCVs and 200 buses and coaches. It is evident that the number of passenger cars rises steadily while the LCVs, HCVs and buses and coaches stagnate from 2018 to 2030. The NIR estimates for CNG passenger vehicles for 2020, 2025 and 2030 are respectively 82,50%, 92.94% and 87,76% lower than the NPF. This signals a lower ambition in the HU NIR towards CNG market development than originally estimated in the NPF.

The 2018 ***attainment*** of future CNG vehicles estimates is 46.19% for 2020 and 8.08% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Hungary is equal to 21%.

Infrastructure

The Hungarian NIR indicates that 13 publicly accessible CNG refuelling points were available in 2018 (Table 5.17.3-1). The NIR reports a target of 12 publicly accessible refuelling points in 2020, one less than in 2018. In 2025, the NIR target is 25 publicly accessible CNG refuelling points and in 2030 the target is 66. Similarly to the CNG vehicle estimates, also for CNG infrastructure, the NIR shows lower ambition and targets compared to the NPF. In particular, the HU NIR states a 81% lower target in 2020, a 83% lower target in 2025 and a nearly 77% lower target in 2030. The NIR report does clarify that this updated report takes into consideration the development and market penetration of all fuel technologies.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 111% for 2020 and 19.71% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Hungary is equal to 15%.

Ratio

Based on the HU NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that sufficiency index is below the indicative value of 600 (see Section 2.1.5) for the 2016-2020 period, and only slightly above 600 thresholds in 2025 and 2030, therefore the sufficiency index is considered adequate.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG	268.20	304.30	248.69	597.69	612.37	606.43

5.17.3.1.3 LNG

Vehicles

The Hungarian NIR indicates that natural gas is the most common alternative fuel to for the long distance transport. Hungary reported that the use of LNG is expected to appear in 2025, when 2,020 LNG vehicles are estimated to be in use, of which 2,000 HCVs and 20 buses and coaches. In 2030, the estimated number is 8,030 LNG vehicles, of which 8,000 HCVs and 30 buses and coaches. Hungary does not provide any LNG vehicles estimate in 2020, while the NPF had estimated 2,550 vehicles. A decrease in ambition between NIR and NPF is observed also for LNG vehicles, with almost 68% and 44% lower estimates in 2025 and 2030, respectively.

Since at the end of 2018 there are no LNG vehicles deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

The Hungarian NIR indicates that there was no LNG refuelling points in use in 2018. The HU NIR reports a target of one public LNG refuelling station in 2020, of 15 in 2025, and of 40 in 2030. In comparison with the NPF and in line with LNG vehicle estimates, the NIR reports a significant reduction in ambition towards LNG infrastructure targets. In 2020, the NIR reports a 95% lower target in publicly available LNG refuelling points, and a lower target around 82% for both 2025 and 2030.

Since at the end of 2018 there are no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the HU NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road. Clearly, only the 2025 and 2030 sufficiency indexes could be computed.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LNG					134.67	200.75

5.17.3.1.4 Hydrogen

Vehicles

There was no hydrogen powered vehicles recorded in Hungary in 2018, and there is no vehicle estimate provided for 2020. In 2025, the Hungarian NIR estimates 330 hydrogen vehicles, of which 200 passenger cars, 60 LCVs, 50 HCVs and 20 buses and coaches. In 2030, the NIR estimates 1,460 vehicles, of which 700 passenger cars, 200 LCVs, 500 HCVs and 60 buses and coaches. Compared to the NPF, the HU NIR does not provide any number for 2020 while the

NPF had estimated 35 vehicles. In 2025 and 2030 however, the estimates for hydrogen vehicles raise significantly. The Hungarian NIR reports a 340% higher estimate for 2025, and a 873% higher estimate for 2030.

Due to the absence of hydrogen vehicles in use at the end of 2018 the 2018 ***attainment*** and ***progress*** have not been calculated.

Infrastructure

The Hungarian NIR indicates that no publicly accessible hydrogen refuelling points were available in 2018 (Table 5.17.3-1) and there is no infrastructure target for 2020. The target for 2025 is equal to six, of which four will be 350 bar and two will be 700 bar points. The HU NIR also reports a target of 26 hydrogen refuelling points for 2030, of which 17 will be 350 bar and 9 will be 700 bar. Compared to the NPF estimates, the NIR reports a 20% higher target for 2025 and a 85% higher target for 2030, reflecting an increased ambition in hydrogen infrastructure deployment.

Due to the absence of hydrogen refuelling points deployed at the end of 2018 the 2018 ***attainment*** and ***progress*** have not been calculated.

Ratio

Based on the HU NIR, the following table shows the ratio between vehicles and infrastructure (i.e. sufficiency index) for the pair hydrogen/road for the 2025-2030 period.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**H2**					55.00	56.15

5.17.3.1.5 Biofuels

Vehicles

The Hungarian NIR does not provide the number of biofuels vehicles in use in 2018 nor any future vehicle estimates, however it does note that biofuel is the most important alternative fuel in road transport, due to the obligatory blending rate. The HU NIR states that next to electro-mobility, biofuels will be the most important contributor to achieve the national energy and climate targets for transport. In 2018, the share of biofuels in the national fuel mix was 4.2%. It is expected to be 4.4% in 2020, 5% in 2025 and 5.1% in 2030. The NIR does not specify what type of biofuels are considered.

Due to the lack of specific information, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Hungarian NIR does not report any dedicated biofuels refuelling points in use in 2018, nor does it provide future targets. However, the NIR states that Hungary will encourage both consumption and domestic production of second-generation biofuels.

Due to the lack of specific information, the 2018 ***attainment*** and ***progress*** could not be computed.

5.17.3.1.6 LPG

The Hungarian NIR states a strong message that the financial support for LPG infrastructure is not foreseen in the future and that the demand for LPG vehicles is expected to decline.

Vehicles

Hungary recorded 28,528 vehicles in 2018, out of which 27,642 passenger cars, 881 LCVs and 5 HCVs. For the next decade the HU NIR estimates 26,000 LPG vehicles in 2020, 19,000 in 2025 and 14,000 in 2030, which represents a steady decline. Compared to the NPF, the NIR reports a 45% lower estimate in 2025 and a nearly 69% lower estimate in 2030, which reflects the lower level of ambition towards the LPG future estimates.

Since the HU NIR foresees a decreasing trend, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Hungary recorded 529 publicly accessible LPG refuelling points in 2018 (Table 5.17.3-1). The HU NIR reports the same target also for 2020. In 2025 and in 2030, the NIR targets respectively 500 and 460 publicly accessible LPG refuelling points. Compared to the NPF, the NIR targets are 16% lower in 2020, 23% lower in 2025 and 34.3% lower in 2030, reflecting the reduced ambition towards LPG market development.

Since a decreasing trend is foreseen by the HU NIR, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the HU NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road (see Section 2.1.5).

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	48.10	49.26	53.93	49.15	38.00	30.43

5.17.3.2 Rail transport

5.17.3.2.1 Electricity

Vehicles

The HU NIR reports 672 electric locomotives in 2018, and estimates 680 electric locomotives in 2020, 673 in 2025 and 663 in 2030. The NPF however did not report any estimates for locomotives.

Infrastructure

The Hungarian NIR reports that 40% (i.e. 3113 km) of the total railways is electrified. Concerning energy consumption for rail transport, in 2018 it was composed by 70% electricity and 30% petroleum.

5.17.3.3 Waterborne transport (maritime)

Not applicable since Hungary has no maritime ports in the TEN-T Core Network.

5.17.3.4 Waterborne transport (inland)

5.17.3.4.1 Electricity

Vessels

The Hungarian NIR recorded 145 electric vessels in use in 2018, and estimates 210 vessels in 2020, 330 vessels in 2025 and 450 in 2030. There are no estimates provided by the NPF to be compared with the NIR.

The 2018 ***attainment*** of the foreseen deployment of electric inland waterway vessels is 69.05% for 2020 and 32.22% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Hungary recorded from 2016 until 2018 for the deployment of electric inland waterway vessels in inland ports corresponds to 13.84% of the overall planned deployment during the period 2016-2030.

Infrastructure

Hungary reported 28 shore-side electricity supply points for inland waterway vessels in inland ports in 2018, and the target for the 2020 is 36 shore-side supply points. The target of 36 remains until 2030, and this is equal to the target reported in the NPF.

The 2018 ***attainment*** of shore-side electricity supply points in inland ports is constant and equal to 77.78% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** Hungary recorded from 2016 until 2018 for the deployment of shore-side electricity supply points in inland ports corresponds to 0.02% of the overall planned deployment during the period 2016-2030.

5.17.3.4.2 LNG

Vessels

The Hungarian NIR reports that there were no LNG inland waterway vessels in use in 2018. For 2025 and for 2030 there is one estimated LNG vessel. In the NPF there were no estimates to be compared with the NIR.

Since at the end of 2018 there are no LNG vessels deployed in the inland ports, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Hungary reported that there were no LNG inland waterway refuelling points in 2018. The HU NIR presents a target of one for 2020, of nine for 2025 and of ten for 2030. Compared to the NPF, this represents a 50% higher target in 2025 and a 25% higher target in 2030, which reflects a higher ambition in LNG infrastructure deployment for inland waterways.

Since at the end of 2018 there are no LNG supply points deployed in the inland ports, the 2018 ***attainment*** and ***progress*** have not been computed.

5.17.3.5 Air transport

5.17.3.5.1 Electricity

Airplanes

The Hungarian NIR reports two electric airplanes in use in 2018, and it provides an estimate of three electric airplanes from 2020 until 2030. The NPF did not report any estimates for the comparison.

Infrastructure (for stationary airplanes)

Hungary reported 52 electricity supplies for stationary airplanes in use in 2018, and similarly to the NPF, the HU NIR does not provide and future targets. For this reason it is not possible to calculate the 2018 ***attainment*** and ***progress***.

5.17.3.5.2 Biofuels

Information is not available in the Hungarian NIR.

5.17.4 ***Measures assessment***

The Hungarian NIR contains a portfolio of measures that is numerically equivalent to the one in the NPF, however it appears overall more focused and aligned to the revised AFV estimates and AFI targets. The measures cover mostly road transport, in particular electricity and to a lesser extent CNG, LPG and LNG. The latter is considered also for waterborne inland transport. Biofuels are also covered but only in the Legal measures.

5.17.4.1 Legal measures

The Hungarian NIR contains seven legal measures (in the NPF there were eight). Of these seven measures, three were also in the NPF, while four are newly introduced in the NIR. Thus, the legal measures are a mix of updated NPF measures and new NIR measures and they present an increased level of ambition.

5.17.4.1.1 Legislative & Regulatory

All the seven legal measures listed in the NIR belong to legislative & regulatory category. They address a combination of alternative fuels and modes, with the majority addressing the road transport.

The first legal measure aims at revising the Governmental Decree 186/2019 (VII.26), so that in 2020 the minimum blend of biofuels in road transport would be raised from 6.4% to 8.4%. An information from the NPF states that Hungary aims to reach 10% overall, thus this represent a step forward towards meeting the target.

Secondly, two measures aim to revise a bill on electro mobility to better organise services, i.e. to clarify reporting obligations, licencing and reporting rules, for both AFV and AFI. The fourth legal measure had been listed in the NPF and considers green licence plates for electric cars. These plates would allow owners of electric vehicles to obtain tax allowances, free parking and more generally, they would help to raise public awareness.

The fifth legal measure aims at the deployment of recharging infrastructure, setting the obligation to consider recharging points in residential environments and in parking spaces.

The two last legal measures are under consideration. The sixth legal measure aims at amending the rules on establishing, operating and decommissioning of port and ferry crossings to create more favourable rules for LNG infrastructure development in inland water transportation. Lastly, there is a measure under discussion to incentivise the production of advanced biofuels and to investigate policies and measures to encourage production.

5.17.4.1.2 Administrative

The Hungarian NIR does not provide specific information on administrative measures.

5.17.4.2 Policy measures

The Hungarian NIR contains 10 policy measures, of which eight aim to ensure national targets and objectives, while two measures aim to promote AFI in public transport services. Compared to the policy measures identified in the NPF, a similar level of ambition can be considered. Most policy measures in the Hungarian NIR are financial incentives.

5.17.4.2.1 Measures to ensure national targets and objectives

Of the eight policy measures to ensure national targets and objectives, six are financial, one is educational and one is classified as other.

Five measures are addressing AFVs while three measures are addressing combinations of AF, AFV and AFI. They mainly cover road transport. One of the most significant measure is the updated version of the Jedlik Anyos plan, i.e. a ten-year plan addressing electro-mobility, aiming to roll out 450.000 EVs and deploy 45.000 recharging points by 2030. This comprehensive plan indicates a level of commitment to meet the 2030 estimates and targets for electro mobility. In fact it aims at exceeding the objectives of the WEM scenario (see the box at beginning of Section 5.17.3). Furthermore, other significant measures regarding the electro-mobility include annual subsidy scheme for purchasing EVs, non-refundable grants to lease EVs and various forms of grants and subsidies to deploy recharging infrastructure at national level. The remaining measures address various forms of tax reliefs and toll exemptions to decrease ownership costs of EVs, and they were also present in the NPF.

5.17.4.2.2 Measures that can promote AFI in public transport services

There are two policy measures listed in the NIR promoting AFI in public transport services. The first measure is a so-called Green Bus Programme that aims to replace 1,290 operating buses with 294 EURO-6 diesel buses, 99 CNG buses and 897 electric buses by 2029. This would be done through national subsidies for local authorities to cover 20% of the cost. Along with the conversion of the buses, the measure also foresees the appropriate recharging/refuelling infrastructure.

The second measure aims at supporting the use of LNG/LBG in both heavy-duty road transport and waterborne inland transport. This measure was in the process of being adopted, with no specific timeline or description provided on how it will exactly address public transport.

5.17.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The Hungarian NIR does not report any measures to promote the deployment of private electro-mobility infrastructure.

5.17.4.3 Deployment and manufacturing support

5.17.4.3.1 AFI deployment

The Hungarian NIR reports two measures concerning AFI deployment, both aiming at the pair electricity/road. The first measure provided direct national subsidies to municipalities to install recharging stations. As a result of this measure, 49 charging points were installed in 2016. The second measure consisted of non-refundable grants given to the state-owned bus company to install fast charging points in 2017.

No other fuels or modes of transport are mentioned in deployment and manufacturing support measure package.

5.17.4.3.2 Support of manufacturing plants for AF technologies

The Hungarian NIR does not provide information regarding the support of manufacturing plants for AF technologies.

5.17.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

The Hungarian NIR reports an elaborate summary on different AFI market development since the NPF report. The HU NIR states that between 2016 and 2018 the number of EVs doubled, while the number of charging points grew 14 times as a result of policies and measures, such as tax incentives and direct financial support. The HU NIR reports that circumstances have changed in the case of fuel cells and LNG, as the technology did not advance as expected in 2016. The NIR states that only in the case that fuel cell technology becomes viable, policies and measures to incentivise its spread will be introduced. On biofuels, Hungary reported increase in use since 2016, and the need to incentivise domestic biofuels production, especially second-generation biofuels.

5.17.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.17.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures in the Hungarian NIR, carried out according to the assessment methodology described in Section 2.2. As it can be seen, five clusters of measures were identified, on electricity, CNG, LNG and LPG for road and on LNG for inland waterborne transport. Only the cluster for the pair electricity/road obtains a high overall score and results comprehensive. The CNG/road and LNG/road clusters are assessed as having a medium score and LPG/road a low score. The LNG/ waterborne inland cluster could not be assessed and since it does not cover in details AFI and AFV deployment, it is not comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road have a high impact, while those for the pairs and CNG/road, LNG/road, and LPG/road have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased only for the pair electricity/road.

Table 5.17.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	M	N	**L**	-
LNG	Road	M	N	**L**	-
	Water - inland	X	N		
LPG	Road	L	N	**L**	=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.17.4.5 Research, Technological Development & Demonstration

The Hungarian NIR lists three RTD&D projects, all newly introduced in the NIR. They are all co-founded through the Connecting Europe Facility Transport programme (CEF). Two projects aim at fostering the deployment of LNG/LBG refuelling points, one for waterborne inland and one for road transport. The third project addresses the deployment of innovative (self-service, 24/7) CNG/CBG refuelling points for road transport across Hungary. The funds for these projects are 85% taken from the European Commission (CEF programme) and 15% from the national funds.

5.17.5 *Additional information on alternative fuels infrastructure developments*

The Hungarian NIR provides a complete information on fuel use in road transport for the past and for the next decade (

Table *5.17.5-1*). In 2018, the HU NIR reports that 64% of all fuel used in the road transport was diesel, followed by gasoline with 31%, biofuels with 4% and LPG with 1%. In 2030 the HU NIR estimates that diesel will remain the dominant fuel with 51% of the national fuel mix, followed by gasoline with 35%, biofuels with 5%, electricity with 4%, LNG with 2%, and CNG with 1%. Interestingly, the LPG will phase out already in 2025.

Table 5.17.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuel use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	33%	32%	31%	36%	32%	35%
	Diesel	61%	64%	64%	58%	60%	51%
	Electricity	0%	0%	0%	0%	1%	4%
	CNG	0%	0%	0%	1%	1%	1%
	LNG	0%	0%	0%	0%	1%	2%
	Hydrogen	0%	0%	0%	0%	0%	0%
	LPG	1%	1%	1%	1%	0%	0%
	Biofuels	5%	4%	4%	4%	5%	5%
	Other AF	0%	0%	0%	0%	0%	0%
	Total Road	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

5.17.6 *Summary of the assessment*

Tabular overview

Table 5.17.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	1,696	2,682	0	0	0	28,858
		Situation (2018)	9,240	3,233	0	0	0	28,528
		Estimate (2030)	389,800	40,000	8,030	1	1,460	14,000
		Future share (2030) [%]	8.59%	0.88%	5.16%		0.03%	0.31%
		Estimate attainment (2018 vs 2030) [%]	2.37%	8.08%				
		Progress (2018)	adequate	slow				
Publicly accessible AF Infrastructure		Past situation (2016)	205	10	0	0	0	600
		Situation (2018)	671	13	0	0	0	529
		Target (2030)	35,000	66	40	10	26	460
		Target attainment (2018 vs 2030) [%]	1.92%	19.71%				
		Progress (2018)	adequate	adequate				
Sufficiency Index		2016	8.27	268.20				48.10
		2018	13.77	248.69				53.93
		2020	15.51	597.69				49.15
		2025	13.27	612.37	134.67		55.00	38.00
		2030	11.14	606.43	200.75		56.15	30.43
Measures	Legal measures	Ambition (NIR vs NPF)	+	=	+	+		
	Policy measures + Deployment & manufacturing support	Score	H	M	M	X		L
		Comprehensiveness	C	N	N	N		N
		Impact	H	L	L			L
		Ambition (NIR vs NPF)	+	-	-			=
	RTD&D	Ambition (NIR vs NPF)		+	+	+		

Legend:		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

The Hungarian NIR is an updated and more focused version of the NPF as it considers the development of various alternative fuels over the past few years, adjusting the estimates and targets accordingly. Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; CNG, LPG, LNG and hydrogen for road transport, LNG also for waterborne inland transport; all the other combinations are either absent or not applicable. LPG is seen as inadequate in the Hungarian future fuel mix and will be gradually phased out.

Most of the measures address the pair electricity/road in detail, both in terms of vehicles and of recharging points. The NIR also reports some measures targeting CNG and LNG for road, and LNG for waterborne inland transport. Biofuels are also covered, but only in the Legal measures.

The main outcomes of the technical assessment of the Hungarian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – In 2018 Hungary recorded 9,240 EVs (of which 1 HCV and 23 buses and coaches) and 671 publicly accessible recharging points. Regarding the future estimates and targets, the HU NIR reports 389,800 EVs (320,000 passenger cars, 60,000 LCVs, 8,500 HCVs and 1,300 buses and coaches) and 35,000 publicly accessible recharging points (25% high power) in 2030. This represents an increase in ambition of around 100% for both AFV and AFI. The 2018 progress is adequate both for vehicles and infrastructure. The sufficiency index is also adequate for the whole period.
- **CNG** – Hungary reported that 3,233 CNG vehicles (of which 104 HCVs and 267 buses and coaches) and 13 publicly accessible refuelling point were in use in 2018. The Hungarian NIR indicates a steady increase of both CNG AFV and AFI by 2030. Regarding the future estimates and targets, the HU NIR reports an estimate of 40,000 CNG vehicles (39,000 passenger cars, 700 LCVs, 100 HCVs and 200 buses and coaches) and 66 refuelling points in 2030. This represent an overall decrease in ambition of around 80% compared to the estimates and targets in the NPF. The 2018 progress is slow for the vehicles and adequate for the infrastructure. The sufficiency index is adequate until 2030.
- **LNG** – Natural gas is seen as the most common alternative fuel to for the long distance transport in Hungary. However, similarly to the CNG, there is a considerable decrease in ambition between NIR and NPF, both in estimates and targets. The HU NIR reports that the use of LNG is expected to appear in 2025 and that by 2030 there will be 8,030 LNG vehicles (8,000 HCVs and 30 buses and coaches) and 40 publicly accessible refuelling points. The NIR estimate of LNG vehicles for 2030 is 43.45% lower and the related infrastructure target is 82.14% lower than in the NPF.
- **Hydrogen** – There were no hydrogen vehicles recorded in Hungary in 2018. For 2030 the HU NIR presents an estimate of 1,460 hydrogen-powered vehicles and a target of 26 publicly accessible refuelling points. This represents a 873% higher vehicle estimate and a 85.71% higher infrastructure target for 2030 compared to the NPF.
- **Biofuels** – The HU NIR reports that biofuels is the most important alternative fuel in road transport, due to the obligatory blending rate, but it does not provide any specific information for the future period.
- **LPG** – Hungary recorded 28,528 vehicles in 2018 and 529 publicly accessible refuelling points. In 2030 the HU NIR estimates 14,000 LPG vehicles and sets a target of 460

refuelling points, which represents a steady decline and lower level of ambition towards LPG.

Rail transport

- **Electricity** – The Hungarian NIR reports 672 electric locomotives in 2018, and estimates 680 electric locomotives in 2020, 673 in 2025 and 663 in 2030. The NIR also reports that, while 40% of the Hungarian railways is electrified, 70% of the total energy consumption for rail transport is based on electricity.

Waterborne transport (inland)

- **Electricity** – The Hungarian NIR recorded 145 electric vessels in use in 2018, and estimates 210 vessels in 2020, 330 vessels in 2025 and 450 in 2030. Hungary reported 28 shore-side electricity supply points in inland ports in 2018, and the target for the 2020 is of 36 shore-side supply points that will remain until 2030. This is a confirmation of the targets reported in the NPF
- **LNG** - The Hungarian NIR reports that there are no LNG inland waterway vessels in use in 2018, while the estimate for 2025 and for 2030 is equal to one. Similarly, there were no LNG inland waterway refuelling points in 2018. The HU NIR presents targets of 1 LNG refuelling point for 2020, 9 for 2025 and 10 for 2030. Compared to the NPF, this represents a 50% higher target in 2025 and 25% higher target in 2030.

Air transport

- **Electricity** – The Hungarian NIR reports two electric airplanes in use in 2018. It also provides an estimate of three electric airplanes from 2020 until 2030. Hungary reported 53 electricity supplies in use in 2018 for stationary airplanes, with no reported future targets.

The Hungarian NIR contains a portfolio of **measures** that is numerically equivalent to the one in the NPF, however it appears overall more focused. The portfolio consists of 22 measures, of which 6 Legal, 10 Policy, 2 Deployment and 3 RTD&D. A significant number of the measures in place are financial and target national co-funding scheme for electric vehicles or electricity infrastructure deployment. One of the most significant measure is the updated version of the Jedlik Anyos plan, a ten-year plan addressing electro-mobility, aiming to roll out 450.000 EVs and deploy 45.000 recharging points by 2030. This plan indicates a high level of commitment to meet or even exceed the 2030 WEM estimates and targets for electro-mobility (see the box at beginning of Section 5.17.3). Legislative and regulatory measures cover different acts on updating the rules and bills on electric AFI deployment, on the increase of minimum biofuels blend level and incentivising domestic biofuels production. One act aims at creating more favourable rules for LNG infrastructure development for inland waterway transport.

Concerning the Policy and Deployment & Manufacturing support measures, five clusters of measures were identified, on electricity, CNG, LNG and LPG for road and on LNG for inland waterborne transport (but this last was not assessable). In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road have a high impact, while those for the pairs and CNG/road, LNG/road, and LPG/road have a low impact.

The Hungarian NIR lists three RTD&D projects, financed through the Connecting Europe Facility transport programme (CEF). Two projects address the deployment of LNG/LBG infrastructure, one for waterborne inland and one for road transport. The third project addresses innovative CNG/CBG refuelling points for road transport across Hungary.

5.17.7 *Final remarks*

The Hungarian NIR provides a quite comprehensive report on the efforts to implement the Directive. It meets almost all the requirements of Annex I to the Directive. All alternative fuels are addressed. The NIR provides estimates for alternative fuel vehicles and targets for the relevant infrastructures. The measures provided in the NIR cover mostly road transport, in particular electro-mobility and, to a lesser extent, CNG, LPG and LNG.

With regard to electricity, the NIR estimates that some 390,000 electric vehicles could be on the roads by 2030, representing about 8.6% of the fleet by that time. Taking into account the current situation and expected trends, this level of ambition does not appear to be fully compatible with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. No information on charging efficiency is provided. The NIR also notes the ambition to electrify inland waterway transport. In 2018, there were already 145 electric vessels in use, and it is estimated that by 2030 there could be 450. In addition, in 2018 there were 28 shore-side electricity supply facilities in inland ports. This number should increase to 36 by 2030. Fifty-two electricity supply points provided electricity for stationary aircraft in 2018. Concerning rail transport, 40% of Hungary's railway lines are electrified. Future reporting should provide further information on the share of rail electrification.

Regarding hydrogen for transport, the NIR does not report current numbers on vehicles or infrastructure. However, it estimates six hydrogen refuelling points and a small fleet of 330 FCHVs by 2025. The NIR expects these figures to increase by 2030 to a fleet of 1,460 FCHVs and 26 refuelling points. The number of refuelling points seems sufficient taking into account the length of the Hungarian TEN-T Road Core Network, provided that the refuelling station are widely distributed along the network.

As for natural gas, in 2018 there was a small fleet of 3,223 CNG vehicles and 13 refuelling points in Hungary. These figures are expected to increase to 40,000 vehicles and 66 refuelling points by 2030, showing a lower level of ambition in the NIR on CNG compared to the NPF. Hungary has still a significant level of ambition regarding LNG for road transport (although again lower than in the NPF); the NIR targets 15 LNG refuelling points in 2025 and 40 in 2030. This seems sufficient taking into account the length of the Hungarian TEN-T Road Core Network, provided that the refuelling points are widely distributed along the network. The NIR also presents a target of nine LNG refuelling points for the inland ports by 2025 and 10 by 2030. These figures seem sufficient when considering that Hungary has two inland ports in the TEN-T Core Network and six inland ports in the Comprehensive TEN-T Core Network.

There was a significant fleet of LPG vehicles (28,520) and refuelling points (529) in 2018. The NIR expects the number of LPG vehicles to decrease significantly by 2030.

As regards biofuels, Hungary will encourage both consumption and domestic production of second-generation biofuels towards 2030, in accordance with the recast Renewable Energy

Directive. Hungary should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.17.8 *ANNEX - Description of the Member State*

On a surface area of 93,000 km², Hungary has a population of 9.778 million people in 2018, which makes up for a population density of 105 inhabitants/km².

Number of main urban agglomerations

- 18 urban agglomerations > 50,000 inhabitants

In 2018, Hungary achieves a per capita gross domestic product at market prices of €13,690, which represents a per capita gross domestic product in purchasing power standards of 71 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Hungary is 1,090 km. The total road network length is 31,993 km, of which 1,982 km are motorways.

The following parts of the TEN-T Road Corridors are present in Hungary: 11% (604 km) of the Mediterranean Corridor, 9% (469 km) of the Orient/ East - Mediterranean Corridor and 10% (469 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, Hungary is connected with the following Member States:
- Austria (through the Orient / East Mediterranean and the Rhine - Danube Corridor)
- Slovakia (through the Orient / East Mediterranean and the Rhine - Danube Corridor)
- Romania (through the Orient / East Mediterranean and the Rhine - Danube Corridor)
- Croatia (through the Mediterranean Corridor)
- Slovenia (through the Mediterranean Corridor)

Number of registered road vehicles

At the end of 2017, Hungary accounts for 4,398,832 registered road vehicles of which 3,641,823 are categorized as passenger cars, 444,588 as light goods vehicles, 125,887 as heavy goods vehicles and 19,134 as buses and coaches. The motorisation rate is 372 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- No maritime ports
- 2 inland ports in the TEN-T Core Network (Budapest Csepel, Komárom)
- 6 inland ports in the TEN-T Comprehensive Network

Through the 405 km inland waterways TEN-T Core Network, Hungary is connected with Croatia and Slovakia by the Rhine - Danube Corridor.

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Budapest-Liszt Ferenc)
- 2 airports in the TEN-T Comprehensive Network

5.18 Malta (MT)

5.18.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Maltese NPF, the Commission concluded:

The Maltese NPF addresses only partly the requirements of Article 3 of the Directive, focussing on electric vehicles and infrastructure for road. For determining the fuel or fuels (other than electricity) that are the most feasible for use in road transport in Malta, the Maltese government will be commissioning in 2018 the 'Alternative Fuels in Road Transport Study'. Another study aiming at providing recommendations regarding the development of LNG as a marine fuel is currently underway.

In the case of electricity for road transport, which constitutes the focus of the Maltese NPF, the requirements of the Directive were fulfilled. The NPF contains, with around 1.7% share by 2020, high estimates for the future deployment of EVs, when compared with its current EV share of less than 0.1%. Already today, the spatial distribution of recharging points appropriately covers the needs of electric vehicles in terms of distance requirements in Malta. The given publicly accessible recharging points target is in line with the requirements of the Directive for 2020 and the assessment threshold of less than 10 EVs per recharging point is fulfilled. The proposed set of measures for electro-mobility could support reaching the declared objectives since it was evaluated as being comprehensive and having a medium overall assessment score.

The NPF does not contain concrete targets to increase the availability of electricity supply at airports for stationary airplanes. In the case of shore-side supply in its maritime ports no targets are provided, but an action plan for its implementation at the TEN-T Core Network ports of Valetta and Marsaxlokk is expected to be finalised by the end of 2018.

Besides electro-mobility, the national strategy for the other alternative fuels is briefly or inadequately treated in the Maltese NPF, being dependent on the results of currently ongoing studies. For CNG and LNG fuels, the NPF contains neither future estimates for vehicles and vessels nor targets for refuelling infrastructure. The lack of ambition for natural gas can be partially explained by the small market size in Malta and the lack of current interconnections with other natural gas networks. The best option known for Malta to be supplied with natural gas is the 159 km gas pipeline connecting Malta to Sicily but the earliest commercial operation of this pipeline is targeted for 2024.

The Maltese NPF does not contain any targets for hydrogen in transport.

The Maltese NPF contains a quite large portfolio of measures and most of them are already existing or adopted. The vast majority of the measures targets electricity for road and includes substantial direct incentives for purchase and tax incentives. Longer durations for the validity of financial support measures could provide certainty for market actors and hence increase the likelihood that the national targets and objectives of the NPF can be reached. The NPF also contains several support measures to promote the use of electricity in public transport which address mainly public procurement. Bicycles and electric bikes as well as their infrastructure *also receive support. No future measures are discussed to promote the deployment of private electro-mobility infrastructure.*

The Maltese NPF does not specify to which extent interests of regional and local authorities, as well as those of the stakeholders concerned have been considered in its drafting. However, it mentions plans to establish a stakeholder group (e.g. including representative of the private sector, NGOs, ministries and public entities) which will be involved in the drafting of the updated NPF.

Several European projects are mentioned in the Maltese NPF, mainly regarding cooperation with Italy. Two of them concern the promotion of electro-mobility while one is related to the connection of Malta to the European Gas Network.

5.18.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.18.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, combination / Electricity, LNG, LPG		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, water-maritime / Electricity, LPG		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, water-maritime / Electricity		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			No
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, water-maritime / electricity, LNG, hydrogen		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / electricity, CNG, LNG, LPG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / electricity, CNG, LNG, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road / electricity, CNG, LNG, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, water-maritime / All		Yes

The checklist shows the requirements of Annex I from the Directive that are covered in the MT NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is partially covered for road and maritime transport; CNG, LNG and LPG are partially covered for road transport; LNG is also mentioned for maritime transport; other combinations are either absent or not applicable.

The Maltese NIR reports 30 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify three AF/transport mode clusters of measures, all assessable.

5.18.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.18.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	926	102	2,161	362	12,350	NA	47,488	NA
	Change NIR vs NPF [%]				-38.64%				
	Attainment [%]			42.85%	28.18%	7.50%		1.95%	
CNG / road	NIR	0	0*	0	NA	253	NA	950	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / road	NIR	0	0*	0	NA	0	NA	22	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	83	6	100	9	100	NA	100	NA
	Change NIR vs NPF [%]								
	Attainment [%]			83.00%	66.67%	83.00%		83.00%	

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Value taken from EAFO (absent in NIR)

5.18.3.1 Road transport

5.18.3.1.1 Electricity

Vehicles

Malta recorded 926 electric vehicles (EVs) in use in 2018 (all of them being BEVs and passenger cars) (see Table 5.18.3-1) and 491 electric powered two wheelers (L-category vehicles). Regarding the next decade, the Maltese NIR confirms the NPF estimate of around 5,000 for 2020, and provides new estimates of 26,425 for 2025 and 89,994 for 2030. All these numbers also include powered two wheelers. The estimates for electric vehicles - excluding PTWs - presented in the MT NIR are 2,161 for 2020, 12,350 for 2025 and 47,488 for 2030 (see Table 5.18.3-1). It is worth noticing that the PTWs are expected to represent around half of the total road electric vehicles in the future in the country. From 2020, the MT NIR expects 6 BEV buses to enter into service and to run up to 2030. No BEVs or PHEVs are expected for LCVs and HCVs.

The 2018 ***attainment*** of future EV estimates is 42.85% for 2020 and 1.95% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Malta is equal to 43%.

Infrastructure

Malta recorded 102 publicly accessible recharging points in 2018 (Table 5.18.3-1), including 3 solar recharging points. The revised NIR target of publicly accessible recharging points for 2020 is 362, which is 38.64% lower than in the NPF. However, it is worth mentioning that the high power (>22kW) recharging points number for 2020 increases from 10 in the NPF to 44 in the NIR (the share changes consequently from 1.69% to 12.15%). In both the NPF and the NIR, Malta did not provide targets for publicly accessible recharging points for 2025 and 2030.

Regarding recharging infrastructure, Malta foresees a national e-car sharing service under which 450 dedicated medium-fast recharging points will be deployed (see also Section 5.18.4.2.1). The Maltese Government is planning to support the development of an electric public transport, by installing four normal charging stations for a planned e-Bus service (see Section 5.18.4.2.2).

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 28.2% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged target. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Malta is equal to 37%.

Ratio

Based on the Maltese NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that the sufficiency index is below 10 and adequate until 2020.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	3.07	3.80	9.08	5.97		

Information on charging efficiency

Information is not available in the MT NIR.

5.18.3.1.2 CNG

Vehicles

Malta did not record any CNG vehicles in use in 2018 (Table 5.18.3-1), but the MT NIR provides estimates for the next decade, which were not present in the NPF. Assuming that CNG will be available from 2021, CNG vehicles are expected to ramp-up from 0 in 2020, to 252 in 2025 and to 950 in 2030. Of these 950 vehicles, 80.3% will be passenger cars, 10.5% LCVs, 3.1% HCVs and 6.1% buses and coaches.

Because at the end of 2018 there are no CNG vehicles in use, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

As Table 5.18.3-1 shows, similarly to the NPF, there is no information on CNG refuelling infrastructure in the Maltese NIR, neither for the past nor for the future. According to EAFO, Malta did not record any CNG refuelling points in 2018.

Because there are no CNG refuelling points targets provided in the Maltese NIR, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

For the same reason it is not possible to compute the sufficiency index.

5.18.3.1.3 LNG

Vehicles

Malta did not record any LNG vehicles in use in 2018 (Table 5.18.3-1). Under the assumption that LNG will be available from 2026, the Maltese NIR estimates 22 vehicles in 2030, all of which will be HCVs.

Because at the end of 2018 there are no LNG vehicles in use, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

As shown in Table 5.18.3-1, similarly to the NPF, there is no information on road LNG refuelling infrastructure in the Maltese NIR, neither for the past nor for the future. According to EAFO, Malta did not record any road LNG refuelling points in 2018.

Because there are no data on road LNG refuelling points in the Maltese NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

For the same reason it is not possible to compute the sufficiency index.

5.18.3.1.4 Hydrogen

Vehicles

In spite of the participation of Malta in two pilot initiatives for proving hydrogen production from renewable energies and its use, no future vehicle estimates were found in the MT NIR and therefore the 2018 ***attainment*** and ***progress*** could not be computed. According to EAFO, Malta did not record any hydrogen refuelling points in 2018.

Infrastructure

Information is not available in the MT NIR.

Ratio

As the Maltese government does not provide any figures for hydrogen, neither in the NPF or in the NIR, no sufficiency index could be computed.

5.18.3.1.5 Biofuels

Vehicles

No specific information was found in the Maltese NIR.

Infrastructure

As in the Maltese NPF, the NIR does not provide additional information on infrastructure requirements for biofuels, as these are expected to be distributed through existing conventional fuels infrastructure, and according to the target set by REDII.

5.18.3.1.6 LPG

Vehicles

Malta recorded 83 LPG vehicles in use in 2018 (Table 5.18.3-1). In 2020, the Maltese NIR expects 100 vehicles on the road, without specification about the class and without further changes to that estimate for the period up to 2030.

The 2018 ***attainment*** of future LPG vehicles estimates is constant and equal to 83% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Malta from 2016 until 2018 for LPG vehicles deployment is 69.1% of the overall planned deployment during the period 2016-2030.

Infrastructure

Malta reported 6 LPG refuelling points in 2018 (see Table 5.18.3-1). For the next decade, the Maltese NIR presents a plan that was not present in the NPF with a growth to 9 refuelling points in 2020, while for 2025 and 2030 no targets are provided. This lack of targets in the medium-long term could be explained by the decision of the Maltese government to investigate the timing for the phasing-out of Internal Combustion Engines (ICE). Nevertheless, as a limited LPG fleet is foreseen after 2020, this absence of refuelling points is not clearly justified in the Maltese NIR.

The 2018 ***attainment*** of future publicly accessible LPG refuelling infrastructure targets is 66.7% for 2020. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Malta for the deployment of publicly accessible LNG refuelling infrastructure from 2016 until 2018 versus the period 2016-2030 could not be computed because the 2030 target is not provided.

Ratio

Based on the MT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road (see Section 2.1.5).

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	9.00	10.33	13.83	11.11		

5.18.3.2 Rail transport

Vehicles

Information is not available in the MT NIR.

Infrastructure

Information is not available in the MT NIR.

5.18.3.3 Waterborne transport (maritime)

5.18.3.3.1 Electricity

Vessels

Information is not available in the MT NIR. Nevertheless, the description about infrastructure provides some information on the expected demand.

Infrastructure

According to the MT NIR, the appointed entity *Infrastructure Malta* will undertake the necessary investment to provide shore-side electricity supply on all the quays within the TEN-T Core port Grand Harbour (port of Valletta) that are utilised for Cruise Liner Ships by 2025. In spite of this initiative, the NIR does not report any figures for this kind of infrastructure. Shore-side electricity supply for the maritime ports on the TEN-T Comprehensive Network is not foreseen in the MT NIR.

Because of the lack of numerical data, no ***attainment*** and ***progress*** could be computed.

5.18.3.3.2 LNG

Vessels

The Maltese NIR reports the outcomes of a study aiming at defining the potential for LNG bunkering. The Government of Malta is expecting to adopt a national policy for the implementation of the required LNG bunkering. For the time being, the MT NIR does not report any information about LNG vessels.

Infrastructure

According to the results of the above-mentioned study, LNG bunkering demand in Malta is expected to start from 2025, and to increase up to 339,000 tonnes/year in 2056 (based on MID scenario). Before 2025, no demand is expected unless a pilot project takes place. For this reason, the MT NIR does not report any quantitative information about LNG infrastructure.

Because of the lack of numerical data, no ***attainment*** and ***progress*** could be computed.

5.18.3.4 Waterborne transport (inland)

Not applicable since Malta has no inland ports in the TEN-T Core Network.

5.18.3.5 Air transport

5.18.3.5.1 Electricity

Airplanes

The Maltese NIR does not consider any hybrid-electric or fully-electric airplanes by 2030.

Infrastructure (for stationary airplanes)

The MT NIR reports no immediate plans to invest in infrastructure for electricity supply at its TEN-T Core airport. There is a generic statement about the intention to move ground operations to fully electric, but no quantitative information is provided.

5.18.3.5.2 Biofuels

Airplanes

Despite MT NIR mentioning the participation of Malta to the ICAO/CORSIA initiative, no quantitative information on flights/airplanes powered by biofuels is provided.

Infrastructure

Information is not available in the MT NIR.

5.18.4 *Measures assessment*

As in the NPF, a series of measures are mentioned in the MT NIR, which reflect mainly the focus on electro-mobility in the short term, as electricity "*is considered as the most promising fuel for future transport systems in Malta*". Some of the measures are vaguely defined or lack concrete information needed to perform the assessment[58].

5.18.4.1 Legal measures

The Maltese NIR contains seven legal measures, in general with a higher level of ambition compared to those in the NPF. The majority of the reported measures are specifically concerning the electricity/road pair.

5.18.4.1.1 Legislative & Regulatory

The legislative & regulatory category of the Maltese NIR contains six legal measures, all of which are exclusively reported in the NIR. Three measures relate to the electricity/road cluster and the rest to combinations of AFs.

An important legal measure, currently under evaluation by Maltese institutions, is the ICE cut-off date. In 2018, the Maltese Government had decreed that a cut-off date for the importation and registration of new and second-hand ICE vehicles on the Maltese Territory should be fixed. The Cabinet of Ministers had mandated the setting up of an inter-ministerial Committee to study the implications of such a ban. It is expected that the Committee will present its findings and suggestions by the second half of 2020 (by time of publication this sentence should be reviewed). This measure is expected to significantly impact the deployment of electro-mobility in Malta.

In Malta's Transport Master Plan 2025 there is a target of 20% of the national vehicle fleet to be composed of non-conventionally fuelled vehicles by 2025, and the gradual phasing out of 'conventionally fuelled' vehicles in urban areas by 50% in 2030. No specific details are reported, as the MT NIR declares that the Government plans to study further this issue and provide more detailed projections after 2020. The Maltese NIR mentions as well that the National Electro-mobility Action Plan is currently being updated.

Other measures concern transpositions into national legislation of articles of the AFI Directive and of the Energy Performance in Buildings Directive. The "Petroleum for the Inland (Retail) Fuel Market Regulations (545.22)" are also mentioned to ensure that the geographic location of the public alternative fuels refuelling points are accessible on an open and non-discriminatory basis to all users. A regulatory framework governing the personal and shared use of e-scooters put in place at the end of 2019 is presented as well.

5.18.4.1.2 Administrative

The only administrative measure mentioned in the MT NIR as well as in the NPF, targeted for completion by the end of 2020, relates to the integration of the Intelligent Transport Systems (ITS) Platform at the National Transport Control Centre aiming at facilitating the interface between vehicles and infrastructure.

[58]For allowing the measure assessment methodology to be employed and for consistency with the classification provided in the Guidance Support document, some measures have been re-classified in different categories.

5.18.4.2 Policy measures

The Maltese NIR reports 15 policy measures of which 11 had already been reported in the NPF and 4 are new. All the policy measures concern the road as transport mode and focus mainly on electricity as alternative fuel. Twelve of them can be categorised as measures to ensure national targets and objectives, two as measures that can promote AFI in public transport services and one as a measure that can promote the deployment of private electro-mobility infrastructure.

5.18.4.2.1 Measures to ensure national targets and objectives

Road transport

The Maltese NPF had mentioned quite a large number of measures to enhance the deployment of road electro-mobility, mainly financial measures like substantial direct incentives for purchase, taxation exemption schemes and public procurement incentives. The measures were often limited in time and budget, with annual extension foreseen. The NIR pursues many of them but in some cases (especially, the purchase subsidies and scrappage schemes) without providing enough details that are needed for their assessment according to the methodology described in Section 2.2. The continuation of these measures in the future is not clearly presented in the MT NIR.

More specifically, the MT NIR mentions that various schemes providing subsidies were launched on an annual basis with various changes over the years and their allocated budget was 1.9 million € for the period 2016-2019 (e.g. direct incentives for purchase for individuals and companies which supported the purchase of 373 EVs, 39 electric motorcycles and 185 pedelecs). EVs have been exempted since 2018 from paying the registration tax as well as the annual circulation tax (for a period of five years after registration). The EVs and the LPG vehicles are allowed to use the priority lane, while EVs are also exempt from tariffs related to the Controlled Vehicular Access system in Valletta.

To increase and stimulate the use of EVs in Malta as well as to promote the sharing economy and address congestion, a National e-Car Sharing Project started in 2018 to offer mobility as a service at no less than 45 mandatory locations. The service was launched with 150 BEVs and an additional 30 BEVs during the third quarter of 2019. In late 2019, electric motorcycle (scooter type) sharing was also introduced. In the NIR, it is reported that the company is expected to include electric van sharing services in 2020 as well as installation and operation of 450 medium-fast recharging points. According to the MT NIR, this deployment has already started. These recharging points will be offered to third party EV owners to charge their vehicle when the point is not being occupied by the EVs of the sharing fleet.

The use of EVs for the last mile delivery of goods is also under evaluation with a pilot project underway[59].

The measures detailed in the NPF on the promotion and support of electric bicycles (pedelecs) use are no longer mentioned in the NIR anymore.

[59] The pilot project comprises a large light commercial electric van for delivery of goods in the capital city of Valletta as well as other touristic zones. This electric van will be shared by a number of small factories in the Ta'Qali Crafts Village.

The incentive scheme for the conversion of a conventional fuel motor vehicle to run on LPG continues since 2013 (granting €200 per vehicle).

Biofuels

Malta has introduced an obligation on fuel importers to blend 0.1% share of advanced biofuels in their mix in 2020. Local importers and wholesalers of petrol and diesel are expected to meet their post-2020 substitution obligation by blending regular diesel with FAME and HVO. High blends of bioethanol (>E5) are not distributed for consumption in Malta.

The Maltese NIR pointed out that, given the relatively small market, the country cannot take advantage of economies of scale in procurement and shipping, therefore the CIF costs[60] tend to be higher than for larger markets. This is expected to limit specific initiatives on biofuels in Malta. In spite of this remark, in the scenario proposed at page 23 of the Maltese NIR, the advanced biofuels are expected to contribute to 25% of the total consumption of biofuels by 2030.

5.18.4.2.2 Measures that can promote AFI in public transport services

The Maltese NIR reports that under the current scheduled public transport Concession Agreement expiring in 2030, fleet using alternative fuels is not contemplated. However, two measures with influence on promoting alternative fuels in the public transport service are present in the MT NIR.

Buses

Six electric buses are planned to operate an on-demand shuttle service, between the multi modal hub in Xewkija and the Mgarr Harbour Terminal (TEN-T comprehensive) in Gozo Island. The aim is to promote the use of greener transport contributing towards lower emissions in the area and reduced traffic congestion within and around the Mgarr Harbour. The total cost for these e-buses is €1,994,607 out of which €1,636,245 are eligible for EU funding. These electric buses will be supported by four slow recharging stations located within the multi modal hub with a cost for purchase and installation estimated at around €230,000. The Ministry of Gozo plans to procure them through National Funds. The ambition of these two measures is slightly reduced compared to that of the NPF, where 8 electric buses and 10 recharging points were foreseen.

5.18.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

On private electro-mobility infrastructure, the Maltese NIR reports that the National Electric Vehicle Charging Network provides electric vehicles users with the possibility to charge using publicly accessible charging points in public parking spaces across Malta and Gozo at 4-hour slot intervals with a pre-booking system being available through a web-based interface.

During 2020, the electricity rate of recharging electric vehicles within residences is foreseen to be capped at €0.1298 per unit during off peak periods.

[60] Cost, Insurance, and Freight (CIF). This expense is the value paid by a seller to cover the costs, insurance, and freight of a buyer's order.

5.18.4.3 Deployment and manufacturing support

5.18.4.3.1 AFI deployment

The Maltese NIR contains two measures considered to address AFI deployment support.

According to the MT NIR, an unspecified number of fast charging points are planned to be installed by January 2021 at both ends of the Malta/Sicily ferry service (funded under the EnerNETMob Interreg Med project). This project's implementation was delayed because, according to the NPF, the installation was foreseen to be accomplished in 2019.

The Maltese NIR reports that "*Infrastructure Malta will undertake all the necessary investment to provide shore side supply on all the quays within the TEN-T Core port Grand Harbour*" (port of Valletta). Phase I targeted the quays utilised for Cruise Liner Ships by 2025 and the foreseen investment is estimated at 40 million €. In phase II of the project, additional investments should allow for supplying other vessels such as cargo roll-on/roll-off (RORO), etc. Shore-side electricity supply for the maritime ports on the TEN-T Comprehensive Network is not foreseen in the MT NIR at this stage.

5.18.4.3.2 Support of manufacturing plants for AF technologies

The Maltese NIR contains no measures to explicitly support manufacturing plants for AF technologies.

5.18.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Maltese NIR.

5.18.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.18.4-1 presents an overview of the analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. No clusters of measures have emerged for CNG, LNG and hydrogen related to road transport, nor for rail and air transport modes.

The vast majority of the assessable measures are targeting the pair electricity/road, which is the main focus of the MT NIR set of measures. While it results comprehensive since it concerns both vehicles and infrastructure (with financial and non-financial measures), it obtained a medium overall score, which is also due to the lack of details that limited the possibility of a robust assessment. Its ambition is considered to have increased compared to the NPF, but greater detail on planned measures is recommended.

Another cluster identified in the MT NIR concerns LPG/road and contains two measures but only one is specifically dedicated to LPG. It has been assessed to have a low score, not to be comprehensive and with a similar ambition level as in the NPF.

Electricity/water - maritime is a cluster newly introduced in the NIR, which contains only one measure. The reported measure seems to have the potential to positively impact on the most important port of Malta. However, the lack of specific details influences the assessment (the NIR reports only an estimated budget for the first phase) (see Section 5.18.4.3.1). Thus, this cluster has been evaluated with a low/medium overall score, and it is considered not comprehensive.

In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a medium impact, while those for electricity/maritime and LNG/maritime result to have a low impact.

Table 5.18.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	M	C		**M**		+
CNG	Road						
LNG	Road						
	Water - maritime						
LPG	Road	L	N		**L**		=
Electricity	Water - maritime	L/M	N		**L**		+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.18.4.5 Research, Technological Development & Demonstration

The Maltese NIR contains six items than can be considered as RTD&D related actions.

Two projects of relevance are presented, both focusing on Hydrogen: BIG HIT (FCH JU) and SMARTHY-AWARE INTERREG Project. The total budget for Malta is lower than €200,000. It is worth noticing that, neither in the NPF nor in the NIR, Malta has foreseen any relevant development of hydrogen for transport. Specific details about each of these projects are not provided in the NIR.

Four measures regard national studies that have been conducted in order to prepare decisions on the future provision of the respective alternative fuels ("*Alternative Fuels in Road Transport Study*", "*LNG Bunkering Study*", "*Shore side Electricity in Ports Study*", and a study in the form of an implementation plan as well as a Cost Benefit Analysis on the extension of the National Electric Vehicle Charging Network).

The Maltese NIR reports in details the outcomes of the study on LNG Bunkering. The market study shows that LNG bunkering demand in Malta is expected to start from 2025, reaching 31,000 tonnes/year in 2030 and increasing up to 339,000 tonnes/year in 2056 (based on MID scenario). Before 2025, no demand is expected unless a pilot project takes place. To date, the number of shipping operators that have committed to LNG is very small because emerging technologies such as biofuels, hybridisation and batteries are gaining more popularity and are considered as a cleaner alternative to LNG.

In the NPF, several European projects were reported (e.g. GrowSmarter, DESTINATIONS, EnerNETMob, DEMO EV and PORT-PVEV). The outcomes of these projects are mentioned in NIR, as base for the plans about the various alternative fuels.

5.18.5 *Additional information on alternative fuels infrastructure developments*

The Maltese NIR provides information on the changes in fuels use (see Table 5.18.5-1).

Table 5.18.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline/Petrol	39.36%	38.29%	35.00%	37.00%	35.40%	36.00%
	Diesel	51.80%	52.18%	56.00%	52.10%	52.00%	52.00%
	Gasoil	5.04%	5.42%	4.00%	6.20%	6.60%	4.00%
	Electricity	negligible	negligible	negligible	negligible	1.00%	2.00%
	LPG	negligible	negligible	negligible	negligible	negligible	negligible
	Biofuels	3.49%	3.79%	5.00%	4.60%	5.50%	7.00%
	Other AF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Total Road	**99.69%**	**99.68%**	**100.00%**	**99.90%**	**100.50%**	**101.00%**
Maritime	Marine gas oil	84.24%	84.00%	80.95%	86.00%	85.00%	75.00%
	Petrol	3.48%	2.47%	2.90%	2.00%	2.00%	4.00%
	Biodiesel	0.41%	0.38%	0.47%	0.00%	0.00%	0.00%
	Marine diesel oil	11.87%	13.15%	16.67%	12.00%	13.00%	21.00%
	Total Maritime	**100.00%**	**100.00%**	**100.99%**	**100.00%**	**100.00%**	**100.00%**

As it can be noticed, biofuels are expected to remain the dominating alternative fuel in road transport throughout the period, followed by electricity that increases from 2025 onwards.

Additionally, the Maltese NIR provides a detailed overview of biofuels use in transport (see **Error! Reference source not found.**). As it can be seen, biofuels in road transport are projected to grow between 2021-2030. Biofuels are expected to continue increasing mainly as blends with regular road diesel and HVO, FAME (to a lesser extent), and advanced biofuels in line with the Renewable Energy Directive. Advanced biofuels are expected to contribute to 25% of the total consumption of biofuels by 2030. This scenario does not require any further investment in terms of infrastructure.

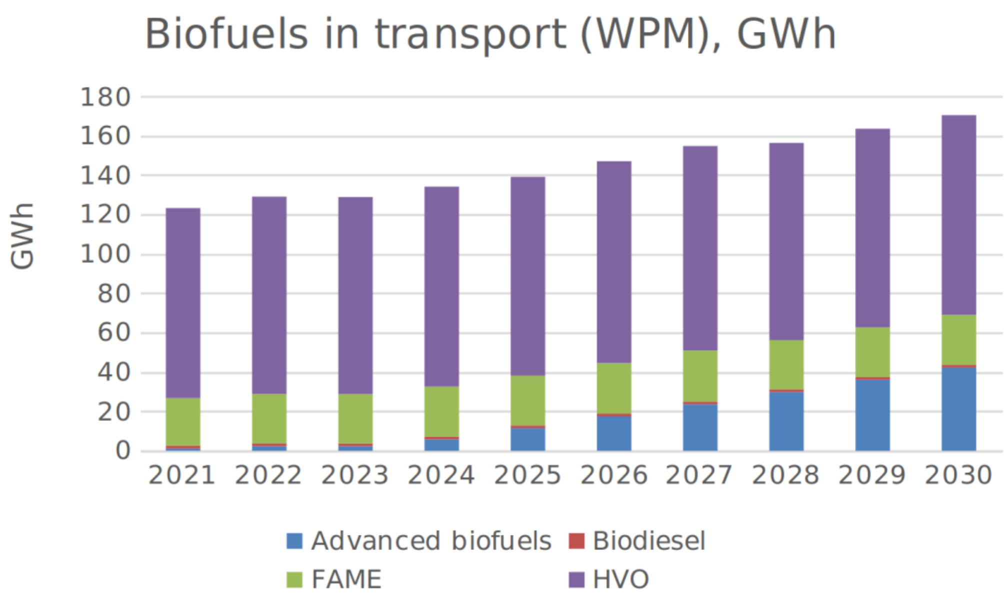

Figure 5.18.5-1 Projections of biofuels under WPM scenario, 2021-2030, GWh (source MT NIR page 23).

5.18.6 *Summary of the assessment*

Tabular overview

Table 5.18.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LPG / road
AF Vehicles / Vessels		Past situation (2016)	313	0	0	NA	45
		Situation (2018)	926	0	0	NA	83
		Estimate (2030)	47,488	950	22	NA	100
		Future share (2030) [%]	14.56%	0.29%	0.12%		0.03%
		Estimate attainment (2018 vs 2030) [%]	1.95%				83.00%
		Progress (2018)	adequate				69.10%
Publicly accessible AF Infrastructure		Past situation (2016)	102	NA	NA	NA	5
		Situation (2018)	102	0*	0*	NA	6
		Target (2030)	NA	NA	NA	NA	NA
		Target attainment (2018 vs 2030) [%]					
		Progress (2018)	slow				
Sufficiency Index		2016	3.07				9.00
		2018	9.08				13.83
		2020	5.97				11.11
		2025					
		2030					
Measures	Legal measures	Ambition (NIR vs NPF)	+				=
	Policy measures + Deployment & manufacturing support	Score	M				L
		Comprehensiveness	C				N
		Impact	M				L
		Ambition (NIR vs NPF)	+				=
	RTD&D	Ambition (NIR vs NPF)	+	=	=	=	

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken from EAFO (absent in NIR).

The requirements of Annex I from the Directive are only partly covered in the Maltese NIR. The NIR does not contain a complete description of the policy direction towards the introduction of alternative fuels in Malta. Also, it does not establish clear AFI targets for the different kinds of alternative fuels. However, the Maltese NIR mentions several studies and evaluations to be completed in 2020 (e.g. ICE cut-off date, update of the Malta Transport Master Plan 2025, and evaluation of the outcomes of studies for LNG). This planning is expected to complement and integrate the current set of national targets for the deployment of alternative fuels and their infrastructure.

The main outcomes of the technical assessment of the Maltese NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – In 2018, Malta reported 962 electric vehicles (all passenger cars). The 5,000 total road electric vehicles (including PTWs) planned in NPF for 2020 are still a valid commitment in the NIR. Additionally, the MT NIR provides estimates by category of vehicles, foreseeing 2,160 EVs (excluding PTWs) in 2020, and new estimates of 12,350 in 2025 and 47,488 EVs in 2030 (all passenger cars, except 6 buses and coaches). Malta recorded 102 recharging points in 2018; the NIR presents a revised target for 2020 (362 points), which is 38.64% lower than that in the NPF but does not provide targets for 2025 and 2030, similarly to the NPF. According to our methodology, the progress between 2016 and 2018 to achieve their objectives in 2030 is considered to be adequate for the vehicles and slow for infrastructure, while the sufficiency index is adequate until 2020.
- **CNG** – Malta did not record any CNG vehicles in use in 2018, but the MT NIR provides an estimate of 950 CNG vehicles in 2030 (of which 100 LCVs, 29 HCVs and 58 buses and coaches). This plan for the CNG vehicles is not accompanied by any information about the development of a specific infrastructure for refuelling.
- **LNG** – Similarly to CNG, no LNG vehicle was recorded in Malta in 2018. For 2030, there are 22 HDVs planned in the NIR. Again, no information is available for the LNG refuelling infrastructure.
- **Hydrogen** – The Maltese NIR mentions no concrete objectives or actions for hydrogen.
- **Biofuels** –Malta considers to increase the uptake of biofuels in the regular distribution system, in order to comply with the target set by the current European legislation (e.g. REDII commitments).
- **LPG** –Malta recorded 83 LPG vehicles on the road and 6 LPG refuelling points in 2018. In the MT NIR there is an estimate of 100 vehicles from 2020 until 2030, while the infrastructure is planned to grow up to 9 refuelling points in 2020, while after that year targets are missing.

Rail transport

- **Electricity** – No specific information was found in the Maltese NIR.

Waterborne transport (maritime)

- **Electricity** – The Maltese NIR states that *Infrastructure Malta* is expected to provide shore-side electricity supply on all the quays within the TEN-T Core port Grand Harbour (port of Valletta). In phase I, quays for Cruise Liner Ships are targeted by 2025 and the foreseen investment is estimated at 40 million €. In phase II of the project, additional investments should allow electricity supply to other vessels such as RO-RO, etc.
- **LNG** – The Maltese NIR reports outcomes of the study on LNG Bunkering. The market study shows an LNG bunkering potential demand in Malta, which is expected to start from 2025. Before 2025, no demand is expected unless a pilot project takes place. To date, the number of shipping operators that have committed to LNG is very small because emerging technologies such as biofuels, hybrid and batteries are gaining more popularity and are considered as a cleaner alternative to LNG.

Air transport

- **Biofuels and electricity** – Despite MT NIR mentions the participation of Malta to the ICAO/CORSIA initiative, it does not provide any quantitative information on flights/airplanes powered by biofuels. The Maltese NIR does not consider any hybrid-electric or fully-electric airplanes by 2030. The MT NIR reports no immediate plans to invest in infrastructure for electricity supply at its TEN-T Core airport.

As regards the **measures**, the MT NIR shows focus on the development of electro-mobility as electricity is considered as the most promising alternative fuel in short term. Some of the presented measures lack concrete information allowing for a proper assessment. Malta should improve the reporting on this matter.

The Legal measures are mainly dedicated to allowing the development of electro-mobility and are almost all exclusively presented in the NIR. Overall, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR. The level of ambition is considered higher in the NIR compared with the NPF.

Concerning the policy measures, the MT NIR contains measures targeting only road as transport mode and focusing mainly on electricity as alternative fuel. The majority of them are a continuation of measures already presented and in place in the NPF. They cover financial aspects (e.g. purchase / conversion /scrappage subsidies, tax incentives) but also non-financial ones (e.g. car-sharing services, access to restricted lanes).

The AFI deployment measures address the electricity/road and electricity/water-maritime pairs.

As for the Policy and Deployment & Manufacturing support measures, in the NIR compared with the NPF, the level of ambition has increased for two identified clusters (i.e. electricity/road, electricity/water-maritime) and remained the same for the third one (i.e. LPG/road). The most complete and numerous cluster of measures is for the pair electricity/road. The assessment was influenced by the lack of concrete information in the description of some measures.

The expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR is medium for the electricity/road pair, while for the pairs electricity/water-maritime and LPG/road it results to be low.

The Maltese NIR provides information about two main ongoing RTD&D initiatives (participation to international projects) ongoing to support the implementation of hydrogen in transport. It also presents four national studies related to electricity, CNG and LNG, which were conducted to facilitate decisions on the future provision of these respective alternative fuels.

5.18.7 *Final remarks*

The Maltese NIR provides a relatively comprehensive report on the efforts to implement the Directive, but does not provide information on the target for electric vehicles' recharging points in 2025 and 2030, nor for CNG refuelling points for vehicles and LNG refuelling points for vehicles and vessels in 2020, 2025 and 2030. A significant number of the measures included in the Maltese's NIR aim at promoting electro-mobility in road transport, in public transport and, to a lower extent, in maritime transport.

With regard to electricity, the NIR estimates that 47,488 electric vehicles could be on the road by 2030, representing about 15% of the fleet by that time. Taking into account the current situation and expected trends, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. Nevertheless, the NIR does not indicate estimates for electric recharging infrastructure by 2025 and 2030. Malta should update its planning and reporting on this matter. No information on charging efficiency is provided. Further, no specific information is given on the electrification of waterborne and air transport. However, the NIR indicates that Malta will undertake the necessary investment to provide shore-side electricity supply on all quays within the TEN-T Core Network used for cruise liner ships.

The Maltese NIR does not report any information on existing or future HFCV and the relevant infrastructure.

Regarding natural gas for transport, the NIR does not report information on the development of CNG and LNG infrastructures for road and maritime transport. Only small fleets of 950 CNG vehicles and 22 LNG vehicles are estimated by 2030. There are no plans to use LNG in the maritime sector before 2025, as the current interest in LNG among shipping operators is noted to be limited.

Concerning LPG, the NIR shows that Malta had a small fleet of 83 LPG vehicles and six LPG refuelling stations by 2018. It estimates around 100 LPG vehicles by 2020, 2025 and 2030 as well as nine LPG refuelling stations at the end of 2020.

Malta should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.18.8 *ANNEX - Description of the Member State*

On a surface area of 300 km², Malta has a population of 476,000 people in 2018, which makes up for a population density of 1,587 inhabitants/km².

Number of main urban agglomerations

- 1 urban agglomeration > 50,000 inhabitants

In 2018, Malta achieves a per capita gross domestic product at market prices of €25,490, which represents a per capita gross domestic product in purchasing power standards of 98 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Malta is 20 km. The total road network length is 2,855.

The following lengths of the TEN-T Road Corridors are present in Malta: 0.3% (20 km) of the Scandinavian - Mediterranean Corridor.

Number of registered road vehicles

At the end of 2018, Malta accounts for 375,634 registered road vehicles of which 300,140 are categorized as passenger cars, 36,571 as light goods vehicles, 12,223 as heavy goods vehicles and 2,100 as buses and coaches. The motorisation rate is 631 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 2 maritime ports in the TEN-T Core Network (Marsaxlokk, Valletta)
- 2 maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Valletta-Malta Luqa)
- No airports in the TEN-T Comprehensive Network

EUROPEAN
COMMISSION

Brussels, 16.2.2022
SWD(2022) 33 final

PART 4/4

COMMISSION STAFF WORKING DOCUMENT

Updated detailed Assessment of the Member States Implementation Reports on the National Policy Frameworks for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure. Implementation of Art 10 (3) of Directive 2014/94/EU

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5.19 Netherlands (NL)

5.19.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Dutch NPF the Commission concluded:

The Dutch NPF fully addresses the requirements of Article 3, except for the definition of future targets for CNG refuelling points. It contains an extensive discussion of the current state and future scenarios for alternative fuels in the transport sector. For all fuels and modes, it establishes targets as required by Article 3 of the Directive, except for CNG refuelling points.

The Dutch NPF puts a lot of emphasis on electric vehicles, although the future estimated share of 1.5% EV seems low in comparison to the current share of EVs on the road, which is already above 1%. The Netherlands already today has a considerable number of recharging points. Their spatial distribution and especially the increasing number of high power recharging points along main roads seems to appropriately cover the needs of electric vehicles in terms of distance requirements. The ratio of one public recharging point per 8 electric vehicles estimated for 2020 indicates that the Netherlands has defined appropriate targets for recharging infrastructure in line with the requirements of the Directive. No targets are foreseen for increasing the availability of electricity supply for stationary airplanes. The Dutch NPF contains targets for further increasing shore-side electricity in its ports.

The same is true for CNG refuelling points. However, the Dutch NPF considers CNG is likely to have a limited market share and does not foresee an increase in CNG refuelling infrastructure. It does not commit to keep the current level of CNG refuelling infrastructure.

Targets for LNG refuelling for vessels and heavy-duty trucks are defined in the NPF. Dual LNG refuelling points for waterborne and road transport is the preferred option. If the planned LNG bunkering points in the Dutch ports were realised, this would guarantee that the requirement for LNG refuelling points on the maritime and inland ports of the TEN-T Core Network would be fulfilled in the Netherlands. The same is true for the targeted LNG refuelling points for heavy-duty trucks.

The Dutch NPF displays a strong commitment towards hydrogen. The deployment of 20 publicly accessible hydrogen refuelling points is planned by 2020.

The Dutch NPF contains a well-balanced portfolio of measures, mostly based on Administrative Agreements and public private cooperation. These instruments, coupled with fiscal incentives, have proven to be effective for the deployment of electric vehicles and the related recharging infrastructure. They are comprehensive and seem to have a high impact on fostering deployment. Hence, similar measures proposed for other AF can be considered having at least a medium impact on market actor's decisions. Most of the measures are already in effect, and have an average duration of four years, so that continuity through that period is assured, increasing the likelihood that targets and objectives of the NPF can be reached.

The consideration of the interests of regional and local authorities, as well as stakeholders is part of the Dutch policy, e.g. put into practice via the "Green Deals", and can be considered exemplary.

The Netherlands is actively involved in coordinating its plans on alternative fuels infrastructure with other Member States as well as collaborating with them in this field.

5.19.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.19.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne, air / All		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne, air / All but LPG		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, waterborne / Electricity, CNG, LNG, Hydrogen		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Not explicitly mentioned / CNG, LNG, Hydrogen		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.	Road, waterborne / Electricity, hydrogen		Yes
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, waterborne / Electricity, hydrogen, biofuels		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	All / Electricity, LNG, hydrogen		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, waterborne, air / All		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, waterborne, air / Electricity, CNG, LNG, Hydrogen		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	Yes
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / Electricity, CNG, LNG, Hydrogen		Yes

The checklist shows that all the requirements of Annex I from the Directive have been covered in the NL NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is partially covered for all modes; CNG, LNG, hydrogen and LPG are partially covered for road transport, LNG also for waterborne transport, while all the other combinations are either absent or not applicable.

The Dutch NIR reports 58 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify eight AF/transport mode clusters of measures, of which five were assessable.

5.19.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.19.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	48,697 BEV 97,750 PHEV	38,977	63,936 BEV	50,000	741,058 BEV	NA	1,453,300 BEV	NA
	Change NIR vs NPF [%]				180.21%				
	Attainment [%]			70.35%	77.95%	6.07%		3.09%	
CNG / road	NIR	7,870	150	NA	170	NA	170	NA	170
	Change NIR vs NPF [%]				17.24%				
	Attainment [%]				88.24%		88.24%		88.24%
LNG / road	NIR	457	27	600	NA	2,925	30	5,250	NA
	Change NIR vs NPF [%]						7.14%		
	Attainment [%]			76.17%		15.62%	90.00%	8.70%	
LNG / water (maritime)	NIR	11	1	11	NA	30	4	48	NA
	Change NIR vs NPF [%]						-33.33%		
	Attainment [%]			100.00%		37.29%	25.00%	22.92%	
LNG / water (inland)	NIR	7	6	11	7	86	NA	160	13
	Change NIR vs NPF [%]			-72.50%					0.00%
	Attainment [%]			63.64%	85.71%	8.19%		4.38%	46.15%
Shore-side electricity supply / water (maritime)	NIR		4*		NA		10**		NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]								
Shore-side electricity supply / water (inland)	NIR		280**		NA		NA		75*
	Change NIR vs NPF [%]								
	Attainment [%]								
Electricity supply / air (stationary airplanes)	NIR		73		73		NA		NA
	Change NIR vs NPF [%]				8.96%				
	Attainment [%]				100.00%				
H2 / road	NIR	69	8***	2,203	20***	33,875	50***	189,400	NA
	Change NIR vs NPF [%]			3.92%					
	Attainment [%]			3.13%	40.00%	0.20%	16.00%	0.04%	
LPG / road	NIR	154,448	1,351	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Number of ports with at least one SSE supply point; ** Number of SSE supply points; ***Public and private hydrogen refuelling stations

5.19.3.1 Road transport

5.19.3.1.1 Electricity

Vehicles

The Netherlands recorded a total of 146,447 EVs in 2018 (in Table 5.19.3-1 they are indicated separately as BEV and PHEV because the estimates for the next decade are only BEV), of which the majority were passenger cars (44,977 BEV and 97,750 PHEV), followed by 3,194 BEV light commercial vehicles, 118 BEV heavy commercial vehicles and 408 BEV buses and coaches. In addition, the number of electric powered two wheelers in 2018 was 49,029. The NIR affirms that the number of BEV cars has almost doubled annually in the recent years while the number of PHEV has decreased by over 2% per year.

The NL NIR's estimates for the number of electric vehicles are based on the Dutch *Climate Agreement's* targets for mobility. It is expected to reach around 1.5 million zero-emission vehicles (with an assumed proportion of 90% BEV and 10% FCEV) by 2030. It is especially remarkable the ambition of selling only zero-emission passenger cars in the Netherlands by then. Hence, the NIR does not provide estimates for the number of PHEV, while the estimates for BEV vehicles are 63,936 (50,000 cars, 13,000 LCVs, 120 HCVs and 816 buses and coaches) in 2020; 741,058 (700,000 cars, 37,000 LCVs, 2,000 HCVs and 2,058 buses and coaches) in 2025 and 1,453,000 (1,350,000 cars, 85,000 LCVs, 15,000 HCVs and 3,300 buses and coaches) in 2030. These estimates represent a confirmation of the NPF for 2020 and reflects a high policy ambition for 2025 and 2030 (no estimates were provided in the NPF for 2025 and 2030).

The 2018 ***attainment*** of future BEV estimates is 70.35% for 2020 and 3.09% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged BEV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for BEV fleet evolution planned by Netherlands is equal to 41%.

Infrastructure

The Netherlands recorded 38,977 publicly[1] accessible recharging points in 2018 (Table 5.19.3-1), of which 35,502 were normal charging points and 3,475 high-power charging points. The NIR mentions that the number of recharging points for road transport is rising rapidly and has doubled in the period 2016-2019. The Netherlands had only provided a target for 2020 in its NPF, which was already achieved before 2018 and the NIR provides a revised target (50,000) that is 180.21% higher than the one in the NPF. The Dutch NIR indicates that although there are not hard targets for the number of recharging points in 2030, the *National Agenda for Charging Infrastructure* considers a number of 1.7 million. On this basis, the NIR presents now

[1] The Dutch NIR notes that differentiation between public and semi-public charging infrastructure is not possible (e.g. Tesla superchargers with limited availability).

targets for recharging points (public/semi-public and private) which are 925,500 in 2025 and 1,826,000 in 2030, however it declares that there are not accurate data regarding the share of private recharging points and thus information to derive the expected number of public recharging points in 2025 and 2030 is not available.

For this reason, the 2018 ***attainment*** of future public recharging infrastructure targets could be computed only for 2020 and is 77.95%. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Netherlands is equal to 17%.

Ratio

Based on the NL NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that in 2020 the foreseen sufficiency index is 3.16, which is regarded as adequate. Because the NIR does not clearly distinct publicly accessible recharging points, the sufficiency index cannot be calculated for 2025 and 2030.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**Electricity**	4.27	3.63	3.76	3.16		

Information on charging efficiency

The NL NIR states that the Dutch public authorities do not use a fixed methodology to determine the charging efficiency of high power (>22kW) recharging points, although the developments concerning the network of fast recharging points will be monitored. The *National Agenda for Charging Infrastructure* contains the assumption that recharging using fast-chargers accounts for 15% of the total energy demand. Consideration on future actions and most suitable locations will be provided in the *National Charging infrastructure Action Plan*.

5.19.3.1.2 CNG

Vehicles

The total number of CNG vehicles recorded by the Netherlands in 2018 was 7,870 (Table 5.19.3-1), of which 4,055 (51.52%) were passenger cars, 2,507 (31.86%) LCVs, 630 (8.01%) HCVs and 678 (8.61%) buses and coaches. The Dutch NPF did not contain any estimate for CNG vehicles in 2020, 2025 and 2030 and, likewise, no estimates are provided in the NIR. For this reason the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Netherlands recorded 150 CNG publicly accessible refuelling points in 2018, see Table 5.19.3-1. The NPF had only provided a target of 145 public refuelling points for 2020. Instead the NL NIR presents a revised target for 2020 (170 points), which is 17.24% higher than the NPF, and states that for CNG the aim is to maintain the network of public refuelling stations, hence the target for 2025 and 2030 remains at 170 refuelling points.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is constant and equal to 88.24% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Netherlands is equal to 1%.

Ratio

Based on the NL NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. Due to the lack of data, the sufficiency index could be calculated only for 2018, resulting well below the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	CNG			52.47			

5.19.3.1.3 LNG

Vehicles

The Netherlands recorded a fleet of 457 LNG vehicles in use in 2018, composed entirely by heavy commercial vehicles (Table 5.19.3-1). The NIR recognises that LNG has not taken off as hoped for years ago, although the fleet is growing by around 100 vehicles per year. The Dutch NPF did not contain any estimate for LNG vehicles. The NIR estimates for the number of LNG vehicles is 600 in 2020, 2,925 in 2025 and 5,250 in 2030, presumably all heavy-duty vehicles. This is showing an increased ambition.

The 2018 ***attainment*** of future LNG vehicles estimates is 76.17% for 2020 and 8.70% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands from 2016 until 2018 for LNG vehicles deployment is 8.70% of the overall planned deployment during the period 2016-2030.

Infrastructure

Table 5.19.3-1 shows that in 2018 there were already 27 publicly accessible LNG refuelling points in the Netherlands. The NL NIR declares that the aim is to have a network of LNG refuelling points where there is demand. The Dutch NPF had only provided a target for 2025. The NIR presents now a revised target of 30 LNG refuelling points in 2025, which is 7.14% higher than in the NPF.

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 90% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands could not be computed because the 2030 target is not provided.

Ratio

Based on the NL NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LNG	18.42*		16.93		97.50	

* Value calculated from NL NPF.

5.19.3.1.4 Hydrogen

Vehicles

The NL NIR indicates that there were 69 hydrogen-powered vehicles (50 passenger cars, 10 LCVs, 1 HCV and 6 buses) in the Netherlands in 2018. The NIR notes that the number of hydrogen vehicles is still very low but rising, expecting a growth from 2025. As mentioned for electric vehicles, estimates for hydrogen vehicles are based on the Dutch *Climate Agreement's* targets for zero-emission vehicles in 2030. The NIR estimates are 2,203 vehicles (1,750 cars, 400 LCVs, 3 HCVs and 50 buses and coaches) in 2020; 33,875 (15,000 cars, 15,000 LCVs, 3,000 HCVs and 875 buses and coaches) in 2025 and 189,400 (150,000 cars, 30,000 LCVs, 7,700 HCVs and 1,700 buses and coaches) in 2030. The NL NPF had only provided an estimate of 2,000 hydrogen vehicles in 2020, compared to which the NIR estimate is 3.92% higher. The estimates for 2025 and 2030 show a high ambition.

The 2018 ***attainment*** of future hydrogen vehicles estimates is 3.13% for 2020 and 0.04% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands from 2016 until 2018 for hydrogen vehicles deployment is 0.02% of the overall planned deployment during the period 2016-2030.

Infrastructure

Table 5.19.3-1 shows that in 2018 there were 15 hydrogen refuelling points in the Netherland, of which 7 publicly accessible, located in 4 public refuelling stations, and the other 8 in 4 private stations. The NIR indicates that there are 6 hydrogen refuelling stations in construction and another 12 under planning. It has to be pointed out that the NL NIR (similarly to the NPF) is not very clear concerning the number of hydrogen refuelling points versus the number of refuelling stations and concerning the share of publicly accessible stations.

The NL NPF had provided a target of 20 publicly accessible refuelling points for 2020. The NIR states that the objective is to increase the number of hydrogen refuelling stations to 20 in 2020 and that *the Dutch Climate Agreement* aim is to reach 50 stations by the end of 2025. This is showing an increase in ambition, however it is not possible for the assessors to deduct if the entire infrastructure would be publicly available.

The 2018 ***attainment*** of future public and private hydrogen refuelling stations targets is 40% for 2020 and 16% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands could not be computed because the 2030 target is not provided.

Ratio

Based on the NL NIR, the following table shows the ratio between vehicles and total (both public and private) refuelling stations for the pair hydrogen/road until 2025. This is not exactly the definition of sufficiency index (which is related to the public refuelling points), however the numbers reported in the table represent a conservative estimate, as the number of refuelling points has to be equal or bigger that the number of refuelling stations.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**H2**		58.00	8.63	110.15	677.50	

5.19.3.1.5 Biofuels

Vehicles

Information in not available in the Dutch NIR.

Infrastructure

The NL NIR indicates that the European Fuel Quality Directive and the European Renewable Energy Directive govern the use of biofuels in the Netherlands. Provision has been made in the Dutch legislation for the blending obligation since 2007. The proportion of renewable fuels has increased to 4% for petrol and 11% for diesel in the recent years.

5.19.3.1.6 LPG

Vehicles

The Netherlands had a fleet of 154,448 LPG vehicles in use in 2018 (see Table 5.19.3-1), of which 132,956 were passenger cars, 20,753 LCVs, 730 HCVs and 9 buses and coaches. The Dutch NIR notes that the popularity of LPG has been declining in the recent years, with a decrease in the number of LPG vehicles. The NIR does not contain any estimates for the next decade. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Table 5.19.3-1 shows that in 2018 there were 1,351 LPG publicly accessible refuelling points in the Netherlands. This, according to the NIR, represents a broad nationwide network. The NIR indicates that the number of stations accessible to the public is decreasing although it does not provide any information on the situation in 2016 and 2017. According to EAFO, there were 1,650 LPG refuelling points in 2016. The NPF had not provided targets for LPG refuelling points and likewise the NIR does not contain any targets. For this reason, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the NL NIR and EAFO, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road, which could be calculated only for 2016 and 2018.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LPG**	105.86*		114.32			

* AFI value taken from EAFO

5.19.3.2 Rail transport

5.19.3.2.1 Hydrogen

Vehicles

The Dutch NIR contains the estimate of one hydrogen locomotive in 2020.

Infrastructure

Information is not available in the Dutch NIR.

5.19.3.3 Waterborne transport (maritime)

5.19.3.3.1 Electricity

Vessels

The Dutch NIR indicates that, as agreed in the *Green deal for shipping, inland shipping and harbours*, the ambition is to realize at least one zero-emission seagoing vessel in 2030, either battery-electric or hydrogen-electric. Since it is unclear which the solution will be, the NIR has allocated this ambition to battery electric. Thus, while the NL NPF had not considered estimates for electric seagoing ships and ferries, the revised NIR estimate is one vessel in 2030.

Infrastructure

Table 5.19.3-1 shows that in 2018 the Netherlands had four (high-voltage) shore-side electricity supply points for ships and ferries in the ports of Den Helder (defence), Ijmuiden (fishing trawlers), Hook of Holland (ferries) and Scheveningen (trawlers and government shipping). The NIR indicates that in 2019 a mobile shore-side installation was opened in Rotterdam; that in Amsterdam cruise ships will be connected to shore-side electricity in the near future, and that plans are well advanced to establish shore-side electricity at the large wharf on the Rotterdam's Calandkanaal. The Dutch NIR target for the number of shore-side electricity supply points for maritime vessels in 2025 is 10, thus confirming the NPF targets for 2025 (and 2030).

The 2018 ***attainment*** of shore-side electricity supply points in maritime ports is 40% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands could not be computed because the 2030 target is not provided.

5.19.3.3.2 LNG

Vessels

In 2018, the Netherlands had 11 LNG seagoing vessels. The Dutch NIR declares that the fleet of seagoing ships powered by LNG is growing slowly but steadily. The NL NPF had not provided estimates for the number of LNG seagoing ships, whereas the NIR estimates are 11 ships in 2020, 30 in 2025 and 48 in 2030 (Table 5.19.3-1). This indicates an increase in ambition, aimed to achieve a CO_2 reduction by 2030 in line with the IMO goals.

The 2018 ***attainment*** of future LNG seagoing ships and ferries estimates is 100% for 2020 and 22.92% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands could not be computed because the 2016 value is not provided.

Infrastructure

The NL NIR indicates that one LNG bunkering vessel, commissioned in 2018, is serving the ports of Amsterdam and Rotterdam. One bunkering pontoon can be deployed flexibly to serve both seagoing ships and inland waterway vessels in Amsterdam and Rotterdam and a second pontoon is ordered. The Dutch NPF had provided a target of six LNG refuelling points for seagoing vessels in 2025, now the NIR presents a revised target of four refuelling points, which is 33.33% lower than the NPF.

The 2018 ***attainment*** for LNG supply points to seagoing ships and ferries is 25% for 2025. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands could not be computed because the 2030 target is not provided.

5.19.3.4 Waterborne transport (inland)

5.19.3.4.1 Electricity

Vessels

In 2018 there were no fully electric inland waterway vessels in the Netherlands. While the Dutch NPF had not provided estimates of electric inland waterway vessels, the NL NIR presents now an ambitious plan: the *Climate Agreement* is aiming for a minimum of 150 zero-emission inland waterway vessels by 2030 (it is not defined which proportion of these vessels will be battery-electric or fuel cell). The NIR assumption is that 66% of the inland waterway vessels will be battery electric and hence estimates for electric vessels are 2 for 2020, 30 for 2025 and 100 for 2030.

Infrastructure

The NL NIR states that shore-side electricity supply is available in almost all major inland waterway ports in the Netherlands. In 2018, more than 280 points have been recorded. The Dutch NPF target was to have shore-side electricity supply in 75 inland ports by 2025, but the total number of shore-side electricity supply points was not specified. The NIR indicates that there is not a specific target for shore-side electricity supply points in inland ports but shifts the target of covering 75 ports to 2030.

Due to data inconsistency, the 2018 ***attainment*** and ***progress*** of shore-side electricity supply deployment in maritime ports cannot be calculated.

5.19.3.4.2 LNG/CNG

Vessels

In 2018 there were seven LNG inland waterway vessels in the Netherlands. In addition the NL NIR indicates that in 2017 the first CNG inland waterway ferry of Europe was commissioned. The Dutch NIR specifies that inland waterway vessels use LNG as fuel on a very limit scale and that LNG is regarded as a transitional fuel towards zero emission, hence the trend in the use of LNG for inland waterborne in uncertain. The NPF had provided an estimate of 40 LNG inland waterway vessels in 2020, whereas the NIR provides a revised estimate 72.5% lower than the NPF (11 vessels) and new targets for 2025 and 2030 which are, respectively, 86 and 160 inland waterway vessels (Table 5.19.3-1).

The 2018 ***attainment*** of future LNG vessels estimates is 63.64% for 2020 and 4.38% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands from 2016 until 2018 for LNG vessels deployment in the inland ports is 1.29% of the overall planned deployment during the period 2016-2030.

Infrastructure

The Dutch NIR indicates that in 2018 there were six inland port locations where LNG could be bunkered (Table 5.19.3-1). The NL NPF had only provided a target for 2030 (13 LNG bunkering points for inland waterborne transport). The NL NIR presents a target of seven bunkering points (six mobile and one fix) in 2020 and confirms the NPF target of 13 in 2030 (six fix and seven mobile).

The 2018 ***attainment*** for LNG supply points in the inland ports is 85.71% 2020 and 46.15% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands from 2016 until 2018 for the deployment of LNG refuelling infrastructure in the inland ports is 12.50% of the overall planned deployment during the period 2016-2030.

5.19.3.4.3 Hydrogen

Vessels

As mentioned earlier, the *Climate Agreement* is aiming for a minimum of 150 zero-emission inland waterway vessels by 2030. The NIR presents estimates for hydrogen inland ships based on the assumption that 34% of the inland waterway vessels will be fuel cell powered (the remaining 63% being battery-electric vessels) and hence estimates are of 15 hydrogen vessels for 2025 and 50 for 2030.

Infrastructure

The Dutch NIR does not provide any further information on infrastructure for refuelling inland waterway vessels.

5.19.3.5 Air transport

5.19.3.5.1 Electricity

Airplanes

The NL NIR indicates that, in line with the CO_2 emission targets agreed with the ICAO, the *draft Agreement on Sustainable Aviation* contains the objective that all NL domestic flights will be zero-emission in 2050.

Infrastructure (for stationary airplanes)

According to the Dutch NIR, in 2018, there were 73 aircraft stands at the main airport in the Netherlands (Schiphol) equipped with fixed installations for electrical ground power and pre-conditioned air units. The target provided in the NPF for electric supply for stationary airplanes in 2020 is already attained. The NPF had not provided targets for 2025 and 2030. Likewise the NL NIR does not provide any specific target for the future number of power supply points for stationary aircraft in the Dutch Airports.

The NIR mentions the ambition in the Dutch *Climate Agreement* that all ground-related activities at the Dutch airports should be zero-emission from 2030.

The 2018 ***attainment*** for electricity supply for stationary airplanes is 100% for 2020. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Netherlands could not be computed because the 2030 target is not provided.

5.19.3.5.2 Biofuels

Airplanes

Information is not available in the NL NIR.

Infrastructure

The Dutch NIR declares that, in principle, there is infrastructure at the main airport in the Netherlands (Schiphol) that could be used for the delivery of renewable fuels. However, the current use of renewable jet fuels is limited and the target for 2030 is 4 Petajoule (PJ), about 2% of the total use. At present, the scale-up of biofuels use is not yet viable.

Moreover, the NIR mentions that according to the Dutch Cabinet, bio-kerosene is seen as the most promising way of flying. The Cabinet wishes to promote developments in the field of sustainable alternative fuels where possible. In this respect, the Ministry of Infrastructure and Environment commissioned in 2017 a research on the possibilities of stimulating the demand for bio-kerosene and the effects on aviation and the economy.

5.19.4 ***Measures assessment***

The Dutch Implementation Report contains a well-balanced portfolio of measures that, as described in the NPF, is based on administrative agreements and public-private cooperation as well as on fiscal incentives. The main driver for the measures presented in the NL NIR are the Dutch *Climate Act* and the *Climate Agreement,* which are setting out ambitious goals for the Netherlands such as the aim for reaching 1.5 million zero-emission vehicles by 2030 and the ambition of selling only zero-emission passenger cars in the Netherlands by then. Accordingly, a significant number of measures in the NIR are oriented to foster deployment of both electric and hydrogen vehicles and the respective recharging and refuelling infrastructure.

5.19.4.1 Legal measures

The Dutch NIR contains 20 legal measures, which represent an increase compared to the 15 measures identified in the NPF. Legal measures are implemented at national level and all the legal measures described in the NIR are existing or adopted. Some of these measures, as the *Green Deals*, are agreements between the Dutch Government and the different sectors, companies and lower level of government (provinces and municipalities) to achieve the national goals and have a duration of around four years.

Considering all the legal measures together, they appear to be designed as the necessary tools to allow the realisation of the AFV/AFI plans as presented in the NPF and revised in the NIR. On the basis of the available information, it can be considered that the level of ambition of the legal measures has increased in the NIR, compared to the NPF, for electricity and hydrogen for road and electricity for air transport.

5.19.4.1.1 Legislative & Regulatory

Of all the legal measures described in the Dutch NIR, 16 can be categorised as legislative and regulatory measures. Three measures are applicable to several transport modes, 10 measures are dedicated to road transport, two to waterborne, while one is addressing airborne transport. The following can be highlighted:

- The partnerships among municipalities and metropolitan regions, as the *Amsterdam Metropolitan Area Electric MRA-E*, to streamline installation of recharging points using only one permit for several potential locations or by providing legal advice for infrastructure on private properties.
- The *Green Deal Autodelen II* (car sharing), which is ensuring the roll-out of 100,000 zero-emission electric or fuel cell shared cars in the period 2018-2021.
- The publication of the *Hazardous Substances Factsheet 35 – PGS 35* on hydrogen installations for the delivery of hydrogen to vehicles and equipment and the working group to establish uniform permits for hydrogen refuelling stations and assist public authorities and businesses in granting permits.
- The *Green Deal on Maritime, Inland Shipping and Ports*, established in 2019, involving all relevant stakeholders to make more sustainable maritime and inland shipping and their ports. It aims to achieve reductions in carbon emissions and pollutants by deploying zero-emissions inland ships and at least one seagoing vessel, and ultimately achieving a climate-neutral maritime shipping as soon as possible after 2050.
- The 2019 *Draft Agreement on Sustainable Aviation*, with the objective of reducing CO_2 emissions from aviation to 2005 level by 2030; to 50% less than in 2005 by 2050 and achieving zero emissions by 2070. Notably it contains the ambition of all domestic aviation no longer emitting CO_2 by 2050.

5.19.4.1.2 Administrative

Four legal measures described in the Dutch NIR can be categorised as administrative measures. One measure is applicable to all transport modes and three measures are specific for road transport. The most relevant are:

The *BREEAM certification scheme* for sustainable buildings, in which points are awarded for the installation of recharging points and solar panels to achieve the quality mark.

The *Lean and Green Personal Mobility*, that encourages and facilitates organisations to raise their sustainability level by taking efficient measures in the field of the mobility of their employees and operational activities. This includes the use of greener or zero-emission transport.

5.19.4.2 Policy measures

The Dutch NIR contains 23 policy measures, which represents an increase compared to the 12 policy measures identified in the NPF. Five of the policy measures described in the NIR refer to both road and waterborne transport, 16 only to road and two refer only to waterborne transport. The Dutch Government has put in place a significant number of direct incentives to foster the deployment of alternative fuel vehicles and related infrastructure. The majority of them are of financial nature, applicable at national level and complemented with public procurement initiatives at regional and local level. Approximately one third of the policy measures are targeting zero-emission transport, in particular electro-mobility. The measures reported in the NIR are existing, with three of them entering into force in 2020. Some measures, such as subsidies, are intended for several alternative fuels, but are applied in practice for only one fuel.

5.19.4.2.1 Measures to ensure national targets and objectives

Of all the policy measures described in the NIR, 21 can be considered as measures to ensure national targets and objectives. The large majority of these measures are of a financial nature.

Road transport

There is a significant number of direct incentives in the Netherlands, which are supporting the deployment of alternative infrastructure and the use of alternative fuel vehicles for road transport. The following could be highlighted:

- The *Autobrief II*, setting the fiscal arrangements, in place since 2017 and prolonged to 2025. It contains incentives to promote zero-emission vehicles by providing exemption from registration tax, reduced income tax liability for business users and exemption from annual vehicle tax. In addition, the 50% reduced rate in the annual vehicle tax for vehicles emitting between 0 and 51 g CO_2/km will be extended up until 2024. In 2025, a 25% reduced rate applies.
- Exemption from excise duty on hydrogen, favourable tax rate for CNG and temporarily refund of excise duty for LNG fuel (for 2020 and 2021, this has been converted into a subsidy scheme with a discount per 1000 kg of LNG sold). Tax rate for electricity is halved in public recharging points; sot that charging station operators will temporarily have to pay less tax for each kWh supplied thus improving the business case for a public charging station. In addition, the excise duty on diesel will be increased by 0.01 €/l in 2021 and 2023.
- The *Environmental Investment Deduction Allowance, MIA/VAMIL*, providing additional tax deduction on taxes on profits. It applies for investments in environmentally vehicles (for example for all zero-emission cars and vans) and charging infrastructure. MIA can be applied by businesses and for private recharging points for lease cars. This amounts to up to 36% of the investment, which can be deducted from corporate income tax.

Regarding public procurement, the following can be highlighted:

- The Dutch Government’s commitment to renew its vehicle fleet, aiming to have 20% to 25% electric vehicles by 2020.
- Provinces, municipalities or metropolitan regions use of joint procurement for the installation of recharging points. Under large-scale procurement, the recharging point operator pays for the right of use. In this way, public authorities and market participants both invest in public charging infrastructure. This holds out the prospect that the public authorities will need to invest less as the market for electric vehicles grows.

There are also measures at local level, for example, purchase subsidies for electric cars have been introduced in Amsterdam, Den Haag, Rotterdam and Utrecht municipalities, for both private individuals and companies. In addition, various provinces and municipalities have established a purchase subsidy for CNG cars. Moreover, non-financial incentives are applied in the Netherlands, notably at local level. For example, electric cars have priority for obtaining a parking permit in Amsterdam and municipalities have a growing number of parking spaces with recharging points where only electric cars may park.

Waterborne transport

In addition to the *Environmental Investment Deduction Allowance, MIA/VAMIL*, the Dutch NIR mentions that the Port Authority in Rotterdam and Amsterdam provide discounts on inland harbour dues or sea harbour dues for vessels using alternative fuels (such as LNG), but does not provide further details. In addition, some municipalities have made it mandatory for inland vessels to use shore-side electricity at berths.

5.19.4.2.2 Measures that can promote AFI in public transport services

The Dutch NIR contains two agreements that can be considered as measures to promote alternative fuels use and infrastructure in public transport, namely:

- The *Administrative Agreement on Zero-Emission Regional Public Transport*, with the aim that all public transport concessions must have the best possible score for well-to-wheel CO_2 emissions per passenger/kilometre. It is also agreed that, from 2025 all public transport concessions will be zero-emission.
- The *Administrative Agreement on Zero Emission for Target Groups Transport* (special transport services for people unable to travel independently). Signed on 31 May 2018 by 32 municipalities and the Ministry of Infrastructure and Water Management. The parties involved agreed that the target group transport they provide will be completely zero-emission from 2025.

5.19.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Information is not available in the Dutch NIR.

5.19.4.3 Deployment and manufacturing support

5.19.4.3.1 AFI deployment

The Dutch NIR contains nine deployment support measures for AFI at national level, which compared to the four measures identified in the NPF, represents an increase in ambition. All these measures are existing. Three AFI deployment support measures refer to a combination of transport modes while six measures are targeting road transport. Four of them regard recharging infrastructure, three are related to hydrogen and two to LNG refuelling points.

The NIR mentions that in the Dutch approach, consisting on green deals, covenants and partnerships with stakeholders and regional and local authorities, a large share of co-financing comes from other parties than the Central Government. For example, public recharging points are being deployed as part of the *Green Deal for Zero Emission in Urban Logistics*, and the

Green Deal Publicly Accessible Electric Charging Infrastructure adds to the Government financial contribution to support municipalities in installing public recharging points.

In addition, the NL NIR mentions several European co-funded programmes that are used for AFI deployment as the BENEFIC Action, Connect2LNG and INTERREG NWE, the FCH JU and TEN-T CEF for hydrogen.

5.19.4.3.2 Support of manufacturing plants for AF technologies

The Dutch NIR indicates that government support for manufacturing plants for AF technologies is not available on large scale. The Top Sector Energy distributes the main subsidies regarding manufacturing of alternative fuels through network of business, knowledge institutions and public authorities. For example, since 2017 innovative projects are supported for manufacturing of renewable gases and climate-neutral hydrogen.

For hydrogen production, support is available via the *Demonstration scheme for climate technologies and innovation in transport (DKTI)* in the form of co-financing for infrastructure with local energy production.

5.19.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

The Dutch NIR mentions the following needs to be considered during deployment of alternative fuel infrastructure:

- For electricity recharging points for road transport, the process from application to materialisation is long. Municipalities are examining how this can be expedited, for example granting a single permit that authorises the installation of recharging points in specific locations in a town.
- With the increasing number of recharging points and with higher power, timely investment in reinforcement of grid connections is important.
- For shore-side electricity for vessels in maritime ports, the high costs of shore-side electricity supply points requires attention. On the one hand, good financing is essential and requires cooperation of banks, ports and electricity suppliers. On the other hand, the costs for the use of shore-side electricity must be more financially attractive than the use of other fuels. This is not currently the case; tax is imposed to electricity while marine fuels are not subjected to tax.
- Hydrogen infrastructure is expensive. Good financing is important at initial stage and it is also important to ensure a fleet that will use the infrastructure. Without users, there is no business case. The first group of buyers can be sought in public transport vehicles. It is also important that local authorities issuing permits become familiar with hydrogen refuelling stations.

5.19.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.19.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, eight clusters of measures are identified, of which five were assessable, for the pairs electricity/road, electricity/water (inland), CNG/road, LNG/road and hydrogen/road. The clusters for the pairs LNG/water and electricity/water (maritime) were not sufficiently detailed for an assessment.

Four out of the five assessable clusters score medium; only the cluster electricity/road scores high. Most of the measures are in effect, and have an average duration of four years, so that continuity through that period is assured. The clusters for the pairs electricity/road, LNG/road, hydrogen/road and electricity/water-inland can be considered comprehensive. The cluster for the pair CNG/road results not comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road have a high impact, those for the pair CNG/road score low, while all the other three assessable clusters have a medium impact.
As it can be seen in Table 5.19.4-1, compared to the NPF, the level of ambition has increased in the NIR for electricity/road, hydrogen/road and electricity/water while it remains the same for CNG/road and LNG/road.

Table 5.19.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	M	N	**L**	=
LNG	Road	M	C	**M**	=
	Water - maritime	X			
	Water - inland	X			
H2	Road	M	C	**M**	+
Electricity	Water - maritime	X			+
	Water - inland	M	C	**M**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.19.4.5 Research, Technological Development & Demonstration

The Dutch NIR presents six measures for RTD&D and innovation activities, which represent a significant increase compared to the one measure identified in the NPF. National financing and support for RTD&D and innovation projects target mainly electricity and hydrogen. In particular, the NIR highlights:

- The *Demonstration scheme for climate technologies and innovation (DKTI)* in transport energy subsidies for transport solutions with low or zero CO_2 emission (31 million € in 2017/2018). DKTI subsidies are as well provided for co-funding European FCH JU hydrogen projects.
- The *Hydrogen for pilot scheme,* with 1.5 million € budget in 2020 and the subsidy for hydrogen Tender with 2.3 million € in 2018 and 2.2 million € in 2019.

- The *Sustainable Inland Shipping subsidy*, with 1.75 million € budget for 2017-2018, funding for example a project dedicated to develop a electricity and hydrogen fuel cell based propulsion configuration for regional shipping suitable for class type approval. This will be tested and validated in a new Zero-Emission-Laboratory.

On the basis of the available information, it can be considered that, compared to the NPF, the level of ambition in the NIR has increased for RTD&D actions for electricity and hydrogen for the different transport modes.

5.19.5 *Additional information on alternative fuels infrastructure developments*

The Dutch NIR contains information on the changes in fuels use in the transport sector (see Table 5.19.5-1). As it can be noticed, LPG use is foreseen to still increase compared to 2018, remaining the most significant alternative fuel in road transport (however slightly decreasing from 2020 until 2030). Electricity share is rather small (the NIR does not take into account PHEVs), reaching 2.61% in 2030. A decrease of diesel use is expected from 2025 and the increase of the excise duty on diesel in 2021 and 2023 could have an influence in this direction. Natural gas and hydrogen will continue to play a minor role. In addition, synthetic and paraffinic fuels will not vary from the current 1% share.

For inland waterway transport, it is expected that in 2030 part of the diesel fuel will be replaced by 8.87% LNG use, 3.74% electricity and 2.65% hydrogen.

A slight increase in LNG use in maritime transport is noticed from 2018 but marine fuel oil will continue to be the main fuel used in maritime transport, with just a 0.61% of LNG use in 2030.

Table 5.19.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	32.39%	33.73%	33.59%	33.46%	35.16%	35.27%
	Diesel	60.56%	59.28%	57.81%	55.13%	53.71%	52.91%
	Electricity	1.23%	1.40%	1.56%	1.55%	1.76%	2.61%
	CNG	0.41%	0.40%	0.39%	0.58%	0.59%	0.60%
	LNG	0.00%	0.00%	0.00%	0.01%	0.01%	0.04%
	Hydrogen	1.64%	1.40%	1.17%	0.97%	0.78%	0.60%
	LPG	2.75%	2.59%	4.49%	7.35%	7.23%	7.01%
	Synthetic and paraffinic fuels	1.02%	1.00%	0.98%	0.97%	0.98%	1.00%
	Other AF						
	Total Road	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Inland	Diesel	100.03%	100.00%	99.56%	99.01%	94.53%	84.74%
	LNG	0.00%	0.00%	0.44%	0.91%	3.47%	8.87%
	Electricity	0.00%	0.00%	0.00%	0.08%	1.17%	3.74%
	Hydrogen	0.00%	0.00%	0.00%	0.00%	0.83%	2.65%
	Total inland	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Maritime	Fuel oil	83.94%	83.82%	83.82%	83.82%	83.82%	83.82%
	Marine gas oil	14.63%	14.61%	14.90%	14.85%	14.73%	14.44%
	Marine diesel oil	1.43%	1.55%	1.14%	1.14%	1.14%	1.14%
	LNG	0.00%	0.02%	0.14%	0.19%	0.32%	0.61%
	Total maritime	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

5.19.6 *Summary of the assessment*

Tabular overview

Table 5.19.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode						
			Electricity / road	**CNG / road**	**LNG / road**	**LNG / water (maritime)**	**LNG / water (inland)**	**H2 / road**	**LPG / road**
AF Vehicles / Vessels		Past situation (2016)	113,893	5,677	350*	NA	NA	30	174,674
		Situation (2018)	146,447 (BEV + PHEV)	7,870	457	11	7	69	154,448
		Estimate (2030)	1,453,300 (only BEV)	NA	5,250	48	160	189,400	NA
		Future share (2030) [%]	13.96%		2.58%			1.82%	
		Estimate attainment (2018 vs 2030) [%]	3.09%		8.70%	22.92%	4.38%	0.04%	
		Progress (2018)	adequate		8.70%			0.02%	
Publicly accessible AF Infrastructure		Past situation (2016)	26,693	145*	19*	NA	NA	0	1650***
		Situation (2018)	38,977	150	27	1	6	8**	1,351
		Target (2030)	NA	170	NA	NA	13	NA	NA
		Target attainment (2018 vs 2030) [%]		88.24%			46.15%		
		Progress (2018)	fast	slow					
Sufficiency Index		2016	4.27		18.42*				
		2018	3.76	52.47	16.93			8.63	114.32
		2020	3.16					110.15	
		2025			97.50			677.50	
		2030							
Measures	**Legal measures**	Ambition (NIR vs NPF)	+	=	=	=	=	+	
	Policy measures + Deployment & manufacturing support	Score	H	M	M	X	X	M	
		Comprehensiveness	C	N	C			C	
		Impact	H	L	M			M	
		Ambition (NIR vs NPF)	+	=	=			+	
	RTD&D	Ambition (NIR vs NPF)	+					+	

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken or calculated from NL NPF. ** Public and private hydrogen refuelling stations. *** Value taken or calculated from EAFO

The NL NIR considers many combinations of alternative fuels and transport modes, with particular focus on zero emission vehicles (electricity and hydrogen) and, to a lesser extent, LNG. The *National Climate Act* and the *Climate Agreement*, which were issued in 2019 as part of the Dutch National and Energy Climate Plan, influence the Dutch policy for alternative fuel transport. The *Climate Agreement* is setting out ambitious goals for the Netherlands such as the aim for reaching 1.5 million zero emission vehicles by 2030 and the ambition of selling only zero-emission passenger cars in the Netherlands by then. Therefore, Dutch targets for alternative fuels have been adjusted in the NIR compared to the NPF and measures in the NIR are oriented to zero-emission transport.

The NL NIR does not establish infrastructure targets/vehicle estimates for all fuels and modes for each of the years of reference (2020, 2025 and 2030). Specifically no targets are provided for recharging infrastructure in 2025 and 2030, for LNG refuelling points for both road and maritime in 2030 and for hydrogen refuelling points in 2030. Therefore, it cannot be stated that the Dutch NIR covers the whole AFID period (2016-2030). The Dutch NPF had addressed most of the requirements of Article 3 of the Directive and, likewise, the NIR almost fully addresses the requirements of Annex I of the Directive.

The main outcomes of the technical assessment of the Dutch NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Concerning EVs, the Netherlands recorded a total of 146,447 electric vehicles in 2018 (of which 142,727 were passenger cars, 3,194 LCVs, 118 HCVs and 408 buses and coaches). The Dutch NIR estimates for the number of electric vehicles are established considering the Climate Agreement target of 1.5 million zero emission vehicles by 2030. Hence the NIR only provide estimates for BEVs, which are 63,936 in 2020, 741,058 in 2025 and 1,453,000 in 2030. These estimates represent a confirmation of the NPF for 2020 and reflects a remarkable high policy ambition for 2025 and 2030. The Netherlands had only provided a target for 2020 in its NPF, which was already surpassed in 2018 with 38,977 publicly accessible recharging points. The NIR provides a revised target (50,000) that for publicly accessible recharging points is 180.21% higher than the NPF. The 2018 progress results to be adequate for the vehicles and fast for infrastructure, while the sufficiency index remains adequate until 2020.
- **CNG** – the Netherlands recorded a total of 7,820 CNG vehicles in 2018 (of which 4,055 cars, 2,507 LCVs, 630 HCVs and 678 buses and coaches). Neither the NPF nor the NIR provide estimates for the number of vehicles in 2020, 2025 and 2030. The Netherlands counted 150 CNG publicly accessible refuelling points in 2018. The NPF had only provided a target for CNG refuelling infrastructure in 2020. The NL NIR presents a revised target for 2020 (170 points), which is 17.24% higher than the NPF. The NIR states that for CNG the aim is to maintain the network of public refuelling stations and hence the target for 2025 and 2030 remains at 170 refuelling points. The 2018 progress results to be not computable for vehicles and slow for infrastructure.
- **LNG** – the Netherlands recorded 457 LNG vehicles in use in 2018, composed entirely by heavy commercial vehicles. The Dutch NPF did not contain estimates for LNG vehicles; the NIR estimate for LNG vehicles is 600 in 2020, 2,925 in 2025 and 5,250 in 2030, presumably all heavy-duty vehicles. This is showing an increased ambition. In 2018, there were 27 LNG refuelling points in the Netherlands. The Dutch NPF had only provided a target for 2025. The NIR presents now revised targets of 30 LNG refuelling points in 2025, which is 7.14% higher than in the NPF.
- **Hydrogen** - there were 69 hydrogen-powered vehicles (50 passenger cars, 10 LCVs, 1 HCV and 6 buses) in the Netherlands in 2018. The Netherlands had included hydrogen in its NPF and had only provided an estimate for hydrogen vehicles in 2020. The NIR estimates for hydrogen vehicles are 2,203 vehicles in 2020 (3.92% higher than in the NPF); 33,875 in 2025 and 189,400 in 2030. These estimates show an increase of ambition. Concerning hydrogen infrastructure, in 2018 there were 15 refuelling points, of which 7 publicly accessible located in 4 public refuelling stations and the other 8 in 4 private stations. The

NL NPF had provided a target of 20 publicly available refuelling points for 2020. Now the NIR provides targets of 20 (public and private) refuelling stations in 2020 and 50 in 2025.

- **Biofuels** – The Dutch NIR does not contain data or estimates on the number of vehicles running on high concentrations of biofuels.
- **LPG** - The Netherlands had a fleet of 154,448 LPG vehicles in use in 2018 (of which 132,956 were passenger cars, 20,753 LCVs, 730 HCVs and 9 buses and coaches). Neither the NPF nor the NIR contain estimates for LPG vehicles. In 2018 there were 1,351 LPG publicly accessible refuelling points in the Netherlands that, according to the NIR, represent a broad nationwide network.

Rail transport

The Dutch NIR contains the estimate of having one hydrogen locomotive in 2020.

Waterborne transport (maritime)

- **Electricity** - Shore-side electricity supply points were available in four Dutch maritime ports in 2018. The Dutch NIR target for the number of shore-side electricity supply points for maritime vessels in 2025 is 10, which is confirming the NPF targets for 2025 and 2030.
- **LNG** - In 2018, the Netherlands had 11 LNG seagoing vessels. The NL NPF had not provided estimates for the number of LNG seagoing ships, whereas the NIR estimates are 11 vessels in 2020, 30 in 2025 and 48 in 2030. This indicates an increase in ambition, aimed to achieve a CO_2 reduction by 2030 in line with the IMO goals. Concerning LNG infrastructure, one LNG bunkering vessel is serving the ports of Amsterdam and Rotterdam and one bunkering pontoon can be deployed flexibly to serve both seagoing ships and inland waterway vessels in Amsterdam and Rotterdam. The Dutch NPF had provided a target of six LNG refuelling points for seagoing vessels in 2025, now the NIR presents a revised target of four refuelling points, which is 33.33% lower than the NPF.

Waterborne transport (inland)

- **Electricity** - In 2018, there were no fully electric inland waterway vessels in the Netherlands. While the Dutch NPF had not provided targets of electric inland waterway vessels, the Netherlands have now increased ambitions: the *Climate Agreement* is aiming for a minimum of 150 zero-emission (i.e. BEV or fuel cell) inland waterway vessels by 2030 and thus estimates for electric vessels are 2 for 2020, 30 for 2025 and 100 for 2030. The NL NIR states that shore-side electricity supply for auxiliary power is available in almost all major inland waterway ports in the Netherlands. The Dutch NPF target was to have shore-side electricity supply in the main 75 inland ports by 2025 and the NIR has shifted this target of 75 ports to 2030.
- **LNG -** In 2018, there were seven LNG inland waterway vessels in the Netherlands. The NPF had provided an estimate of 40 LNG inland waterway vessels in 2020, whereas the NIR provides a revised estimate 72.5% lower than the NPF for 2020 (11 vessels) and new targets for 2025 and 2030 which are, respectively, 86 and 160 inland waterway vessels. Concerning infrastructure, the Dutch NIR indicates that in 2018 for inland shipping there were 6 locations LNG could be bunkered. The NL NIR targets for LNG supply for inland

waterway is seven bunkering points (six mobile and one fixed) in 2020 and 13 in 2030, so the NL NPF target of for 2030 is confirmed in the NIR.

- **Hydrogen** - The Dutch NIR presents estimates for hydrogen-powered inland ships derived from the *Climate Agreement* target of a minimum of 150 zero-emission inland waterway vessels by 2030. Therefore, estimates for hydrogen inland ships are 15 for 2025 and 50 for 2030.

Air transport

- **Electricity** (for stationary airplanes) - According to the NL NIR, in 2018 there were 73 aircraft stands at the main airport in the Netherlands (Schiphol) equipped with fixed installations for electrical ground power and pre-conditioned air units. The target provided in the NPF for electric supply for stationary airplanes in 2020 is already attained. Neither the NPF nor the NIR provide targets for the number of power supply points for stationary aircraft in the Dutch Airports in 2025 and 2030. The NIR mentions the ambition in the Dutch Climate Agreement of all ground-related activities at the Dutch airports to be zero-emission from 2030.

The Dutch Implementation Report contains a well-balanced portfolio of 58 **measures** that is based on administrative agreements and public-private cooperation as well as on fiscal incentives. The main driver for the measures presented in the NL NIR are the Dutch *Climate Act* and the *Climate Agreement.* The measures cover various alternative fuels and transport modes, mostly targeting electricity and hydrogen for road transport and electricity for inland waterborne, and to a lesser extent CNG and LNG for road. Some measures, such as subsidies, are intended for several alternative fuels, but are applied in practice for only one fuel. The Dutch NIR contains 20 legal measures that are implemented at national level. Considering all the legal measures together, they appear to be designed as the necessary tools to allow the realisation of the AFV/AFI plans as presented in the NPF and revised in the NIR.

The Dutch NIR contains 23 policy measures; the majority of them are of financial nature applicable at national level and complemented with public procurement initiatives at regional and local level. The Dutch Government has put in place a significant number of direct incentives to foster the deployment of alternative fuel vehicles and related infrastructure. Approximately one third of the policy measures are targeting zero-emission transport, in particular electro-mobility. As for deployment and manufacturing support, nine measures have been identified in the NIR. Eight clusters of measures were identified, of which only five were assessable, for the pairs electricity/road, electricity/water (inland), CNG/road, LNG/road and hydrogen/road. The clusters for the pairs LNG/water and electricity/water (maritime) were not sufficiently detailed for an assessment. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road have a high impact, while all the other (assessable) measures have a medium impact. The level of ambition for policy and deployment & manufacture support measures between the NPF and the NIR has increased in the NIR for electricity/road, hydrogen/road and electricity/water while it remains the same for CNG/road and LNG/road.

The Dutch NIR presents six measures for RTD&D and innovation activities. National financing and support for RTD&D and innovation projects target mainly electricity and hydrogen, showing that for these AFs the level of ambition has increased at RTD&D level.

5.19.7 *Final remarks*

The NIR of the Netherlands provides a comprehensive report on the efforts to implement the Directive. The NIR complies largely with the requirements of Annex I to the Directive with the exception that it does not include targets of electric vehicles' recharging points by 2025 and 2030. The NIR announces a minimum of 150 zero-emission inland waterway vessels by 2030 and a target for all Dutch domestic flights to be zero-emission by 2050. A significant number of measures are being implemented to promote alternative fuels in all modes, but with a special focus on electro-mobility and on hydrogen.

With regard to electricity, the NIR plans for approximately 1,500,000 vehicles on the roads by 2030, representing about 14% of the fleet by that time. Taking into account the current situation and expected trends, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. The NIR targets a network of 50,000 recharging points in the Netherlands by 2020, but it does not provide additional targets for recharging infrastructure for 2025 and 2030. This is a shortcoming, as the 2020 target is not sufficient to take into account the estimated number of electric vehicles in 2030. Future reporting should indicate the planning for 2025 and 2030. Information on charging efficiency is provided. Four out of the five maritime ports in the Netherlands' TEN-T Core Network were already equipped with shore-side electricity supply in 2018. The NIR estimates that the number of shore-side electricity supply points for maritime vessels will be 10 in 2025. In addition, all major inland ports had already shore side electricity supply facilities in 2018 and the plan is to have shore-side electricity supply in 75 inland ports by 2025. Moreover, 73 airplane stands at the main airport in the Netherlands (Schiphol) are equipped with fixed installations for electrical land power and pre-conditioned air unit. However, further information should be given for the airport of Rotterdam-The Hague that is also included in the TEN-T Core Network. Further information should be provided on the future share of the electrified rail network.

Regarding hydrogen for transport, the NIR reports the target of 50 public and private hydrogen refuelling stations by 2025. It does not set a target for hydrogen refuelling points for 2030. The Dutch NIR estimates a significant fleet of 189,400 FCHVs by 2030 (150,000 cars, 30,000 light commercial vehicles, 7,700 heavy commercial vehicles and 1,700 buses and coaches).

In terms of natural gas for transport, the Netherlands already has a network of CNG refuelling stations, which is sufficient for the current and future CNG vehicle fleet. The NIR does not provide any estimates on the future growth of CNG vehicles. There are already 27 LNG refuelling stations for vehicles, which should grow to 30 by 2025 according to the NIR. This number seems appropriate considering the total length of the Dutch TEN-T Core Network, provided that the refuelling stations are widely distributed along the network. There is already one LNG refuelling point for maritime vessels. The NIR presents a target that four out of five ports in the TEN-T Core Network will be equipped with LNG refuelling points by 2025. As regards inland ports, 6 out of 11 ports in the TEN-T Core Network already have LNG refuelling points. The NIR targets 13 refuelling points by 2030, thus complying largely with the requirements of the Directive. The number of maritime and inland LNG vessels is growing steadily.

In 2018, there were 154,448 registered LPG vehicles and 1,351 refuelling points. The NIR does not provide information on the estimated future number of LPG vehicles and refuelling points.

The NIR states that the proportion of renewable fuels has increased in the last years. A limited use of renewable fuels in aviation is foreseen by 2030. The NIR mentions that bio-kerosene is considered as the most promising way of flying. In this respect, The Netherlands should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.19.8 *ANNEX - Description of the Member State*

On a surface area of 41,500 km², the Netherlands has a population of 17.181 million people in 2018, which makes up for a population density of 414 inhabitants/km².

Number of main urban agglomerations

- 47 urban agglomerations > 50,000 inhabitants

In 2018, Netherlands achieves a per capita gross domestic product at market prices of €44,920, which represents a per capita gross domestic product in purchasing power standards of 129 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in the Netherlands is 671 km. The total road network length is 13,165 km, of which 2,756 km are motorways.

The following lengths of the TEN-T Road Corridors are present in the Netherlands: 8% (334 km) of the North Sea - Baltic Corridor, 20% (282 km) of the Rhine - Alpine Corridor, 6% (254 km) of the North Sea - Mediterranean Corridor.

Through the TEN-T Road Corridors, the Netherlands is connected with the following Member States:
- Belgium (through the North Sea - Baltic and the North Sea - Mediterranean Corridor),
- Germany (through the North Sea - Baltic and the Rhine - Alpine Corridor Corridor)

Number of registered road vehicles

At the end of 2018, the Netherlands accounts for 11,471,308 registered road vehicles of which 8,530,584 are categorised as passenger cars, 914,766 as light goods vehicles, 143,041 as heavy goods vehicles and 9,717 as buses and coaches. The motorisation rate is 497 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 5 maritime ports in the TEN-T Core Network (Amsterdam, Moerdijk, Rotterdam, Terneuzen, Vlissingen)
- 8 maritime ports in the TEN-T Comprehensive Network
- 11 inland ports in the TEN-T Core Network (Almelo, Amsterdam, Bergen op Zoom, Deventer, Hengelo, Moerdijk, Nijmegen, Rotterdam, Terneuzen, Utrecht, Vlissingen)
- 44 inland ports in the TEN-T Comprehensive Network

Through the 1,370 km inland waterways TEN-T Core Network, the Netherlands is connected with Germany by the North Sea - Baltic and Rhine - Alpine Corridors and with Belgium by the North Sea - Baltic and North - Sea Mediterranean Corridor.

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Amsterdam-Schiphol, Rotterdam-The Hague)
- 4 airports in the TEN-T Comprehensive Network

5.20 Austria (AT)

5.20.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Austrian NPF the Commission concluded:

The Austrian NPF fully addresses the requirements of Article 3. It contains an extensive discussion of the current state and future scenarios for alternative fuels in the transport sector. For all fuels and modes, it establishes targets as required by Article 3 of the Directive.

The Austrian NPF puts a lot of emphasis on electric vehicles and contains, with more than 1.3% share by 2020, high estimates for the future deployment of EV, when compared with its current EV shares (0.3%). Austria has already today a relatively dense network of public recharging points. Eligibility for several support measures for EV is contingent on 100% renewable electricity contracts. This ensures zero emission electro-mobility also under a well-to-wheel perspective. Austria, already today, has a significant number of electric buses, some powered via overhead lines. Bicycles and electric bikes as well as their infrastructure also receive support. Regarding electricity supply for stationary airplanes, the Austrian NPF commits to maintaining the current infrastructure. For shore-side electricity, the NPF mentions ongoing studies to investigate the possible extension of the basic existing network.

Today, the spatial distribution of recharging points and especially high power recharging infrastructure seems to appropriately cover the needs of electric vehicles in terms of distance requirements in Austria. For the future, the targeted ratio of only one public recharging point per 18-37 electric vehicles estimated for 2020 could evolve to become a barrier for the further market deployment of electric vehicles. This could also lead to market fragmentation within the EU. It will be important to closely monitor this development and correct infrastructure targets in line with the market developments.

Austria currently has a sufficient network of CNG refuelling points. However, the Austrian NPF displays a sceptical view on the future prospects of CNG vehicles and does not foresee additional investments in CNG refuelling infrastructure.

Depending on market demand, 1-2 dual use LNG refuelling points for vessels and heavy-duty trucks are proposed in the NPF. If both LNG refuelling points were realised, this would guarantee that the maximum distance requirement for LNG refuelling points along the TEN-T Core Network would be fulfilled on Austrian territory.

The Austrian NPF considers hydrogen for transport and targets a slight increase of hydrogen refuelling points.

The Austrian NPF contains a very comprehensive list of measures, most already in place and their prolongation foreseen. Most of them can be considered having a medium impact on market actor's decisions. Longer periods for their validity could provide certainty for market actors and hence increase the likelihood that the national targets and objectives of the NPF can be reached. The NPF contains a comprehensive list of support measures that can promote the deployment of alternative fuels infrastructure in public transport services.

The consideration of the interests of regional and local authorities, as well as stakeholders during the drafting of the Austrian NPF can be considered exemplary. Further coordination is planned in order to ensure follow-up of the implementation actions, collaboration among authorities and advice from stakeholders.

Austria is actively involved in coordinating its plans on alternative fuels infrastructure with other Member States as well as collaborating with them in this field.

5.20.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.20.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport/Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road/All		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road/All		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, rail / Electricity, CNG		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			No
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	All/All		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, rail, air / All		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, water, air / Electricity, CNG, LNG, Hydrogen, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road / Electricity		Yes
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / Electricity		Yes

The checklist shows the requirements of Annex I from the Directive covered in the AT NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is partially covered for all modes; CNG, hydrogen and LPG are partially covered for road transport; LNG is partially covered for road and inland waterborne transport; all the other combinations are either absent or not applicable.

The Austrian NIR reports 159 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify five AF/transport mode clusters of measures, all assessable.

5.20.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.20.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road*	NIR	28,847	4,178	89,774	3,500	405,402	NA	960,395	NA
	Change NIR vs NPF [%]			-24.88%	-14.63%			-26.97%	
	Attainment [%]			32.13%	119.37%	7.12%		3.00%	
CNG / road	NIR	7,614	161	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / road	NIR	NA	1	NA	NA	NA	1	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]						100.00%		
LNG / water (inland)	NIR	NA	0	NA	NA	NA	1	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]								
H2 / road	NIR	24	5	NA	5	NA	NA	NA	NA
	Change NIR vs NPF [%]				0.00%				
	Attainment [%]				100.00%				
LPG / road	NIR	694	45	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:

(grey)	not applicable
(white)	the value could not be computed
NA	no value/information provided/available in the NIR

* The NPF value used for the calculation is based on an average of values reported in the Austrian NPF.

5.20.3.1 Road transport

5.20.3.1.1 Electricity

Vehicles

Austria recorded 28,847 battery-electric and plug-in hybrid electric vehicles in use in 2018, of which 26,541 were passenger cars, 2,141 battery-electric LCVs, 11 battery-electric HCVs and 154 battery-electric buses and coaches (see Table 5.20.3-1). The Austrian NIR EV estimates are 89,774 for 2020 and 960,395 for 2030. These figures are respectively 24.88% and 26.97% lower than those reported in the NPF. This reflects a lower policy ambition, with a caveat: while the underlying NPF numbers used to calculate these percentages are based on an average value, the actual future EV estimates provided in the NPF were a range (low and high). This is shown for 2020 and 2030 in Figure 5.20.3-1. As it can be seen, the 2030 estimate provided in the NIR is close to the NPF low estimate. The figure also shows that Austria did not provide 2025 EV estimates in the NPF but the NIR presents an estimate (405,402 EVs). No future estimates are provided for the stock of electric HCVs. In addition, the Austrian NIR provides an estimate of 85,161 electric PTW in 2030, compared to 8,614 in 2018.

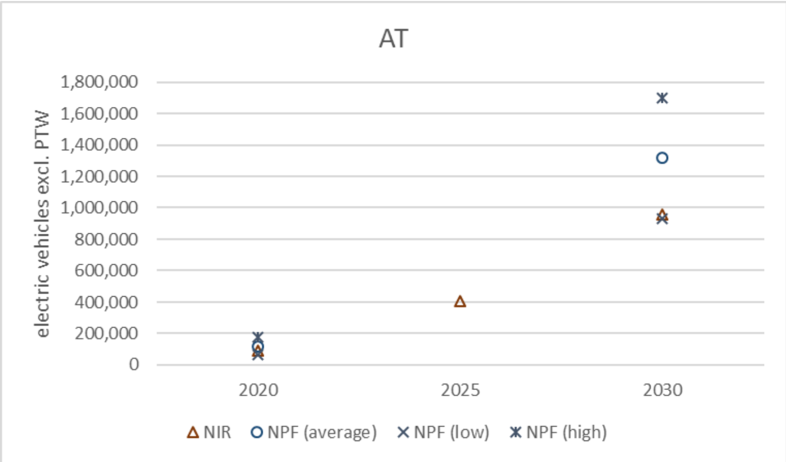

Figure 5.20.3-1 Future EV estimates in the Austrian NPF versus NIR

The 2018 ***attainment*** of future EV estimates is 32.13% for 2020 to 3.00% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Austria is equal to 35%.

Infrastructure

Austria recorded 4,178 publicly accessible recharging points in 2018 (Table 5.20.3-1). The NIR target for the publicly accessible electric recharging points for 2020 is 3,500, of which 500 would be high power (>22kW). This is 14.63% lower than the target set in the NPF, with a caveat: while the underlying NPF number used to calculate this percentage is based on an average value, the actual target provided in the NPF was a range (low and high). As Figure

5.20.3-2 shows, the 2020 target provided in the NIR is close to the NPF low target. The figure also indicates that neither the Austrian NPF nor the NIR provide publicly accessible electric recharging points targets for 2025 and 2030.

The Austrian NIR does not provide information on the number of private recharging points but assumes that one private recharging point will be available for each passenger car.

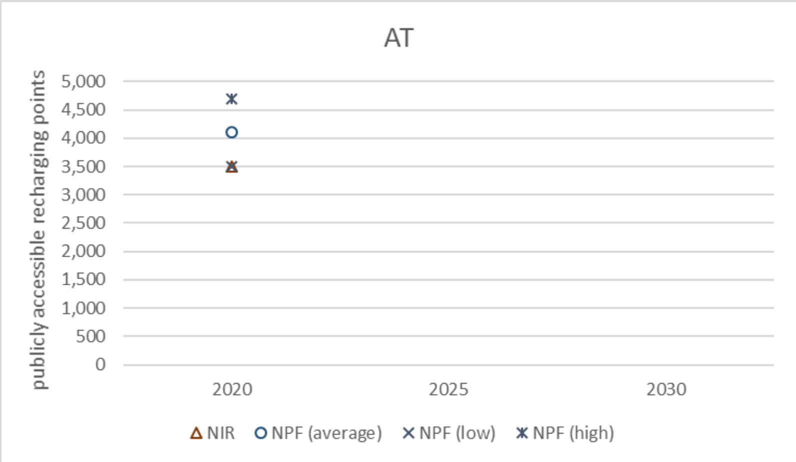

Figure 5.20.3-2 AFI targets in the Austrian NPF versus NIR: publicly accessible electric recharging points

The 2018 ***attainment*** of future publicly accessible recharging infrastructure target is 119.37% for 2020. The attainment >100% represents an early over-achievement of the target. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching the envisaged target. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Austria is equal to 10%.

Ratio

Based on the AT NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. In 2020 the foreseen sufficiency index exceeds a value of 10 that, even considering the 14% high power share, can be regarded as inadequate. The lack of 2025 and 2030 targets precluded the calculation of the sufficiency index.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	5.51	5.68	6.90	25.65		

Information on charging efficiency

In line with the information provided by the Commission (Frequently-Asked Questions document issued to the Member States on 16 September 2019), the Austrian NIR reported the following average data based on 86 high power (>22kW) recharging points along the ASFiNAG network, concluding that the utilisation rate is low: 0.4 charges/day, 7.5 kW delivered/day and 11 minutes/day. Although this data collection is part of Austria's assessment of the efficiency of high power recharging infrastructure, the NIR[2] does not disclose any detail on the methodology applied.

5.20.3.1.2 CNG

Vehicles

Austria recorded 7,614 CNG vehicles in use in 2018, of which 5,542 were passenger cars, 1,846 LCVs, 55 HCVs and 171 buses and coaches (Table 5.20.3-1). The Austrian NIR does not provide future estimates of CNG vehicles because it considers them currently unfeasible. As a result, the future values in Table 5.20.3-1 are shown as NA and the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Austrian NIR provides information on the number of CNG refuelling points that have been declining over the past years (171 in 2016, 166 in 2017, 161 in 2018 and 156 in September 2019). The NIR does not provide future targets, thus the relevant values in Table 5.20.3-1 are shown as NA. As in the NPF, the Austrian NIR confirms the intention of preserving the existing CNG refuelling infrastructure. The NPF had reported that five refuelling points for pure biomethane were available in Austria in 2016, whereas the NIR asserts that three such refuelling points were available in 2019.

Due to the absence of future CNG refuelling points targets, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the AT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. The sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the period 2016-2018. Since there are no future CNG vehicle estimates and no refuelling points targets in the AT NIR, it is not possible to compute the sufficiency index for the period 2020-2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**CNG**	40.26	43.22	47.29			

5.20.3.1.3 LNG

The Austrian NIR acknowledges that the deployment of LNG infrastructure has not been a priority so far, because LNG does not play a role in Austria's heavy goods transport.

Vehicles

Information is not available in the Austrian NIR.

[2] See Section 5.20.4.1 for two Federal Acts on technical standards for recharging infrastructure.

Infrastructure

The Austrian NIR indicates the presence of one publicly accessible LNG refuelling point for road vehicles in 2018 and two in 2019. The NIR also provides a target of one public LNG refuelling point in 2025, which is in line with the value reported in the NPF (Table 5.20.3-1). The Austrian NIR states that future target setting of LNG infrastructure will depend on the market development along the TEN-T Network.

The 2018 ***attainment*** of future LNG refuelling infrastructure target could only be calculated with respect to 2025 and is equal to 100%, while the ***progress*** could not be computed.

Ratio

Due to the lack of LNG vehicle estimates in the AT NIR it was not possible to compute the sufficiency index.

5.20.3.1.4 Hydrogen

Since the Austrian government considered hydrogen for transport in its NPF, it became mandatory for Austria to include hydrogen-related information in its NIR. The Austrian NIR states that concrete future estimates and targets for 2020, 2025 and 2030 are excluded from the NIR because the country's Hydrogen Strategy was being drafted at the time of notification of the NIR.

Vehicles

The Austrian NIR indicates that 24 hydrogen-powered vehicles (all of them passenger cars) were in use in 2018 (Table 5.20.3-1), but it does not provide future estimates. As a result, the future values in Table 5.20.3-1 are shown as NA and the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Austrian NIR reports that hydrogen refuelling points are slowly increasing (3 in 2016, 4 in 2017 and 5 in 2018 and 2019; they are all publicly accessible 700 bar infrastructure). The NIR also presents a target of five hydrogen refuelling points for 2020 that is in line with the one indicated in the NPF (Table 5.20.3-1). In contrast to the NPF, the NIR no longer provides a target for 2025 and states that the 2025 and 2030 targets would be set only if market developments require them.

The 2018 ***attainment*** of future hydrogen refuelling infrastructure target could only be calculated with respect to for 2020 and is equal to 100%, while the ***progress*** could not be computed.

Ratio

Based on the AT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road. The sufficiency index (see Section 2.1.5) remains below five for the period 2016-2018. Since there are no future vehicle estimates and refuelling points targets in the AT NIR, it is not possible to compute the sufficiency index for the period 2020-2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Hydrogen**	4.33	4.75	4.80			

5.20.3.1.5 Biofuels

Vehicles

Information is not available in the Austrian NIR.

Infrastructure

Information is not available in the Austrian NIR.

5.20.3.1.6 LPG

The Austrian government does not mention LPG in its main report but provides historical data in the Annex.

Vehicles

Austria recorded 694 LPG vehicles in use in 2018 (of which 329 were passenger cars, 173 LCVs, 1 HCV and 191 buses and coaches) (see Table 5.20.3-1). Most of these vehicles are bi-fuel (petrol-LPG), with the exception of buses and coaches. The Austrian NIR does not provide any justification for the lack of future estimates of LPG vehicles. As a result, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Austrian NIR provides information on the number of publicly accessible LPG refuelling points for the period 2016-2018 (50 points in 2016 and 45 in 2017 and 2018) but does not provide future targets. As a result, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the AT NIR, the following table shows the ratio between vehicles and publicly accessible LPG refuelling points (i.e. sufficiency index) for the pair LPG/road. Since there are no future LPG vehicle estimates and no refuelling points targets in the AT NIR, it was not possible to compute the sufficiency index for the period 2020-2030.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LPG	9.96	11.20	15.42			

*Note: The 2016 and 2017 values are calculated without taking into account the stock of buses and coaches, for which the NIR provided no information.

5.20.3.2 Rail transport

5.20.3.2.1 Electricity

Vehicles

Austria recorded 824 electric and 9 hybrid electric locomotives in 2018.

Infrastructure

According to the Austrian NIR, around 70% of the rail network is electrified and further progress is ongoing on rail electrification, with a focus on high-traffic passenger and freight routes.

5.20.3.3 Waterborne transport (maritime)

Not applicable since Austria has no maritime ports in the TEN-T Core Network.

5.20.3.4 Waterborne transport (inland)

5.20.3.4.1 Electricity

Vessels

Information is not available in the Austrian NIR.

Infrastructure

As in the NPF, the Austrian NIR does not provide specific values on the number of shore-side electricity recharging points. The NIR states that a basic level of shore-side electricity supply for inland waterway vessels is available at Austria's TEN-T ports. As for the future, the Austrian NIR indicates that the aim is to maintain the existing basic infrastructure and to analyse additional needs in the context of the 'Action Programme Danube 2022'.

5.20.3.4.2 LNG

Similarly to the heavy goods transport, the Austrian NIR acknowledges that LNG does not play a role in Austria's inland waterborne transport.

Vessels

Information is not available in the Austrian NIR.

Infrastructure

Austria recorded zero LNG refuelling points in inland ports for the period 2016-2018 (Table 5.20.3-1). Both the NPF and the NIR are consistent in indicating one refuelling point for 2025 (at Enns or Linz); however, in the main body of the NIR, the Austrian government considers the possibility of a second LNG refuelling point in the port of Vienna), but its deployment by 2030 will depend on the market development along the TEN-T Network.

Since there was no LNG refuelling infrastructure in 2018, the **attainment** and **progress** have not been computed.

5.20.3.5 Air transport

5.20.3.5.1 Electricity

According to the NIR, electro-mobility deployment at all airports has a high priority for Austria.

Airplanes

Information is not available in the Austrian NIR.

Infrastructure (for stationary airplanes)

The Austrian NIR provides a figure of 42 recharging points at airports for use by stationary planes over the period 2016-2018. This number is the same as the one provided in the NPF for the period 2020-2030. In addition, the Austrian NIR states that around 50 mobile GPUs are available. Austria considers that the current electricity supply at commercial airports for use by stationary airplanes is adequate. For the future, the Austrian NIR indicates that the aim is to maintain the existing electricity supply for stationary aircraft at Austrian airports until further evidence of additional needs.

5.20.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is unavailable in the Austrian NIR.

Infrastructure

Information is not available in the Austrian NIR.

5.20.4 *Measures assessment*

As in the NPF, the Austrian NIR contains a very comprehensive list of measures that covers various fuels and modes, with particular emphasis on electricity for road transport. The Austrian NPF had proposed the extension of existing measures and this has been reflected in the NIR.

5.20.4.1 Legal measures

The Austrian NIR contains 52 legal measures, which represents a strong increase compared to the 16 legal measures identified in the NPF. Slightly less than half of them corresponds to measures at national level (most of the rest are regional measures). Some of the new legal measures update the measures provided in the NPF (e.g. related to the Passenger Car Consumer Information Act). The majority of the legal measures described in the NIR are existing (around 12% are under consideration). Some of these measures relate to the implementation of the provisions stipulated in the Energy Performance of Buildings Directive (2018/844/EU).

All together, the legal measures appear to address relevant needs for the realisation of the AFV/AFI ambition as described in the NPF. On the basis of the available information, it is considered that the level of ambition of the legal measures has generally increased in the NIR, compared to the NPF**.**

5.20.4.1.1 Legislative & Regulatory

Of all the legal measures described in the Austrian NIR, 37 can be categorised as legislative and regulatory measures. The following new measures can be highlighted:

- National targets: exemptions for zero-emission lorries (BEV and FCEV) from the driving bans applicable on a section of the A12 Inntal motorway as well as the obligation to register all publicly accessible recharging points in Austria, so that information on the geographical location is available to users in a non-discriminatory and open manner.

- Norms & requirements: the NIR mentions the adoption of two relevant federal acts on technical standards since the notification of the NPF. The first one is “the Federal Act laying down uniform standards for the deployment of alternative fuels infrastructure was adopted on 12 July 2018 (Federal Law Gazette I No 38/2018)”. The second one is the Federal Act laying down “uniform standards for normal-power and high-power recharging points for electric vehicles that are accessible to the public, hydrogen refuelling points for vehicles that are accessible to the public and CNG refuelling points for vehicles that are accessible to the public” adopted on 23 September 2019 (Federal Law Gazette II No 280/2019).
- Permits: a measure stipulating that recharging stations should be regarded as installations that require approval only in exceptional cases.

5.20.4.1.2 Administrative

Of all the legal measures described in the Austrian NIR, 15 can be categorised as administrative (basically regional) measures. The following new measures can be highlighted:

- AFV classification on environmental performance: possibility to switch all public bus routes to alternative drive technologies in Vorarlberg.
- Certification of the environmental performance of businesses: commercial recharging stations for EVs do not require approval under plant permit law in Upper Austria.
- EU & international standards implementation: all the electricity delivered by publicly accessible recharging stations in Vienna must be ‘green’.
- Other: prioritisation of EVs in the procurement of company cars in Vorarlberg (‘Mission ZeroV’); (ii) cross-border electro-mobility strategy for the area Burgenland-West Hungary (INTERREG ‘Low Carb Mobility’ project); and (iii) international cooperation on electro-mobility in the Lake Constance area (E-Charter).

5.20.4.2 Policy measures

The Austrian NIR contains 56 policy measures that represent a strong increase compared to the 14 policy measures identified in the NPF. Almost 40% of them corresponds to measures at national level (most of the rest are regional measures). Some of the new policy measures update those provided in the NPF. Most of the policy measures are in place. Almost 30% of them have expired by 2019 and around 2% were under consideration. The vast majority of the policy measures described in the NIR refer to road transport.

5.20.4.2.1 Measures to ensure national targets and objectives

Of all the policy measures described in the Austrian NIR, 46 can be categorised as measures to ensure national targets and objectives. Around 70% of these measures provide financial support.

Road transport

As the Austrian NIR states, financial incentives for the acquisition of vehicles powered by the following alternative fuels continue to be available:

- Electricity: federal subsidies are available for enterprises (a maximum funding rate of 30% applies) and private individuals. For M1 vehicles, the subsidy ranges from €1,500 for PHEVs to €3,000 for BEV and FCEVs. Funding is also available for freight vehicles (€1,500-€10,000 for N1; €20,000 for N2; €50,000 for N3) and for public vehicles (taxis and buses (up to €100,000)). Subsidies in some regions complement the federal subsidies for one or more vehicle categories. Moreover, funding is available for motorcycles as well as for electric bikes (including electric cargo bikes), as in the NPF.
- CNG: tax concessions continue to be available and several regions offer subsidies for new CNG vehicles.
- Hydrogen: certain tax concessions are available for FCEVs.

Financial incentives are also available for the deployment of private recharging infrastructure, including for multi-family dwellings, both at the federal level and in certain regions.

Among the non-financial incentives, it is worth mentioning exemptions for BEVs and FCEVs from the speed limit (100 km/h under the Ambient Air Quality Act) on motorways and dual carriageways.

In terms of measures at local level, the number of Austrian cities and towns with parking fee exemptions for EVs and hydrogen-powered vehicles rose from 14 in mid-2016 to 33 in late 2019. This exemplifies an increased level of ambition in support measures for zero-emission vehicles at local level.

Rail transport

The Austrian NIR lists two policy measures in Burgenland Upper Austria on rail transport: both are existing public procurement incentives targeting electricity, though their budgets vary greatly. Besides, the Austrian NIR indicates that the Zillertal Railway in Tyrol is scheduled to switch from diesel to hydrogen.

Waterborne transport

In addition to the aforementioned ‘Action Programme Danube 2022’, the Austrian NIR mentions the ‘LNG Master Plan Rhine-Main-Danube’ project (but without providing details).

5.20.4.2.2 Measures that can promote AFI in public transport services

The main report of the Austrian NIR highlights three examples of best practice at sub-national level that concern public transport: electric bus tests in Carinthia; the promotion of multimodal transport (including electric taxis) in Styria; and funding for zero-emission taxis in Upper Austria.

Of all the policy measures described in the Annex of the Austrian NIR, two can be categorised as measures to promote AFI in public transport services (both of them in Vorarlberg).

5.20.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The main report of the Austrian NIR highlights funding for the deployment of recharging infrastructure in multi-family dwellings in Vorarlberg as an example of best practice at sub-national level.

Of all the policy measures described in the Annex of the Austrian NIR, eight can be categorised as measures to promote the deployment of private electro-mobility infrastructure. All of these are regional measures. In addition, the main report of the NIR indicates that funding is available for wall boxes for multi-family dwellings at the federal level.

5.20.4.3 Deployment and manufacturing support

5.20.4.3.1 AFI deployment

The Austrian NIR contains 19 deployment support measures, which represents a significant increase compared to the three measures identified in the NPF. Twelve of the measures were in place. Most of the support concerns electricity for road. The total estimated budget for AFI deployment reported in the NIR amounts to around 36.7 million € for the period 2016-2030 (though most of it reflects the period 2016-2020 and information on the budget is incomplete).

5.20.4.3.2 Support of manufacturing plants for AF technologies

Although the Austrian NIR states that the Province of Lower Austria has collaborated with recharging stations manufacturers and will be offering support for the development of recharging stations, no concrete measure regarding support of manufacturing plants for AF technologies is presented in the Annex of the Austrian NIR.

5.20.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Austrian NIR.

5.20.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.20.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, in addition to electricity for various transport modes, clusters of measures for the pairs CNG/road and hydrogen/road could also be identified in the Austrian NIR. Similarly to the NPF, nothing assessable could be defined for LNG and for the other AFs. All the assessable measures mentioned in the NIR score low or medium. Only the clusters of measures for the pairs electricity/road and electricity/bicycles are comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of a complete plan regarding future targets and estimates does not facilitate the task of putting this assessment into perspective. Based on the impact seen during the implementation period, for the future it can be said that the measures for the pairs electricity/road and electricity/bicycles have a medium impact, those for the pairs CNG/road, hydrogen/road and electricity/rail have a low impact.

Compared to the NPF, the level of ambition increases only for the electricity-related measures.

Table 5.20.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	**Score**	**Comprehensiveness**	**Impact**	**Ambition (IR vs NPF)**
Electricity	Road	M	C	**M**	+
CNG	Road	M	N	**L**	=
LNG	Road				
	Water- inland				
Hydrogen	Road	L	N	**L**	=
Electricity	Bicycles	M	C	**M**	+
	Rail	L	N	**L**	+

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.20.4.5 Research, Technological Development & Demonstration

The Austrian NIR contains 32 RTD&D projects, which represents a significant increase compared to the 17 RTD&D projects identified in the NPF. Some of the new projects are follow-ups or expansions of the projects listed in the NPF (e.g. the 'Zero-Emission Mobility' project). A significant proportion of the RTD&D projects described in the NIR are probably concluded at the time of writing this assessment. The vast majority of the RTD&D projects described in the NIR refer to road transport. Electricity features prominently in these projects, but hydrogen, LNG and combinations of alternative fuels are also addressed. The total estimated budget for RTD&D projects reported in the NIR amounts to 148 million € for the period 2016-2025 (though most of it reflects the period 2016-2020 and information on the budget is not complete). The reported budget includes sub-national, national and supra-national funding.

On the basis of the available information, it can be considered that, compared to the NPF, the level of ambition in the NIR has increased only for the clusters electricity / road and hydrogen / road.

5.20.5 *Additional information on alternative fuels infrastructure developments*

The Austrian NIR does not provide information on the changes in fuel use.

5.20.6 *Summary of the assessment*

Tabular overview

Table 5.20.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	12,977	6,884	NA	NA	13	498
		Situation (2018)	28,847	7,614	NA	NA	24	694
		Estimate (2030)	960,395	NA	NA	NA	NA	NA
		Future share (2030) [%]	16.15%					
		Estimate attainment (2018 vs 2030) [%]	3.00%					
		Progress (2018)	adequate					
Publicly accessible AF Infrastructure		Past situation (2016)	2,356	171	0	0	3	50
		Situation (2018)	4,178	161	1	0	5	45
		Target (2030)	NA	NA	NA	NA	NA	NA
		Target attainment (2018 vs 2030) [%]						
		Progress (2018)	fast					
Sufficiency Index		2016	5.51	40.26			4.33	9.96
		2018	6.90	47.29			4.80	15.42
		2020	25.65					
		2025						
		2030						
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	=	+	+
	Policy measures + Deployment & manufacturing support	Score	M	M			L	
		Comprehensiveness	C	N			N	
		Impact	M	L			L	
		Ambition (NIR vs NPF)	+	=			=	
	RTD&D	Ambition (NIR vs NPF)	+	=	=	=	+	=

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

As stated in the NIR, the Austrian government aims at limiting transport GHG emissions to 15.7 million tCO_2 by 2030. As road transport currently accounts for most of Austria's GHG emissions in the transport sector, road transport decarbonisation is crucial. Moreover, the Austrian NIR asserts that the country is well positioned to make the transition to a transport sector powered by electricity, thanks to its high share of renewables in electricity generation. Since the notification of the NIR, Austria has published its National Energy and Climate Plan. The NIR indicates that Austria is drafting its Hydrogen Strategy.

The NIR does not establish infrastructure targets / vehicle estimates for all fuels and modes for each of the years of reference (2020, 2025 and 2030). Therefore, it cannot be stated that the Austrian NIR covers the whole AFID period (2016-2030). Compared to the Austrian NPF that had fully addressed the requirements of Article 3 of the Directive, the Austrian NIR almost fully addresses the requirements of Annex I of the Directive, with the exception of: a) information on the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network; b) information on the annual public budget allocated to support manufacturing plants for alternative fuels technologies; c) information on any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Austrian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – With 28,847 electric vehicles registered in 2018, the Austrian NIR puts a lot of emphasis on road electrification, to be led by the passenger car market, though electric LCVs, HCVs and buses and coaches are also indicated for 2018 (2,141 battery-electric LCVs, 11 battery-electric HCVs and 154 battery-electric buses and coaches). With regards to future EV estimates and publicly accessible recharging points targets, the Austrian government updates its policy goals by indicating values in the NIR that are closer to the least ambitious scenario of the two reported in its NPF and does not provide details on the heavy-duty vehicles. As for recharging infrastructure, the NIR only reports a target for 2020, which was already exceeded by the 2018 value, meaning a fast progress. The 2018 progress for EVs is adequate, but when the estimated number of EVs in 2020 is compared to the corresponding infrastructure, the result is a rather deteriorated sufficiency index in 2020.
- **CNG** – Austria recorded 7,614 CNG vehicles in use in 2018, of which 55 HCVs and 171 buses and coaches. Biomethane was available in three out of the 156 Austrian CNG refuelling points in use in 2019. The NIR signals the intention to maintain the existing CNG infrastructure. As in the NPF, the Austrian NIR exhibits a sceptical view on the future prospects of CNG vehicles. Due to the lack data, the attainment, progress and sufficiency index could not be calculated.
- **LNG** – Due to the high focus on the national electricity generation based on renewable energy, the Austrian NIR is cautious also about the development of LNG for transport. The Austrian NIR only notes the intention to maintain one LNG refuelling point for 2025, and keep future target development open.
- **Hydrogen** – As in the NPF, the Austrian NIR considers hydrogen for transport. However, the information contained in the NIR is rather limited. It is expected that the upcoming Austrian Hydrogen Strategy will shed more light into the future developments Austria envisages for this alternative fuel in transport.
- **Biofuels** – The Austrian NIR provides no relevant information on biofuels for transport.
- **LPG** – The Austrian NIR provides only past information on LPG vehicles and refuelling infrastructure.

Rail transport

- **Electricity** – According to the NIR, electrification efforts have taken place, although the information provided is rather scarce.
- **Hydrogen** – The Austrian NIR indicates the promotion of hydrogen trains in Tyrol.

Waterborne transport (inland)

- **Electricity** – The Austrian NIR indicates that shore-side electricity supply is available at Austria's TEN-T inland ports but provides no information on battery-powered vessels as well as on specific future developments in this sector.
- **LNG** – None of the Austrian inland ports had LNG supply available in 2018. Following the Austrian NIR, at least one inland port is expected to supply LNG by 2025. No information on LNG vessels could be found in the NIR.

Air transport

- **Biofuels** – The Austrian government did not consider the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network in its NIR.

The Austrian NIR contains a lengthy list of **measures**, of which: 108 are legal and policy measures, 19 are deployment support measures and 32 RTD&D projects. Overall, the Austrian NIR contains a very comprehensive list of measures to support the AF infrastructure and vehicles, many of them still in place and financially supported. Concerning the Policy and Deployment & Manufacturing support measures, the Austrian NIR continues to provide a large amount of measures to support the uptake of alternative fuels for transport but the vast majority of them focuses on electricity for road. As in the NPF, nothing assessable could be defined for LNG. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of a complete plan regarding future targets and estimates does not facilitate the task of putting this assessment into perspective. Based on the impact seen during the implementation period, for the future it can be said that the measures for the pairs electricity/road and electricity/bicycles have a medium impact, those for the pairs CNG/road, hydrogen/road and electricity/rail have a low impact. Compared to the NPF, the NIR features an increased level of ambition for support actions to the electrification, in particular, of road transport. The key to success may lie in the measures supporting private recharging infrastructure, but at the moment, the effectiveness of the measures in place remains to be seen.

The Austrian NIR contains 32 RTD&D projects, which represents a significant increase compared to the 17 RTD&D projects identified in the NPF.

5.20.7 *Final remarks*

The Austrian NIR provides a rather comprehensive report on the efforts made to implement the Directive. The NIR is, to a certain extent, in line with most of the provisions of Annex I of the Directive with the main exception that the Austrian NIR does not provide estimates for CNG vehicles and LNG vehicles and inland navigation vessels. Furthermore, concerning the infrastructure, targets for road recharging points are provided only for 2020 but not for 2025 and 2030, and for road and inland navigation LNG refuelling points for 2025; no information is provided for CNG, and LNG refuelling point targets for road and inland navigation are provided only for 2025. The NIR includes a very comprehensive list of measures which support particularly the electrification of transport (including bicycles), but also research and innovation and support for deployment and manufacturing.

Regarding electricity, the NIR estimates that there will be some 960,000 electric vehicles on the roads by 2030, representing about 16% of the fleet by that time. Taking into account the current situation and expected trend development, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles estimated as necessary for the transition to carbon neutrality by 2050. However, the Austrian NIR does not provide targets for publicly accessible recharging points for 2025 and 2030. It would be beneficial to provide further information. Information on charging efficiency is provided. A basic level of shore side electricity is already supplied in the inland navigation ports of the TEN-T Core Network; however, no numbers are provided. Electricity to stationary aircraft is supplied in most Austrian airports. The Austrian NIR reports 42 recharging points at airports in 2018. Around 50 mobile ground power units are available. The NIR indicates that Austria aims at maintaining the existing electricity supply for stationary aircraft. Approximately 70% of the Austrian rail network is electrified. Further progress on rail electrification is ongoing, with a focus on high-traffic passenger and freight routes.

Regarding hydrogen for road transport, the NIR shows Austria's interest in developing hydrogen as a fuel for road transport. There are currently five hydrogen refuelling points and a small number of hydrogen fuel cell vehicles. However, no estimates are provided on vehicles and infrastructure for 2025 and 2030. Nevertheless, the NIR announces that a “Hydrogen Strategy” was in process of elaboration.

With regard to natural gas for transport, there is already a small number of CNG vehicles and a significant number of CNG refuelling points in Austria. Only one road LNG refuelling point is foreseen until 2025; this number seems insufficient taking into account the length of the Austrian TEN-T Core Network. Furthermore, only one of the two Austrian inland ports in the TEN-T Core Network will have a LNG refuelling point by 2025. Finally, the NIR considers no need for additional measures to support the development of the market for LNG vehicles and inland waterway vessels and their necessary infrastructure. Austria should corroborate its position in this respect.

Concerning LPG, the NIR shows that Austria already had a small LPG vehicle fleet and infrastructure in 2018, but the NIR does not provide any estimates of vehicles and targets for infrastructure by 2020, 2025 and 2030.

Further information should be provided on the consumption of biofuels in road transport and particularly aviation transport, where the promotion of such fuels is essential to contribute to emission reduction.

5.20.8 *ANNEX - Description of the Member State*

On a surface area of 83,900 km², Austria has a population of 8.822 million people in 2018, which makes up for a population density of 105 inhabitants/km².

Number of main urban agglomerations

- 6 urban agglomerations > 50,000 inhabitants

In 2018, Austria achieves a per capita gross domestic product at market prices of €43,640, which represents a per capita gross domestic product in purchasing power standards of 127 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Austria is 1,084 km. The total road network length is 36,242 km, of which 1,743 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Austria: 15% (559 km) of the Baltic - Adriatic Corridor, 3% (142 km) of the Orient / East Mediterranean Corridor, 2% (110 km) of the Scandinavian - Mediterranean Corridor and 11% (485 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, Austria is connected with the following Member States:
- Czechia (through the Baltic - Adriatic and the Orient / East Mediterranean Corridor),
- Slovakia (through the Baltic - Adriatic and the Rhine - Danube Corridor),
- Slovenia (through the Baltic - Adriatic Corridor),
- Italy (through the Baltic - Adriatic and the Scandinavian - Mediterranean Corridor),
- Germany (through the Scandinavian - Mediterranean and the Rhine - Danube Corridor) and
- Hungary (through the Orient / East Mediterranean and the Rhine - Danube Corridor)

Number of registered road vehicles

At the end of 2018, Austria accounts for 6,316,320 registered road vehicles of which 4,978,852 are categorized as passenger cars, 422,745 as light goods vehicles, 72,486 as heavy goods vehicles and 10,037 as buses and coaches. The motorisation rate is 564 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- No maritime ports
- 2 inland ports in the TEN-T Core Network (Enns, Vienna)
- 2 inland ports in the TEN-T Comprehensive Network (Krems, Linz)

Through the 343 km inland waterways TEN-T Core Network, Austria is connected with Germany and Slovakia by the Rhine - Danube Corridor.

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Vienna/Schwechat)
- 5 airports in the TEN-T Comprehensive Network

5.21 Poland (PL)

5.21.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Polish NPF the Commission concluded:

The Polish NPF addresses most of the requirements of Article 3. It contains a description of the current state and future estimates for alternative fuels vehicles in the transport sector and establishes targets as required by Article 3 of the Directive. The analysis of agglomerations/densely populated areas and TEN-T network needs regarding AFI, including the calculation of market needs can be considered exemplary. The Polish NPF does not contain any measures that could encourage and facilitate the deployment of recharging points not accessible to the public.

The Polish NPF puts a lot of emphasis on the development of the market for electric and CNG cars; however, it is currently at a very early stage of its development. In view of the low numbers of EV and CNG cars on the road today, Poland has at the moment a sufficient network of public recharging and CNG refuelling points and this situation is going to be maintained in the time frame mentioned in the NPF. Beyond 2020, Poland, in its NPF, defined a very ambitious target of reaching more than 1 million of EVs on the road by 2025. The support measures defined in the NPF may not be sufficient to ensure target achievement, considering that the EV share in Poland is very low today. The spatial distribution of recharging points seems to appropriately cover the needs of electric vehicles in terms of distance requirements. No targets are foreseen for increasing the availability of electricity supply for stationary airplanes. Also for shore-side electricity the Polish NPF does not contain concrete targets. However, it envisages a pilot project to better assess the cost and benefits.

The planned LNG refuelling points for heavy-duty vehicles could guarantee that the maximum distance requirement for LNG refuelling points along the road TEN-T Core Network would be fulfilled on Polish territory.

LNG refuelling is planned for all maritime and inland ports in the TEN-T Core Network.

The Polish NPF displays no commitment towards hydrogen in the next future.

The Polish NPF contains a comprehensive list of measures; however, most of them are still only under consideration or in an early stage of the adoption process. Very few are already in place. Some of the measures, especially the ones targeting to improve the economics of AF, can be considered having a medium impact on market actor's decisions. Poland has also defined ambitious targets for low emitting vehicles in fleets of companies performing public services and fleets of public institutions. Direct incentives are foreseen aiming in increasing the AFV market share. The Polish NPF also contains targets for increasing shore-side electricity supply in its maritime ports.

The consideration of the interests of regional and local authorities, as well as stakeholders during the drafting of the Polish NPF is not evident throughout the text of the NPF. This issue should be strengthened.

Poland did not present any evidence of coordinating its plans on alternative fuels infrastructure with other countries, especially neighbouring. It is advised to provide evidence of existing collaborations and planning or to engage in such cooperation.

5.21.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.21.2-1 Checklist Table

Article of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes/ No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, Waterborne, Rail / Electricity, CNG, LNG, H2, biocomponents		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, Waterborne, Rail / Electricity, CNG, LNG, H2, biocomponents		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Combination / Combination		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Combination / Combination		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road / All		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity, CNG, LNG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG, LNG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes			No
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points			No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, Waterborne / All		Yes

The checklist shows the requirements of Annex I from the Directive that are covered in the PL NIR.

Regarding the combinations of AF and transport mode, electricity/road, CNG/road and LNG/road are partially covered for AFV and AFI. LPG for road is mentioned. About the remaining combinations, the Polish NIR does not offer exhaustive quantitative future AFI targets or AFV estimates.

The Polish NIR reports 26 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify eight AF/transport mode clusters of measures, all assessable.

5.21.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.21.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	3,338	769 (1)	76,898	6,400	1,029,470	NA	1,900,000 (2)	NA
	Change NIR vs NPF [%]			0.00%	-6.69%	0.00%			
	Attainment [%]			4.34%	12.02%	0.32%		0.18%	
CNG / road	NIR	8,490	26 (1)	9,592	76	54,206	102	60,871	NA
	Change NIR vs NPF [%]			0.00%	5.56%	0.00%	218.75%		
	Attainment [%]			88.51%	34.21%	15.66%	25.49%	13.95%	
LNG / road	NIR	235	3 (1)	492	NA	2,745	14	4,023	NA
	Change NIR vs NPF [%]			0.00%		-8.50%	0.00%		
	Attainment [%]			47.76%		8.56%	21.43%	5.84%	
LNG / water (maritime)	NIR	NA	NA	NA	NA	NA	4	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]								
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	2,994,644 (1)	7,432 (1)	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

(1) Value taken from EAFO 2018 (absent in NIR)
(2) This value is mentioned in the PL NIR but not officially reported in the accompanying excel file

5.21.3.1 Road transport

5.21.3.1.1 Electricity

Vehicles

Poland recorded a total of 3,338 electric vehicles in use in 2018 (of which 3,018 were passenger cars and 320 buses and coaches). The Polish NIR confirms the EV estimates presented in the NPF for the years 2020 and 2025 (76,898 and 1,029,470 EVs, respectively) and adds a new estimate for 2030 (1,900,00 EVs) that was not present in the NPF. The level of ambition in the PL NIR remains the same as in the NPF. Concerning the heavy-duty sector, the Polish NIR does not provide specific information for the years 2020-2030.

The 2018 ***attainment*** of future EV estimates is 4.34% for 2020 and 0.18% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Poland is equal to 69%.

Infrastructure

The PL NIR does not provide information on the number of publicly accessible recharging points in Poland in 2018. The value of 769 reported in Table 5.21.3-1 is taken from EAFO 2018 database. The target for publicly accessible recharging points in 2020 provided in the PL NIR is 6,400, almost 7% lower than in the NPF, of which 6,000 are normal power (≤22kW) points and 400 high power (>22kW) points. Similarly to the NPF, no targets for 2025 and 2030 are provided in the PL NIR. Similarly to the vehicles, the level of ambition for infrastructure in the PL NIR appears the same as in the NPF.

The 2018 ***attainment*** of future public recharging infrastructure targets is 12.02% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Poland is equal to 111%.

Ratio

Based on the PL NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. For 2025 and 2030 the sufficiency index could not be computed, while for 2020 it exceeds the value of 10. It can be considered still adequate but the trend from the previous years raises some doubts about it adequacy also after 2020.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**Electricity**	3.12		4.34	12.02		

Information on charging efficiency

Information is not available in the Polish NIR.

5.21.3.1.2 CNG

Vehicles

Poland reported 8,490 CNG vehicles in use in 2018, of which 5,339 were passenger cars, 2,405 LCVs, 177 HCVs and 569 buses and coaches. Concerning the years 2020 and 2025, the PL NIR confirms the NPF estimates (respectively 9,592 and 54,206 CNG vehicles). In addition, the PL NIR presents an estimate of 60,871 CNG vehicles in 2030, which was absent in the NPF. This new estimate is not accompanied by details on the heavy-duty vehicles.

The 2018 ***attainment*** of future CNG vehicles estimates is 88.51% for 2020 and 13.95% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Poland is equal to 30%.

Infrastructure

The PL NIR does not provide information on the number of CNG refuelling points in Poland in 2018. The value of 26 reported in Table 5.21.3-1 is taken from EAFO 2018 database. However, the PL NIR does report that 28 CNG refuelling points were in place at the end of August 2019. The PL NIR also reports that Poland aims to achieve 76 CNG refuelling points in 2020 and 102 in 2025. No target for 2030 was indicated. The value for 2020 is in line with the NPF (5.56% higher) while the value for 2025 is remarkably higher (+218.75%) but this could be due to an incorrect reporting of the original value in the PL NPF.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 34.21% for 2020 and 25.49% for 2025. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible CNG refuelling infrastructure evolution planned by Poland is equal to 16%.

Ratio

Based on the PL NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. The values not shown could not be computed as vehicle estimates and/or targets for infrastructure were not given. According to the available data, the sufficiency index is always below the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**CNG**	66.23		326.54	126.21	531.43	

5.21.3.1.3 LNG

Vehicles

Poland recorded 235 LNG vehicles in 2018, all in the heavy-duty sector (200 HCVs and 35 buses and coaches). Regarding next years, the PL NIR confirms the NPF estimate for 2020 (492 LNG vehicles) and decreases the estimate for 2025 (2,745 compared to 3,000 in the NPF). The PL NIR reports also that in 2030 the number of LNG vehicles is expected to increase to 4023 (this value was not present in the NPF). This estimated growth is planned mainly for the heavy-duty sector.

The 2018 ***attainment*** of future LNG vehicles estimates is 47.76% for 2020 and 5.84% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Poland from 2016 until 2018 for LNG vehicles deployment is 4.49% of the overall planned deployment during the period 2016-2030.

Infrastructure

The PL NIR does not provide information on the number of LNG refuelling points in Poland in 2018. The value of three reported in Table 5.21.3-1 is taken from EAFO 2018 database. As for the next decade, the PL NIR only confirms for 2025 the NPF target of 14 publicly accessible LNG refuelling points, to be developed on the TEN-T network.

The 2018 ***attainment*** of future LNG refuelling infrastructure target could only be calculated with respect to 2025 and is equal to 21.43%, while the ***progress*** could not be computed.

Ratio

Based on the PL NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road. Obviously, the sufficiency indexes for 2020 and 2030 could not be computed as targets for infrastructure were not indicated.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LNG**	19.00		78.33		196.07	

5.21.3.1.4 Hydrogen

Vehicles

Information is not available in the PL NIR.

Infrastructure

Information is not available in the PL NIR on the hydrogen infrastructure development, but financial support for such projects is foreseen within the Polish Low-Emission Transport Fund.

Ratio

As no information has been provided for vehicles and infrastructure, the sufficiency index could not be computed.

5.21.3.1.5 Biofuels

Vehicles

Information is not available in the Polish NIR.

Infrastructure

The PL NIR reports that there is no obligation to obtain a licence for the production of bio-components used for the production of liquid fuels or liquid biofuels. Producers of bio-components are only obliged to register with the Producer Register, kept by the National Support Centre for Agriculture.

5.21.3.1.6 LPG

Vehicles

Information is not available in the Polish NIR. The value shown in Table 5.21.3-1 (2,994,644 LPG vehicles in 2018) is taken from EAFO.

Infrastructure

The Polish NIR, similarly to the NPF, does not report any past of future data on LPG infrastructure. The 2018 value of 7,432 publicly accessible LPG refuelling points, shown in Table 5.21.3-1, is taken from EAFO.

Ratio

Based on the PL NPF and EAFO data, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road. Only the ratios for 2016 and 2018 could be computed.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**LPG**	537.64*		402.94*			

* computed with values taken from NPF and EAFO

5.21.3.2 Rail transport

5.21.3.2.1 Electricity

Vehicles

Information is not available in the Polish NIR.

Infrastructure

Information is not available in the Polish NIR.

5.21.3.3 Waterborne transport (maritime)

5.21.3.3.1 Electricity

Vessels

Information is not available in the Polish NIR.

Infrastructure

Information is not available in the Polish NIR.

5.21.3.3.2 LNG

Vessels

Information is not available in the Polish NIR.

Infrastructure

The PL NPF had claimed that "*Because of insufficient demand, there is currently no need to build fixed LNG bunkering installations in Polish ports. It is enough to use tank trucks or bunker vessels for this purpose".* Despite that, the NPF had provided a provisional plan to develop by 2025 infrastructure for provision of LNG bunkering services in the ports of Gdańsk, Gdynia, Szczecin, and Świnoujście, within the TEN-T Core Network. The PL NIR confirms this plan.

Since the current LNG refuelling infrastructure situation in the maritime ports was not provided, the 2018 ***attainment*** and ***progress*** could not be computed.

5.21.3.4 Waterborne transport (inland)

Information is not available in the Polish NIR.

5.21.3.5 Air transport

5.21.3.5.1 Electricity

Airplanes

Information is not available in the Polish NIR.

Infrastructure (for stationary airplanes)

Information is not available in the Polish NIR.

5.21.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is unavailable in the Polish NIR.

Infrastructure

The Polish NIR makes only some general considerations of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network.

5.21.4 *Measures assessment*

The measures listed in the Polish NIR are not differentiated at regional level. As the NPF, the Polish NIR contains an extensive and detailed description of measures. They cover a wide variety of AFs and transport modes, however the vast majority focuses on electricity and natural gas as AF and on road as transport mode. In comparison to the NPF, the measures in the PL NIR include hydrogen, which is an additional value to the program. For example, there is the possibility for financing projects for hydrogen use in maritime transport. Shore-side electricity supply and LNG refuelling infrastructure for ships were in some way addressed in the NPF but after transposition of the legal acts they are not further reported in the NIR. The focus on CNG development is strong in Poland and measures continue to support further development.

5.21.4.1 Legal measures

The Polish NIR contains 10 legal measures (versus 18 in the NPF) to promote AF, with detailed descriptions. Measures focusing on defining the legislative framework for AF deployment were not reported in the NIR, while the law is now developed and functioning. Most of the NIR measures are covered by the *Act of 11 January 2018 on electromobility and alternative fuels* that addresses entirely or partly the topic of alternative fuels and by national legal acts transposing EU Directives. The Low-Emission Transport Fund to finance the measures implementation has been established, scheduled for release on the second half of 2019 and planned to be functional until the end of 2027. This is a main implementation tool providing financial support.

In line with the overall focus on electrification in the NIR, the most numerous cluster concerns electricity/road containing 9 measures out of which three are specifically dedicated to this pair of AF/transport mode while the other six cover also other AFs. Four measures target AFI and information tools development, one addresses production of bio-components for liquid fuels or liquid biofuels, three refer to AFV and involve obligation to involve AFVs in the fleets of administrative bodies, and one refers to the Low-Emission Fund that is presented as main financing tool.

Overall, the legal measures in the PL NIR show an increased ambition level compared to that in the NPF.

5.21.4.1.1 Legislative & Regulatory

Poland lists seven legal measures in its NIR that are implemented directly on the basis of by the *Act of 11 January 2018 on electromobility and alternative fuels* to allow for the implementation of principles for deployment of alternative fuels infrastructure, fuel quality and clean vehicles:

- recharging points and CNG/LNG stations development within the TEN-T Core Network,
- obligation to have electric vehicles in supreme or central state administration bodies and local self-government units
- no requirement to obtain a permit for the construction of a charging station
- no obligation to obtain a license for the production of bio-components used to produce liquid fuels or liquid biofuels
- establishing vehicle charging service as new type of business activity that does not require concession
- electronic application to provide information on the availability of infrastructure for charging electric vehicles.

5.21.4.1.2 Administrative

The Polish NIR only reports one administrative measure, on rules and standards for the construction of alternative fuels infrastructure. Also this measure is implemented in the *Act of 11 January 2018 on electromobility and alternative fuels* with statutory definitions created in line with Directive 2014/94/EU.

The updated *National policy framework for alternative fuels infrastructure development*, adopted by the Council of Ministers on 17 October 2018[3], assumes the introduction into the National Framework of technical specifications for hydrogen refuelling points, in accordance with the content of AFI Directive 2014/94/EU. Technical specifications are specified in the following standards:

- ISO / TS 20100, concerning the filling of hydrogen gas[4],
- ISO 17268, concerning connection devices for filling hydrogen in gaseous state in motor vehicles,
- ISO 14687-2, concerning the purity of hydrogen issued by hydrogen refuelling points.

The national framework will also be updated with information on consumer rights to choose an electricity seller to charge electric vehicles other than the household electricity supplier.

5.21.4.2 Policy measures

The PL NIR states that the policy direction in Poland is to encourage the introduction of alternative fuels vehicles and other sustainable transport modes. The main focus in the Polish NIR is on electric and CNG vehicles, where financial instruments are introduced for different vehicle categories. In comparison to the NPF, hydrogen is also acknowledged and supported in the NIR.

5.21.4.2.1 Measures to ensure national targets and objectives

Road transport

Most of the policy measures described in the Polish NIR can be categorised as measures to ensure national targets and objectives.

The implementation report lists a series of twelve (of which six financial, and six non-financial) policy measures, all related mainly to road transport, but not excluding other modes if the potential project would pass the eligibility criteria. Two of them involve taxation: tax reductions or exemptions for alternative fuels or for vehicle registration. Although both of them were present also in the NPF, changes have been implemented. Since then new caps are proposed for excise duty on all vehicles, starting from 1 January 2020 (50% lower than in the NPF), which could stimulate the economy, but at the same time the incentives to buy electric or hydrogen car dropped by 50% in comparison to the NPF level. The support for plug-in hybrid electric vehicles will be stopped in 2021.

The second tax incentive is a more favourable tax depreciation for electric vehicles purchased by companies and put into service after 18 December 2018. From January 2019, the tax-

[3] https://bip.kprm.gov.pl/kpr/form/r54402924429635,Krajowe-ramy-polityki-rozwoju-infrastruktury-paliw-alternatywnych.html

[4] Hydrogen standards have been amended by the Commission Delegated Regulation (EU) 2019/1745.

deductible costs have been increased by 70% for all types of vehicles. This change incentivises the purchase of the more expensive cars in general.

The draft implementing act to operationalise the Low-Emission Transport Fund foresees support through competitive and non-competitive procedures for all transport modes and AF. It covers projects indicated in the Electro-mobility Development Plan in Poland, in the NPF and in the Act on electro-mobility and alternative fuels. The values and types of support for investments linked to alternative fuels infrastructure and the purchase of vehicles are simply tabularised. Substantial support is available for purchase of EV, CNG/LNG and hydrogen vehicles (types M1, M2, N1-N3, L up to 30% of the purchase cost).

Other transport modes

The PL NIR does not report measures specifically addressing other transport modes (waterborne, air, railway). However, other modes are not excluded if the potential project would pass the eligibility criteria. The main instrument for financing the projects remains the Low-Emission Transport Fund.

5.21.4.2.2 Measures that can promote AFI in public transport services

Five of the policy measures described in the Polish NIR, can be categorised also as measures that can promote AFI in public transport services. All of them are existing measures: one is dealing with research on alternative fuels, and the remaining four provide financial support for buses and trolley buses at national level.

Buses

The draft implementing act to operationalise the Low-Emission Transport Fund foresees support through competitive and non-competitive procedures for all transport modes and AFs. The values and types of support for investments linked to alternative fuels infrastructure and the purchase of vehicles are simply tabularised. Substantial support is available for EV (55% of the purchase cost), CNG/LNG (15%) and hydrogen (55%) fuelled buses and electric trolley buses (45%).

Also research aimed at developing new types of bio-components, liquid biofuels, other renewable fuels, or the use of CNG or LNG, including that derived from biomethane, or hydrogen, or electricity is subsidised. Transport projects or research towards new design-related solutions in this area, up to PLN 5,000,000, can obtain financing up to 25%, 50% or even 100% of eligible costs per project.

Other transport modes

Transport modes other than those indicated directly in Directive 2014/94/EU (inter alia, railway transport) may be taken into account under that Directive, but these measures are not a mandatory part of Directive. As railway transport is not a transport mode for which limited alternatives to fossil fuels are available in Poland, it is not considered necessary to set targets for railway transport in the NIR.

5.21.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Support for private electro-mobility infrastructure is provided as the possibility of financial support for normal power (≤22kW) recharging stations, up to 50% of eligible costs, but with a cap of PLN 25,500 per station. The main instrument for financing the projects remains the Low-Emission Transport Fund, but no allocations/denominations have been indicated.

5.21.4.3 Deployment and manufacturing support

5.21.4.3.1 AFI deployment

Both categories, AFI deployment and support of manufacturing plants for AF technologies, fall under funding from the Low-Emission Transport Fund with no denominations given. As no allocations have been given, the quantitative assessment is not possible.

5.21.4.3.2 Support of manufacturing plants for AF technologies

Both categories, AFI deployment and support of manufacturing plants for AF technologies, fall under funding from the Low-Emission Transport Fund with no denominations given. As no allocations have been given, the quantitative assessment is not possible.

5.21.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructure

Information is not available in the Polish NIR.

5.21.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.21.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, all the identified clusters can be considered comprehensive, however all get a low overall score with the exception of the electricity/road cluster that obtains a medium score. The reason for this overall situation is that, although in principle the measures look quite promising and with a wide scope, they cannot be properly assessed, as the specific allocations to support the attainment of the declared targets and objectives were not given. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the partial lack of objectives (especially regarding future infrastructure) and information related to budget allocations, does not allow to put this assessment in the right perspective. However, on the basis of a comparison of the Polish measures with those provided by other Member States, it can be said that the measures for the pair electricity/road might have a medium impact while all the other might have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all pairs.

Table 5.21.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	L	C	**L**	+
LNG	Road	L	C	**L**	+
	Water - maritime	L	C	**L**	+
	Water - inland				
Biofuel	Road	L	C	**L**	+
H2	Road	L	C	**L**	+
Electricity	Water - maritime	L	C	**L**	+
	Air	L	C	**L**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.21.4.5 Research, Technological Development & Demonstration

Four measures for financing the RTD&D activities are given for Poland. The first one is the Low-Emission Transport Fund, where by the end of 2027, the resources available to the Fund will have amounted to more than PLN 6.7 billion. All projects indicated in the *Electromobility Development Plan in Poland*, NPF and *Act on electromobility and alternative fuels* are supposed to be financed from the Low-Emission Transport Fund.

On top of that, financial support for R&D is granted by the National Centre for Research and Development. Funding amounting to:

a) PLN 1,579,000 has been established to co-fund R&D related to road transport based on natural gas,
b) PLN 11,030,800 has been established to co-fund R&D related to road transport based on hydrogen,
c) PLN 14,069,404 has been established to co-fund R&D related to road transport based on electricity.

Compared to the NPF, the PL NIR shows that the financing instruments for RTD&D projects have been established.

5.21.5 *Additional information on alternative fuels infrastructure developments*

The Polish NIR provides information on the changes in fuel use but only until 2018 (see Table 5.21.5-1). As no future estimates were provided, one can only comment on the slight decrease of gasoline and LPG use for road transport, accompanied with a growing use of biofuels and, to a much lesser extent, of CNG. The use of electricity as a fuel for transport is still marginal.

No noticeable LNG use in maritime transport is reported. Marine gas oil is the dominant fuel for maritime and inland waterways.

Table 5.21.5-1 Changes in fuel use in transport sector (2016-2018)

MODE OF TRANSPORT	FUEL	Fuels use [%]		
		2016	2017	2018
Road	Gasoline	**21.69%**	**20.42%**	**20.31%**
	Diesel	**65.00%**	**66.84%**	**65.49%**
	Electricity	0.01%	0.01%	0.01%
	CNG	0.09%	0.06%	0.41%
	LPG	10.66%	9.74%	9.56%
	Biofuels	2.55%	2.93%	4.22%
	Other AF			
	Total Road	**100.00%**	**100.00%**	**100.00%**
Maritime	Marine gas oil	72.35%	81.07%	72.40%
	Marine diesel oil	27.65%	18.93%	27.60%
Inland waterways	Marine gas oil	100%	100%	100%

5.21.6 *Summary of the assessment*

Tabular overview

Table 5.21.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode						
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	1,010**	1,722**	57**	NA	NA	NA	2,914,000**
		Situation (2018)	3,338	8,490	235	NA	NA	NA	2,994,644**
		Estimate (2030)	1,900,000***	60,871	4,023	NA	NA	NA	NA
		Future share (2030) [%]	6.86%	0.22%	0.25%				
		Estimate attainment (2018 vs 2030) [%]	0.18%	13.95%	5.84%				
		Progress (2018)	adequate	adequate					
Publicly accessible AF Infrastructure		Past situation (2016)	324	26	3*	NA	NA	0	5,420*
		Situation (2018)	769**	26**	3**	NA	NA	0	7,432**
		Target (2030)	NA	NA	NA	NA	NA	NA	NA
		Target attainment (2018 vs 2030) [%]							
		Progress (2018)	slow	slow					
Sufficiency Index		2016	3.12	66.23	19.00				537.64
		2018	4.34	326.54	78.33				402.94
		2020	12.02	126.21					
		2025		531.43	196.07				
		2030							
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+	+		+	=
	Policy measures + Deployment & manufacturing support	Score	M	L	L	L		L	
		Comprehensiveness	C	C	C	C		C	
		Impact	M	L	L	L		L	
		Ambition (NIR vs NPF)	+	+	+	+		+	
	RTD&D	Ambition (NIR vs NPF)							

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Value taken or calculated from PL NPF; ** Value taken from EAFO (absent in both NPF and NIR); ***Value mentioned in the PL NIR but not officially reported in the accompanying excel file.

The Polish NIR only partially covers the whole AFID period (2016-2030). The Polish government took actions to fulfil its NPF, specifically implementing legal changes announced in the NPF, as well as by constituting the Low-Emission Transport Fund. The Polish NIR addresses several requirements of Annex I of the Directive, but it does not provide information on the methodology applied to take account of the charging efficiency of high power recharging points and it does not provide considerations on any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Polish NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** - Poland recorded a total of 3,338 electric vehicles in use in 2018 (of which 3,018 were passenger cars and 320 buses and coaches). Poland is progressing adequately towards reaching the envisaged EV estimates but slowly in terms of recharging infrastructure. With regards to the latter, the targeted number of publicly accessible recharging points in 2020 is slightly less ambitious in the NIR than in the NPF (-6.69%). The sufficiency index deteriorates slightly over time. In 2020 it can still be considered adequate, but the trend raises some doubts about it adequacy also after 2020. The Polish NIR does not give information on the foreseen electric heavy-duty vehicles by 2030.
- **CNG** - The second fastest growing alternative fuel in Poland is CNG. According to the Polish NIR, the number of CNG vehicles will be growing from 8,490 reported for 2018, up to 60,871 in 2030, which corresponds to adequate progress. While the number of heavy-duty vehicles is reported for 2018 (177 HCVs and 569 buses and coaches) no information is given for 2030. As for CNG infrastructure, the targeted number of CNG refuelling points for 2020 is higher (5.56%) in the NIR than in NPF. Also, the target value for 2025 in the NIR is remarkably higher (+218.75%) but this could be due to an incorrect reporting of the original value in the PL NPF. The 2018 situation corresponds to a slow progress towards reaching these envisaged targets. The sufficiency index is always below 600.
- **LNG** - The Polish NIR foresees a development of LNG for road transport. It is worth noting that the whole LNG/road pair is reported mainly for the heavy-duty sector (200 HCVs and 35 buses and coaches were recorded in 2018). The progress obtained from 2016 till 2018 by Poland for LNG vehicles deployment is 4.49% of the overall planned deployment during the period 2016-2030. By 2025, the construction and deployment of 14 public LNG refuelling points is planned on the TEN-T network.
- **Hydrogen** – Similarly to the NPF, the NIR does not report any vehicle estimate or infrastructure target until 2030, but foresees the possibility of financial support for eligible projects on hydrogen vehicles and refuelling infrastructure within the Low-Emission Transport Fund.
- **Biofuels** – The PL NIR only reports on the lack of obligation to obtain a licence for the production of bio-components used for the production of liquid fuels or liquid biofuels.
- **LPG** – LPG is not taken into consideration in the Polish NIR, even if in practice it plays a considerable role in the Polish transport system.

Rail transport

Information is not available in the Polish NIR.

Waterborne transport (maritime)

- **Electricity –** Information is not available in the Polish NIR.
- **LNG** - While in the NPF Poland claimed that "*Because of insufficient demand, there is currently no need to build fixed LNG bunkering installations in Polish ports. It is enough to use tank trucks or bunker vessels for this purpose.",* the PL NIR provides some new elements, as Poland plans to develop 4 LNG refuelling points in the TEN-T Core maritime ports by 2025. At the same time, no plans for LNG vessels are revealed.

Waterborne transport (inland)

Information is not available in the Polish NIR.

Air transport

Information is not available in the Polish NIR.

The Polish NIR contains an extensive and detailed description of **measures**. They cover a wide variety of AFs and transport modes, however the vast majority focuses on electricity and natural gas as AF and on road as transport mode. An overall assessment of the legal measures is that the PL NIR shows an increased ambition level compared to the NPF.

With reference to the Policy and Deployment & Manufacturing support measures, financial instruments are introduced for different vehicle categories. In comparison to NPF, hydrogen is also acknowledged and supported in the NIR. In terms of expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the partial lack of objectives (especially regarding future infrastructure) and information related to budget allocations, does not allow to put this assessment in the right perspective. However, on the basis of a comparison of the Polish measures with those provided by other Member States, it can be said that the measures for the pair electricity/road might have a medium impact while all the other might have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing measures support measures has increased for all pairs.

The financial support for the measures implementation will be provided mainly from the national Low-Emission Transport Fund, but some support from EU funds is also taken into consideration, mainly in case of RTD&D. Although the government of Poland officially excludes hydrogen from its plans, the prominence of this alternative fuel in support measures, particularly RTD&D funding, is noteworthy.

5.21.7 *Final remarks*

The Polish NIR provides a rather comprehensive report on the efforts to implement the Directive. The NIR complies, to a certain extent, with the requirements of Annex I to the Directive. However, the NIR does not set targets for electricity recharging points for 2025 and 2030 as well as for CNG and LNG refuelling points for road and maritime transport in 2030. Information is not available on the LNG planning for inland water transport. Furthermore, the NIR does not provide information on existing and future plans for the supply of electricity in ports and airports. The NIR includes an elaborated list of measures; however, they are mainly focused on road transport and, in particular, on its electrification.

For electricity, the NIR estimates that approximately more than one million electric vehicles could be on the road in Poland by 2025 and almost two million by 2030, representing about 7% of the fleet by that time. Taking into account the current situation, fleet and existing trends, this level of ambition does not appear to be fully compatible with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. Furthermore, Poland should provide further information on its targets for recharging points by 2025 and 2030. No information on charging efficiency is provided. Further information should be given on shore side electricity, electricity supply for stationary aircraft and rail transport. Poland should also report on its plans for further electrification of these modes of transport.

Regarding hydrogen for transport, the NIR does not report any vehicle estimates or infrastructure target until 2030, merely indicating that Poland provides financial support to vehicles and refuelling infrastructure as part of its Low-Emission Transport Fund. It would be relevant that Poland provides more information on how to ensure EU-wide connectivity for HCEV.

Concerning natural gas, the NIR shows a target of 60,871 CNG vehicles in 2030. Although the number of CNG vehicles is considered to increase in Poland until 2030, they would only represent 0.22% of the future fleet in 2030 according to the NIR. For 2025, 102 CNG refuelling points are planned, which seems sufficient for the estimated CNG fleet. For LNG, only a moderate increase of heavy-duty vehicles is expected in the next years. Furthermore, the NIR estimates 14 LNG refuelling stations by 2025. The number of LNG refuelling points seem sufficient considering the length of Poland's TEN-T Core Network, provided that the refuelling points are widely distributed along the network. The current target is that LNG refuelling points will be installed in the four Polish ports in the TEN-T Core Network by 2025, thus complying with the requirements of the Directive. However, Poland should provide information on estimates for LNG vessels in its fleet. Nevertheless, no information is provided to ensure LNG refuelling in the two inland ports of the TEN-T Core Network by 2030.

Future LPG development is not taken into consideration in the Polish NIR, even if in practice it plays a considerable role in the Polish transport system (three million LPG vehicles and around 7,400 refuelling points). Future reporting should provide more information on LPG development.

Poland should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.21.8 *ANNEX - Description of the Member State*

On a surface area of 312,700 km², Poland has a population of 37.977 million people in 2018, which makes up for a population density of 121 inhabitants/km².

Number of main urban agglomerations

- 69 urban agglomerations > 50,000 inhabitants

In 2018, Poland achieves a per capita gross domestic product at market prices of €12,920, which represents a per capita gross domestic product in purchasing power standards of 70 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Poland is 3,834 km. The total road network length is 156,822 km, of which 1,637 km are motorways.

The following lengths of TEN-T Road Corridors are present in Poland: 1,832 km (51%) of the Baltic - Adriatic Corridor and 975 km (24%) of the North Sea - Baltic Corridor.

Through the TEN-T Road Corridors, Poland is connected with the following Member States:
- Germany (through the North Sea - Baltic Corridor)
- Lithuania (through the North Sea - Baltic Corridor)
- Slovakia (through the Baltic - Adriatic Corridor)
- Czechia (through the Baltic - Adriatic Corridor)

Number of registered road vehicles

At the end of 2018, Poland accounts for 30,061,644 registered road vehicles of which 23,429,016 are categorized as passenger cars, 2,649,198 as light goods vehicles, 1,108,075 as heavy goods vehicles and 119,471 as buses and coaches. The motorisation rate is 617 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 4 maritime ports in the TEN-T Core Network (Gdánsk, Gdynia, Świnoujście, Szczecin)
- 1 maritime port in the TEN-T Comprehensive Network
- 2 inland ports in the TEN-T Core Network (Świnoujście, Szczecin)
- 1 inland port in the TEN-T Comprehensive Network

Through the 65 km inland waterways TEN-T Core Network, Poland is connected with Germany through the North Sea – Baltic Corridor.

Number of airports in the TEN-T Core Network

- 8 airports in the TEN-T Core Network (Gdánsk, Katowice-Pyrzowice, Kraków, Łódź, Poznań, Szczecin, Warszawa, Wrocław)
- 2 airports in the TEN-T Comprehensive Network

5.22 Portugal (PT)

5.22.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Portuguese NPF the Commission concluded:

The Portuguese NPF addresses most of the requirements of Article 3. It contains a description of the current state and future estimates for alternative fuels vehicles in the transport sector and establishes targets as required by Article 3 of the Directive, except LNG refuelling in its TEN-T Core Network inland port.

Thanks to its strategy to develop electric recharging infrastructure, Portugal was an early mover. However, the stock of EV has grown slowly, as corroborated by the sufficiency index. The ratio of EV per recharging point is low, suggesting that Portugal may consider implementing further support measures, specifically designed to stimulate the market uptake of EVs, in order to align the deployment of EV infrastructure with EVs on the road. The recent introduction of EV purchase subsidies (2,250 EUR for BEVs and 1,125 EUR for PHEVs) is likely to have a slightly favourable impact in this regard. The future estimate of EVs in Portugal is modest with a share of about 0.23% in 2020. The role of two-wheelers in Portugal can also be highlighted. The NPF estimates ca. 20,000 electric two-wheelers in 2020. The Portuguese NPF does not discuss electricity supply for stationary airplanes. Furthermore, the provision of shore-side electricity supply for vessels and seagoing ships is minimally addressed, but not articulated.

There appears to be a need to fulfil the distance requirements for CNG along several routes of the TEN-T Core Network. In terms of LNG, the NPF defines 2025 targets, both for road and maritime transport. It also proposes supporting policy measures which, in principle, may lead to achieving these targets. However, appropriate coverage of LNG refuelling seems not to be ensured for the complete road TEN-T Core Network crossing Portuguese territory. Given the weight of LPG in the Portuguese alternative fuels vehicle stock, the NPF offers a target for LPG refuelling points in 2020.

The Portuguese NPF, at the moment, does not foresee any targets for hydrogen for transport.

The NPF is detailed in describing past legislation and contains a relatively abundant list of policy measures, structured by type of alternative fuel. Positively, the Portuguese NPF tackles infrastructure deployment in the realms of public transport and private electro-mobility. However, there is no indication of the tentative size of funding to be earmarked for the implementation of these measures. The rate of tax exemptions is not communicated either. This is an important issue because, as could be seen from past plans (e.g. EV purchase subsidy), translating these into action is far from a simple process.

Finally, the NPF highlights at several instances the importance of MS cooperation, particularly with Spain.

5.22.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.22.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, water / Electricity, LNG, H2, biofuels, AF (in general)		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, water / Electricity, AF (in general)		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, rail / Electricity		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Road / Electricity		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.	Water, air / AF (in general)		No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, air / Electricty, biofuels, H2		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	All		Yes

The checklist shows the requirements of Annex I from the Directive that are covered in the PT NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity, CNG, LNG, hydrogen and LPG are covered for road transport. Electricity is also partially covered in rail and water transport. All the other combinations are either absent or not applicable. The PT NIR mentions that, particularly concerning air and water transport, more reflection is still needed on the scale of such infrastructure and on the detailed setting of objectives.

The Portuguese NIR reports more than 50 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify 7 AF/transport mode clusters of measures, all assessable.

5.22.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.22.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	20,692	1,260	59,208	2,200	277,300	15,000	896,160	36,000
	Change NIR vs NPF [%]			322.91%	-8.10%	516.22%		1020.20%	
	Attainment [%]			34.95%	57.27%	7.46%	8.40%	2.31%	3.50%
CNG / road	NIR	590	8	1,400	13	2,300	20	3,100	26
	Change NIR vs NPF [%]			63.17%	62.50%		17.65%		
	Attainment [%]			42.14%	61.54%	25.65%	40.00%	19.03%	30.77%
LNG / road	NIR	4	5	163	11	700	18	1,400	24
	Change NIR vs NPF [%]				83.33%	250.00%	63.64%		
	Attainment [%]			2.45%	45.45%	0.57%	27.78%	0.29%	20.83%
LNG / water (maritime)	NIR	NA	NA	NA	NA	NA	5	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	0	0	0	0	600	25	2,250	100
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	56,883	383	58,345	397	54,434	320	44,113	200
	Change NIR vs NPF [%]				1.02%				
	Attainment [%]			97.49%	96.47%				

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.22.3.1 Road transport

5.22.3.1.1 Electricity

Vehicles

Portugal recorded a total of 20,692 EVs in 2018, of which the majority were passenger cars (10,104 BEV and 9,822 PHEV), followed by 705 LCVs, 10 HCVs and 51 buses and coaches, all BEVs.

The PT NIR's estimates for the number of electric vehicles are based on the National Energy and Climate Plan 2021-2030 (NECP 2030). The Plan established more ambitious targets and objectives for Portugal, promoting the decarbonisation of various sectors with a view to attaining carbon neutrality by 2050. The NIR affirms that, by 2019, the number of electric vehicles in circulation had already exceeded the estimate set out in the NPF for 2020 (34,000 of which 20,000 powered two wheelers). The NIR does not provide estimates for electric two-wheelers, which instead were reported in the NPF (20,000, 65,000 and 99,000 powered two-wheelers respectively for 2020, 2025 and 2030).

The NIR provides estimates for both the number of BEV and for PHEV: in particular, 59,208 vehicles are estimated in 2020. Of these, 56,000 are passenger cars (30,000 BEVs and 26,000 PHEVs), in addition to 3,000 LCVs, 18 HCVs and 190 buses and coaches, all BEVs. For 2025, the PT NIR estimates 277,300 vehicles, of which 250,000 passenger cars (150,000 BEVs and 100,000 PHEVs), 26,000 LCVs, 420 HCVs and 880 buses and coaches, all BEVs. For 2030, 896,160 vehicles are also estimated, of which 806,000 passenger cars (550,000 BEVs and 256,000 PHEVs), 86,000 LCVs, 1,960 HCVs and 2,200 buses and coaches, all BEVs.

These estimates show an increased ambition in the number of electric vehicles compared to the NPF (e.g. + 322.91% in 2020, + 516.22% in 2025 and + 1020.20% in 2030).

The 2018 ***attainment*** of future EV estimates is 34.95% for 2020, 7.46% for 2025 and 2.31% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Portugal is equal to 45%.

Infrastructure

Portugal recorded 1,260 publicly accessible recharging points in 2018 (Table 5.22.3-1), of which 1,087 were normal power recharging points and 173 high power recharging points. Portugal had already provided a target for 2020 for publicly accessible recharging points in its NPF (2,394), which was slightly higher than the revised target for 2020 provided in the NIR (2,200). The PT NIR also presents targets for 2025 (15,000 recharging points, of which 3,650 high power points) and for 2030 (36,000 recharging points, of which 12,000 high power points).

The 2018 ***attainment*** of future public recharging infrastructure targets is 57.27% for 2020, 8.40% for 2025 and 3.50% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Portugal is equal to 31%.

Ratio

Based on the PT NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that for the next decade the foreseen sufficiency index is expected to fluctuate around the value of 20, which is above 10 and thus risks to become inadequate to support EV uptake, even considering the average (over the decade) 25% high power recharging points share.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	4.34	8.59	16.42	26.91	18.49	24.89

Information on charging efficiency

Information is not available in the PT NIR.

5.22.3.1.2 CNG

Vehicles

The total number of CNG vehicles recorded by Portugal in 2018 was 590 (Table 5.22.3-1), of which 39 were passenger cars, 46 LCVs, 128 HCVs and 377 buses and coaches. The Portuguese NPF did not contain any estimate for CNG vehicles in 2020, 2025 and 2030, instead the PT NIR provides estimates but only for HCV and buses and coaches. As these appear to be the large majority of CNG vehicles in the next decade, the 2018 ***attainment*** and ***progress*** were nonetheless computed.

The 2018 ***attainment*** of future CNG vehicles estimates is 42.14% for 2020, 25.65% for 2025 and 19.03% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for CNG vehicles fleet evolution planned by Portugal is equal to 15%.

Infrastructure

Portugal recorded 8 publicly accessible CNG refuelling points in 2018, see Table 5.22.3-1. The NPF had provided a target of 8 public refuelling points for 2020 and 17 for 2025. The PT NIR presents revised targets for 2020 (13 points) and for 2025 (20 points), which are, respectively, 63% and 18% higher than in the NPF, and presents a new target of 26 public refuelling points for 2030.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 61.54% for 2020, 40% for 2025 and 30.77% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Portugal is equal to 9%.

Ratio

Based on the PT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that for the next decade the foreseen sufficiency index is well below the indicative value of 600 (see Section 2.1).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**CNG**	47.25	51.63	73.75	107.69	115.00	119.23

5.22.3.1.3 LNG

Vehicles

Portugal recorded a fleet of 4 LNG vehicles in use in 2018: one passenger car and 3 HCVs (Table 5.22.3-1). The Portuguese NPF had only provided an estimate of 200 LNG vehicles in 2025, all HCVs. The PT NIR provides a new estimate for 2020 (163 LNG vehicles), a revised estimate for 2025 (700 vehicles, which is 250% more ambitious than in the NPF) and a new estimate for 2030 (1,400 vehicles), all HCVs.

The 2018 ***attainment*** of future LNG vehicles estimates is 2.45% for 2020, 0.57% for 2025 and 0.29% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Portugal from 2016 until 2018 for LNG vehicles deployment is 0.14% of the overall planned deployment during the period 2016-2030.

Infrastructure

Table 5.22.3-1 shows that in 2018 there were already 5 publicly accessible LNG refuelling points in Portugal. The Portuguese NPF had only provided targets for 2020 (6 points) and 2025 (11 points). The NIR presents now revised targets of 11 and 18 publicly accessible LNG refuelling points for 2020 and 2025, respectively, which are about 83% and 64% higher than in the NPF. The NIR also presents a target of 24 publicly accessible LNG refuelling points in 2030. This is showing an increased ambition.

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is 45.45% for 2020, 27.78% for 2025 and 20.83% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Portugal from 2016 until 2018 for public LNG refuelling infrastructure deployment is 0.00% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the PT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LNG**	0.40	0.40	0.80	14.82	38.89	58.33

5.22.3.1.4 Hydrogen

Vehicles

The PT NIR indicates that there were no hydrogen-powered vehicles in Portugal in 2018. The NIR notes that the number of hydrogen vehicles is expected to start around 2025. Estimates for hydrogen vehicles are based on the new goals set out in the NECP 2030 and in the recently approved National Strategy on Hydrogen (EN-H2), which considers the use of hydrogen in transport and the creation of hydrogen refuelling points. The NIR estimates are 600 (500 passenger cars, 50 HCVs and 50 buses and coaches) in 2025 and 2,250 (1,000 passenger cars, 500 HCVs and 750 buses and coaches) in 2030. The PT NPF had not provided any estimate of hydrogen vehicles.

Because there were no hydrogen vehicles recorded in 2018, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Table 5.22.3-1 shows that in 2018 there were no hydrogen refuelling points in Portugal. The PT NPF had not provided any target of publicly accessible refuelling points. The NIR states that the objective is to have 25 hydrogen refuelling points (all 350-bar points) by 2025 and 100 points (all 350-bar points) by the end of 2030. This is showing an increase in ambition.

Because there is no hydrogen infrastructure in 2018, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the PT NIR, the following table shows the ratio between vehicles and public refuelling stations for the pair hydrogen/road until 2030.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**H2**					24.00	22.50

5.22.3.1.5 Biofuels

The Portuguese NIR does not provide quantitative information regarding vehicles fuelled by biofuels nor on related infrastructure. However, the PT NIR contains some details on the biofuels consumption in transport (see Section 5.22.5) and about the allocation, in the initial stage, of fiscal incentives such as exemptions from the tax on oil and energy products, which helped reinforce the foothold of this solution on the national market. The NIR also mentions that the NECP 2030 reinforces national ambitions concerning electric mobility and commitment to advanced biofuels, i.e. made from alternative raw materials.

Vehicles

Information is not available in the Portuguese NIR.

Infrastructure

Information is not available in the Portuguese NIR.

5.22.3.1.6 LPG

Vehicles

Portugal had a fleet of 56,883 LPG vehicles in use in 2018 (see Table 5.22.3-1), of which 56,213 were passenger cars, 620 LCVs, 45 HCVs and 5 buses and coaches. While the NPF had not provided LPG vehicle estimates for the next decade, the NIR presents such estimates, i.e. 58,345 vehicles (57,700 passenger cars, 600 LVCs, 40 HCVs and 5 buses and coaches) in 2020, 54,434 vehicles (54,000 passenger cars, 400 LVCs, 30 HCVs and 4 buses and coaches) in 2025 and 44,113 vehicles (44,000 passenger cars, 100 LCVs, 10 HCVs and 3 buses and coaches) in 2030.

The 2018 ***attainment*** of future LPG vehicles estimates is 97.49% for 2020. Because the PT NIR expects a decrease of the LPG vehicles fleet from 2025, no ***attainment*** for 2025 and 2030 and ***progress*** values have been computed

Infrastructure

Table 5.22.3-1 shows that in 2018 there were 383 publicly accessible LPG refuelling points in Portugal. The NIR targets are 397 points in 2020, 320 points in 2025 and 200 points in 2030. The NPF had only indicated a target for 2020, equal to 393 LPG refuelling points. The NIR states that the arrival of alternative technologies with better environmental and/or energy benefits led Portugal to focus more on other alternatives.

The 2018 ***attainment*** of future public LPG refuelling infrastructure targets is 96.47% for 2020. Because the Portuguese NIR expects a decrease of the publicly accessible LPG refuelling points from 2025, no ***attainment*** for 2025 and 2030 and ***progress*** values have been computed.

Ratio

Based on the PT NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LPG**	140.36	145.94	148.52	146.96	170.11	220.57

5.22.3.2 Rail transport

5.22.3.2.1 Electricity

Vehicles

The Portuguese NIR recorded 213 electric locomotives in 2018. However, the PT NIR did not provide estimates for the next decade.

Infrastructure

Information is not available in the Portuguese NIR. The NIR reports measures in place for the railway modernisation and electrification, as well as expansion plans for the metro network (see Section 5.22.4.3).

5.22.3.3 Waterborne transport (maritime)

5.22.3.3.1 Electricity

Vessels

The PT NIR mentions that at the Viana do Castelo shipyards work is ongoing to build vessels with a hybrid propulsion system, equipped with electric and combustion engines

Infrastructure

The PT NIR did not provide numerical data regarding the shore-side electricity supply points. However, the NIR reports that the NECP 2030 includes an action measure on the promotion of the development of infrastructure for the supply of renewable energy sources to vessels in ports.

5.22.3.3.2 LNG

Vessels

No quantitative information regarding vessels fuelled by LNG is provided in the Portuguese NIR. However, the PT NIR mentions that there are currently two Portuguese vessels fuelled by LNG, known as 'AUTO ECO' (IMO No 9736365) and 'AUTO ENERGY' (IMO No 9736377). Around 80 LNG-fuelled vessels stopped at Portuguese ports in 2019. The majority of these stopovers were linked to 35 LNG tankers which visited Portuguese ports (between 1 and 4 times at most in 2019).

Infrastructure

As for the supply of LNG at Portuguese ports, 13 truck-to-ship operations were carried out at the ports of Sines and Funchal between November 2017 and April 2018.

The NIR also states that in February 2020, a new LNG supply was carried out at the port of Sines. The LNG was loaded onto road tankers at the NG refuelling station at the Sines terminal and then supplied to the anchored vessel.

The NPF had set a target of 5 LNG refuelling points in 2025, however the PT NIR does not provide any confirmation/modification of this plan.

5.22.3.4 Waterborne transport (inland)

5.22.3.4.1 Electricity

Vessels

Information is not available in the Portuguese NIR.

Infrastructure

The PT NIR did not provide numerical data regarding the shore-side electricity supply points. However, the NIR reports that the NECP 2030 includes an action measure on the promotion of the development of infrastructure for the supply of renewable energy sources to vessels in ports.

5.22.3.4.2 LNG

There is no specific information on the use of LNG for waterborne inland transport, but it is reasonable to assume that some initiatives mentioned in Section 5.22.3.3.2 are applicable also in this case.

5.22.3.5 Air transport

5.22.3.5.1 Electricity

Information is not available in the Portuguese NIR.

5.22.3.5.2 Biofuels

Airplanes

Information is not available in the Portuguese NIR.

Infrastructure

As regards the need for refuelling points for renewable fuels to be used in airports belonging to the TEN-T, the NIR affirms that it is not yet possible to discuss this issue within the scope of this report, given the relatively recent changes in the PT energy and climate policy.

5.22.4 ***Measures assessment***

The Portuguese Implementation Report contains an extended portfolio of measures. The measures cover mostly road transport, in particular electricity and, to a lesser extent, CNG, hydrogen, LPG and LNG. The latter is also considered for waterborne transport. Electricity/rail is also partially covered. Biofuels are covered only in the Legal measures. The main driver for the measures presented in the PT NIR is the National Energy and Climate Plan 2021-2030 (NECP 2030), which is the main instrument of the Portuguese energy and climate policy for the next decade. The NECP 2030 includes the promotion of the decarbonisation in transport as a priority for the next decade. Accordingly, a significant number of measures in the NIR are oriented to foster deployment of electric and hydrogen vehicles and the respective recharging and refuelling infrastructure, to the detriment of other technologies which are considered to have less interesting environmental advantages by the Portuguese Government.

5.22.4.1 Legal measures

The Portuguese NIR contains 23 legal measures, which represent an increase compared to the 17 measures identified in the NPF. Most of the measures are accompanied by a detailed description; 15 measures appear only in the NIR, 8 are common to the NIR and the NPF, while 9 were only present in the NPF. Legal measures are implemented at national level and all the legal measures described in the NIR are existing or adopted.

On the basis of the available information, it can be considered that, compared to the NPF, the level of ambition of the legal measures has increased in the NIR for electricity, hydrogen, CNG and LPG for road transport and for LNG for maritime transport.

5.22.4.1.1 Legislative & Regulatory

Of all the legal measures described in the Portuguese NIR, 20 can be categorised as legislative and regulatory measures. Three measures are applicable to several transport modes, 16 measures are dedicated to road transport, one to waterborne.

Several national plans that concern alternative fuels are mentioned:

- National Energy and Climate Plan 2021-2030 (NECP 2030)
- National Strategy on Hydrogen (EN-H2)
- National Biorefinery Promotion Plan
- Plan for Electric Mobility in the Azores (PEMA 2018-2024);
- Electric Mobility Incentive Programme for the Autonomous Region of Madeira (PRIME-RAM)

Listed as well are the new Regulation on Electric Mobility, approved by the Energy Services Regulatory Authority (ERSE) establishing rules for the commercial relations between participants in the electric mobility system, and the Technical Guide to supply facilities for electric vehicles.

5.22.4.1.2 Administrative

Three legal measures described in the Portuguese NIR can be categorised as administrative measures. All these measures are specific for road transport.

The most relevant of these measures is the new Regulation on Electric Mobility establishing new provisions applicable to the exercise of electric mobility activities that come under the regulatory remit of the Energy Services Regulatory Authority (ERSE).

5.22.4.2 Policy measures

The Portuguese NIR contains 16 policy measures, which represents an increase compared to the 13 policy measures identified in the NPF. One of the policy measures described in the NIR refers to waterborne transport, while the other 15 refer to road transport. The Portuguese Government has put in place a significant number of financial incentives to foster the deployment of alternative fuels vehicles and related infrastructure. The majority of them are applicable at national level. The vast majority of the policy measures are targeting zero-emission transport, in particular electro-mobility. Most of the measures reported in the NIR are existing or existed, while only three of them are adopted or in process of adoption. Some measures, such as fiscal exemptions and reductions, are intended for several alternative fuels.

5.22.4.2.1 Measures to ensure national targets and objectives

Road transport

Various incentives have been granted in Portugal at both national and regional level to support the introduction of low emissions vehicles and the respective recharging infrastructure. The main listed measures include:

- Purchase subsidies for new 100% electric vehicles that have not been registered before on the consumer market (incentives of up to €3,000 for private individuals or legal persons);

- In the Autonomous Region of the Azores, financial incentives towards the acquisition of new electric vehicles and their recharging points (incentives of 10% of the amount paid, up to €3,000 per vehicle for private individuals and €2,000 per vehicle for legal persons; 50% of the amount paid for domestic recharging infrastructure, up to €500);
- In the Autonomous Region of Madeira, incentives towards the acquisition of new electric vehicles and their recharging points (in 2019, up to €10,000 per vehicle for private individuals and €7,500 in the case of legal persons; in 2020, €5,000 for private individual and €3,500 for legal persons);
- Replacement of service vehicles belonging to the fleets of bodies in charge of managing multi-municipal or inter-municipal systems (grants of €10,000 per electric vehicle and 75% of the total eligible expenditure on each recharging point, up to a maximum of €1,500 per recharging point, rising to €5,000 if the operation includes photovoltaic panels and/or energy storage devices);
- Incentives to support the installation of recharging points for electric vehicles on university campuses (eligible expenditure funded up to 100%, with limit of €5,000 per recharging point) and to support the acquisition, installation and public provision of rapid recharging points for electric vehicles;
- Exemption from vehicle tax for vehicles that are exclusively electric or powered by non-fuel renewable energies and a reduction in vehicle tax for vehicles powered by alternative energy sources, depending on the type of vehicle or fuel;
- Some 1,200 electric vehicles are expected to be added to the state’s fleet of vehicles by 2020. Smart recharging facilities integrated with network management by an electric mobility model (named MOBI.E) will also be introduced. The model consists of a charging system on a national scale, accessible to any user, with guarantees of technical and service interoperability, enabling access to any recharging point through a single registration or contract and authentication and access mechanism.

5.22.4.2.2 Measures that can promote AFI in public transport services

The following measures can be highlighted:

- Replacement of road vehicles used in public passenger transport entrusted with public service responsibilities, via the acquisition of new vehicles fuelled by CNG, LNG, hydrogen, electricity or plug-in hybrids (funding is granted for the difference between the purchase cost of the ‘clean bus’ and the purchase cost of an equivalent new bus compliant with the Euro VI standard; the grant goes up to a maximum of €100,000 in the case of CNG or LNG and €200,000 in the case of other technologies); the installation of the respective refuelling/recharging infrastructure is also funded;
- Support for the acquisition of new 100% electric vehicles for use in public transport activities involving the hiring of light passenger vehicles (taxi services) and the acquisition and installation of the respective charging facilities.

Waterborne transport

Measures to promote the use of cleaner fuel sources in inland waterway public transport, such as CNG, LNG, electricity and hydrogen, via the acquisition or conversion of vessels, and the installation of the respective refuelling/recharging points, have received support under a National Operational Programme. The eligible incentive corresponds to the difference between the purchase cost of the 'clean boat' and the expected cost of an equivalent diesel-fuelled boat complying with the maximum NOx limits under the Marpol Convention.

5.22.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The incentives to support the installation of recharging points for electric vehicles on university campuses (described in Section 5.22.4.2.1) are the only clearly mentioned case of measure to promote the deployment of private electro-mobility infrastructure. The incentives towards the acquisition of recharging points for domestic application in the Autonomous Region of the Azores (see Section 5.22.4.2.1) can also be mentioned. The NIR mentions that a Decree-Law intended to transpose Directive (EU) 2018/844 on the energy performance of buildings is now at its final stage of drafting. This legal act will ensure that the targets set out in the above-mentioned Directive will be ensured; the targets concern minimal recharging infrastructure required or the preparation for such infrastructure to be installed in car parks of either new residential and non-residential buildings or those undergoing significant refurbishment.

5.22.4.3 Deployment and manufacturing support

5.22.4.3.1 AFI deployment

The Portuguese NIR contains seven deployment support measures for AFI at national level, which, compared to the two measures identified in the NPF, represent an increase in ambition. Four of these measures are existing or existed, while three of them are in process of adoption. Six AFI deployment support measures refer to rail transport while one measure is targeting road transport.

These measures cover a range of projects, from the expansion of the Lisbon and Porto metro networks, to the acquisition of new rolling stocks, to the general modernisation and electrification of the Portuguese rail system.

The deployment measure dedicated to road transport deals with extending and improving the electric recharging infrastructure network. The PT NIR mentions that most of these measures have been supported with national and EU sources of funding.

Different incentives towards the acquisition of new recharging points were also introduced at national and regional level. These measures are described in detail in Section 5.22.4.2

5.22.4.3.2 Support of manufacturing plants for AF technologies

The PT NIR includes three measures regarding the support of manufacturing plants for AF technologies. All these measures are related to road electro-mobility. For example, the COMPETE programme provides support for the creation of a production unit devoted to the extrusion of aluminium and the machining of customised parts for the electric mobility segment.

Another example is the creation of an innovative centre of research dedicated to technological development for electric cars.

5.22.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Portuguese NIR.

5.22.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.22.4-1 presents an overview of the analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, seven clusters of measures are identified for the pairs electricity/road, CNG/road, LNG/water (inland), hydrogen/road, LPG/road, electricity/rail and electricity/water (inland).

Three of the seven assessable clusters score medium; the other four clusters score low. The vast majority of the measures are targeting the pair electricity/road, which is the main focus of the PT NIR set of measures. Only the clusters for the pairs electricity/road and electricity/rail can be considered comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road and electricity/rail have a medium impact, while all the other assessable clusters have a low impact.
As it can be seen in Table 5.22.4-1, compared to the NPF, the level of ambition has increased in the NIR for all the assessable clusters.

Table 5.22.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	L	N	**L**	+
LNG	Road				
	Water - maritime				
	Water - inland	L	N	**L**	+
H2	Road	L	N	**L**	+
LPG	Road	M	N	**L**	+
Electricity	Rail	M	C	**M**	+
	Water - inland	L	N	**L**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.22.4.5 Research, Technological Development & Demonstration

The Portuguese NIR lists eleven measures for RTD&D and innovation activities, which represent a significant increase compared to the one measure identified in the NPF. National financing and support for RTD&D and innovation projects target mainly electricity and hydrogen. In particular, the NIR highlights:

- The creation of collaborative laboratories, which are centres for technology transfer and support for innovation, driving collaboration between the science and technology community and enterprise, especially in the area of research into the production of advanced biofuels;
- The creation of a collaborative laboratory that would be a national and international reference as regards the most important components in the value chain for hydrogen, thereby fostering the development of new industries and services on the basis of highly qualified human resources;
- The funding of a project to demonstrate the main advantages of using electric vehicles to store clean energy and their energy storage capacity for a building or a community, in a circuit that is independent of the distribution network (Vehicle to Grid – V2G);
- The funding of a project to design, develop and produce solar electric vessels.

On the basis of the available information, it can be considered that, compared to the NPF, the level of ambition in the NIR has increased for RTD&D actions for electricity and hydrogen, especially for the road transport mode.

5.22.5 *Additional information on alternative fuels infrastructure developments*

The Portuguese NIR contains information on the fuels use in the transport sector (see Table 5.22.5-1). Biofuels are foreseen to increase progressively (from 5% in 2018 to 8% in 2025 and 2030), remaining the most significant alternative fuel in road transport for the next decade. Electricity is also expected to increase in 2025 (1%) and 2030 (3.8%) while LPG presents a slight decrease in the three years covered (2020, 2025 and 2030). No real increase in CNG and LNG use in road transport is expected. A decrease in diesel use is expected in the next decade.

The PT NIR also foresees a significant increase in LNG use in waterborne transport (15% in 2030), even though marine diesel and gas oil will continue to be the main fuels. Hydrogen use in waterborne transport is also expected to increase to 5% in 2030.

Table 5.22.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	**20.0%**	**20.0%**	**19.0%**	**20.2%**	21.2%	24.4%
	Diesel	**74.0%**	**75.0%**	**74.0%**	**71.6%**	68.6%	61.9%
	Electricity	0.0%	0.0%	0.0%	0.2%	1.0%	3.8%
	CNG	0.2%	0.2%	0.2%	0.1%	0.2%	0.5%
	LNG	0.0%	0.0%	0.1%	0.1%	0.2%	0.3%
	Hydrogen	0.0%	0.0%	0.0%	0.0%	0.1%	0.5%
	LPG	1.0%	1.0%	1.0%	0.8%	0.8%	0.6%
	Biofuels	5.0%	5.0%	5.0%	7.0%	8.0%	8.0%
	Total Road	**100%**	**101%**	**100%**	**100%**	**100%**	**100%**
Maritime and Inland waterway	Marine gas oil	28%	39%	39%	42%	36%	30%
	Marine diesel oil	72%	61%	61%	58%	54%	50%
	LNG	0%	0%	0%	0%	8%	15%
	Hydrogen	0%	0%	0%	0%	3%	5%
	Total Waterborne	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

5.22.6 *Summary of the assessment*

Tabular overview

Table 5.22.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode						
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	4,352	378	2	NA	NA	0	49,967
		Situation (2018)	20,692	590	4	NA	NA	0	56,883
		Estimate (2030)	896,160	3,100	1,400	NA	NA	2,250	44,113
		Future share (2030) [%]	14.32%	0.05%	0.74%			0.04%	0.70%
		Estimate attainment (2018 vs 2030) [%]	2.31%	19.03%	0.29%				
		Progress (2018)	adequate	adequate	0.14%				
Publicly accessible AF Infrastructure		Past situation (2016)	1,002	8	5	NA	NA	0	356
		Situation (2018)	1,260	8	5	NA	NA	0	383
		Target (2030)	36,000	26	24	NA	NA	100	200
		Target attainment (2018 vs 2030) [%]	3.50%	30.77%	20.83%				
		Progress (2018)	slow	slow	0.00%				
Sufficiency Index		2016	4.34	47.25	0.40				140.36
		2018	16.42	73.75	0.80				145.94
		2020	26.91	107.69	14.82				148.52
		2025	18.49	115.00	38.89			24.00	146.96
		2030	24.89	119.23	58.33			22.50	170.11
Measures	Legal measures	Ambition (NIR vs NPF)	+	+			+	+	+
	Policy measures + Deployment & manufacturing support	Score	M	L			L	L	M
		Comprehensiveness	C	N			N	N	N
		Impact	M	L			L	L	L
		Ambition (NIR vs NPF)	+	+			+	+	+
	RTD&D	Ambition (NIR vs NPF)	+					+	

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

The Portuguese NPF had addressed most of the requirements of Article 3 of the Directive and, likewise, the NIR almost fully addresses the requirements of Annex I of the Directive. The PT NIR considers many combinations of alternative fuels and transport modes, with particular focus on zero emission vehicles (electricity and hydrogen) and, to a lesser extent, CNG, LNG and LPG. The National Energy and Climate Plan 2021-2030 (NECP 2030) and the National Strategy on Hydrogen (EN-H2) drive the Portuguese policy for alternative fuels transport. Therefore, the Portuguese targets for alternative fuels have been adjusted in the NIR compared to the NPF and the measures in the NIR are generally more ambitious. The NIR states that the country's main commitment for the next decade will be to focus on electric mobility and green hydrogen, to the detriment of other technologies which are considered by the Portuguese Government as having less interesting environmental advantages.

The PT NIR does not establish infrastructure targets/vehicle estimates for all fuels and modes for each of the reference years (2020, 2025 and 2030). Specifically, no objectives are provided for infrastructure and vessels in 2020, 2025 and 2030, for LNG for both inland and maritime transport.

The main outcomes of the technical assessment of the Portuguese NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Portugal recorded a total of 20,692 EVs in 2018, of which the majority were passenger cars (10,104 BEV and 9,822 PHEV), followed by 705 LCVs, 10 HCVs and 51 buses and coaches, all BEVs. For the next decade, the NIR provides estimates for all the reference years: in particular, 896,160 electric vehicles are estimated for 2030, of which 86,000 LCVs, 1,962 HCVs and 2,200 buses and coaches, all BEVs. These estimates show an increased ambition compared to the NPF. Regarding recharging infrastructure, Portugal recorded 1,260 publicly accesible points in 2018 (of which 173 were high power recharging points) and the PT NIR presents targets for the next decade. In particular, 36,000 publicly accessible points are foreseen in 2030, of which 12,000 high power points. The 2018 progress results to be adequate for the vehicles and slow for the infrastructure, while the sufficiency index might risk to become inadequate to support EV uptake.
- **CNG** – Portugal recorded a total of 590 CNG vehicles in 2018 (of which 39 passenger cars, 46 LCVs, 128 HCVs and 377 buses and coaches). Future estimates for CNG vehicles are provided only for HCV, buses and coaches. In particular, 2,100 HCVs and 1,000 buses and coaches are estimated for 2030. Portugal recorded 8 CNG publicly accessible refuelling points in 2018, and the PT NIR presents revised targets for 2020 (13 points) and for 2025 (20 points) which are, respectively, 63% and 18% higher than in the NPF, and states that target for 2030 is 26. The 2018 progress results to be adequate for the vehicles and slow for the infrastructure, while the sufficiency index is well below the indicative value of 600.
- **LNG** – Portugal recorded 4 LNG vehicles in use in 2018, composed by one passenger car and 3 HCVs. For the next decade, the Portuguese NIR estimates 163 LNG vehicles for 2020, 700 for 2025 and 1,400 for 2030, all HCVs. Regarding LNG refuelling infrastructure, the PT NIR presents now revised targets of 11 and 18 publicly accessible LNG refuelling points in, respectively, 2020 and 2025, which are about 83% and 64% higher than in the NPF. The NIR also presents a target of 24 publicly accessible LNG refuelling points in 2030. This is showing an increased ambition.
- **Hydrogen** – The PT NIR indicates that there were no hydrogen-powered vehicles in Portugal in 2018. The NIR notes that the number of hydrogen vehicles is expected to start around 2025. The NIR estimates are 600 (500 passenger cars, 50 HCVs and 50 buses and coaches) in 2025 and 2,250 (1,000 passenger cars, 500 HCVs and 750 buses and coaches) in 2030. Regarding hydrogen infrastructure, in 2018 there were no hydrogen refuelling points in Portugal. The PT NPF did not provide any target of publicly accessible refuelling points. The NIR states that the objective is to have 25 hydrogen refuelling points (all 350-bar points) by 2025 and 100 stations (all 350-bar points) by the end of 2030. Overall, the PT NIR is showing an increase in ambition regarding hydrogen for road transport.

- **Biofuels** – Information is not available in the PT NIR.
- **LPG** – Portugal had a fleet of 56,883 LPG vehicles in use in 2018 (of which 56,213 were passenger cars, 620 LCVs, 45 HCVs and 5 buses and coaches). The NIR estimates are 58,345 in 2020, 54,434 in 2025 and 44,113 in 2030. The estimates denote that the PT Government expects a decrease of the LPG vehicles fleet in the future. In 2018 there were 383 publicly accessible LPG refuelling points in Portugal. The NIR estimates are 397 in 2020, 320 in 2025 and 200 in 2030, showing a decrease in line with the one for LPG vehicles.

Rail transport

The Portuguese NIR reports 213 electric locomotives in 2018, but no estimate for the next decade. The NIR reports measures in place for the railway modernisation and electrification, as well as expansion plans for the metro network.

Waterborne transport (maritime)

- **Electricity** – Information is not provided in the PT NIR concerning vessels nor infrastructure. The NIR only mentions the intention to promote the development of infrastructure for the supply of renewable energy sources to vessels in ports in the next decade.
- **LNG** – The PT NIR provides no official numbers nor estimates regarding vessels fuelled by LNG but mentions that in 2020 there were two Portuguese vessels fuelled by LNG. As for infrastructure, apart from some truck-to-ship operations, the NPF target of 5 LNG refuelling points by 2025 has not been confirmed in the PT NIR.

Waterborne transport (inland)

Information is not available in the Portuguese NIR.

Air transport

Information is not available in the Portuguese NIR.

The Portuguese NIR contains a significant list of **measures** to support the envisaged AFI targets and AFV estimates. The main drivers for the measures presented in the PT NIR are the National Energy and Climate Plan 2021-2030 (NECP 2030) and the National Strategy on Hydrogen (EN-H2).

The measures cover various alternative fuels and transport modes, mostly targeting electricity and hydrogen for road transport. Some measures, such as subsidies, are intended for several alternative fuels. The Portuguese NIR contains 23 legal measures, that are implemented at national level. Considering all the legal measures together, they appear to be designed as the necessary tools to allow the realisation of the AFV/AFI plans as presented in the NPF and revised in the NIR.

The Portuguese NIR contains 16 policy measures; the majority of them are of financial nature and applicable at national level. The Portuguese Government has put in place a significant number of direct incentives to foster the deployment of alternative fuels vehicles and related infrastructure. The vast majority of the policy measures are targeting zero-emission transport, in particular electro-mobility. As for deployment and manufacturing support, ten measures have been identified in the NIR. Seven clusters of measures were identified, for the pairs electricity/road, CNG/road, LNG/water (inland), hydrogen/road, LPG/road, electricity/rail and electricity/water (inland). In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road and electricity/rail have a medium impact, while all the other clusters have a low impact. The level of ambition has increased in the NIR for all the clusters.

The Portuguese NIR lists eleven measures for RTD&D and innovation activities, which represents a significant increase compared to the one measure identified in the NPF. National financing and support for RTD&D and innovation projects target mainly electricity and hydrogen.

5.22.7 *Final remarks*

The Portuguese NIR provides a rather comprehensive reporting on the efforts to implement Directive 2014/94/EU on the deployment of alternative fuels infrastructure, notably in line with the provisions of Annex I. However, information is lacking on estimates and targets for LNG vessels and infrastructure for the years 2020, 2025 and 2030. The number of measures to promote alternative fuels and the relevant infrastructures contained in the NIR has been increased significantly in comparison with those reported in the NPF.

With regard to electricity, the NIR sets out Portugal's ambition to promote the large-scale electrification of road transport, in line with the EU objective of achieving climate-neutrality in the EU by 2050. It is estimated that there will be some 896,100 electric vehicles on the roads by 2030, representing about 14.3 % of the expected fleet vehicle fleet by that year. Furthermore, 36,000 recharging points are foreseen by 2030, corresponding to about one recharging point per 24 electric vehicles. Regarding the supply of shore-side electricity in ports, the NIR only mentions the intention to promote the development of infrastructures for the supply of renewable energy to vessels in ports in the next decade, but fails to provide further detail. Moreover, the NIR does not provide information on the supply of electricity for stationary aircraft at Portuguese airports. Portugal should therefore update its planning and reporting accordingly. Nevertheless, the NIR notes that the National Energy and Climate Plan 2021-2030 (NECP 2030) includes one action for the development of infrastructure for the supply of renewable energy sources to vessels in ports. On the other hand, 213 electric locomotives were in operation in 2018, although no estimates have been provided at the horizon 2025 and 2030. However, the NIR reports measures in place for the modernisation and electrification of railways, as well as plans to extend expansion the metro networks.

Concerning hydrogen, the number of 25 hydrogen refuelling points planned by 2025 and 100 by 2030 seems sufficient taking into account the length of the Portuguese TEN-T network. However, the expected number of hydrogen vehicles by 2030 (2,250 FCEV) seems very limited for the infrastructure planned.

The NIR shows a limited level of ambition for the use of natural gas in road transport. There were 8 CNG refuelling points in 2018 for a small fleet of 590 CNG vehicles. It is estimated that in 2030 the number of CNG refuelling points will be 26 and the number of vehicles will be 3,100, indicating a low policy priority in PT. Nevertheless, there were already five LNG refuelling points in Portugal in 2018; 18 are planned for 2025 and 24 for 2030, which seems sufficient taking into account the length of the TEN-T Road Core Network and the limited number of LNG trucks foreseen by 2025 and 2030 (700 and 1,400 LNG trucks respectively). Although the NIR does not provide LNG vessel estimates and targets for the three maritime ports and the one inland port in the TEN-T Core Network, the NIR does report that there are currently two Portuguese LNG-fuelled vessels. It also indicates that around 80 LNG-fuelled vessels called at Portuguese ports in 2019. Most of these calls were related to 35 LNG-tankers calling at Portuguese ports between 1 and 4 times mostly in 2019. Portugal should clarify whether, in the future, the refuelling of LNG-fuelled vessels will be done by LNG trucks or LNG barges or whether Portugal plans to build the relevant LNG infrastructure.

As regards LPG, the number of LPG vehicles and refuelling stations will decrease from 56,883 and 383 in 2018 to 44,113 and 200 in 2030. These figures announce a certain shift from LPG vehicles to other vehicles fuel technologies.

Biofuels for road transport are foreseen to increase progressively (from 5% in 2018 to 8% in 2025 and 2030). However, no information is provided on the planned use of biofuels for aviation. Portugal should promote the use of renewable fuels in its aircraft fleet in order to contribute to the decarbonisation of air transport.

The Portuguese government has put in place a significant number of direct incentives to foster the deployment of alternative fuels vehicles and related infrastructure. The vast majority of the policy measures are targeting zero-emission transport, with a particular focus on electro-mobility.

5.22.8 *ANNEX – Description of the Member State*

On a surface area of 92,100 km², Portugal has a population of 10.291 million people in 2018, which makes up for a population density of 112 inhabitants/km².

Number of main urban agglomerations

- 25 urban agglomerations > 50,000 inhabitants

In 2018, Portugal achieves a per capita gross domestic product at market prices of €19,830, which represents a per capita gross domestic product in purchasing power standards of 77 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Portugal is 908 km. The total road network length is 14,313 km, of which 3,065 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Portugal: 18% (796 km) of the Atlantic Corridor.

Through the TEN-T Road Corridors, Portugal is connected with the following Member States:
- Spain (through the Atlantic Corridor)

Number of registered road vehicles

At the end of 2018, Portugal accounts for 7,260,643 registered road vehicles of which 5,282,970 are categorized as passenger cars, 1,267,647 as light goods vehicles, 102,033 as heavy goods vehicles and 15,493 as buses and coaches. The motorisation rate is 513 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 3 maritime ports in the TEN-T Core Network (Lisboa, Porto-Leixões, Sines)
- 10 maritime ports in the TEN-T Comprehensive Network
- 1 inland ports in the TEN-T Core Network (Porto)
- No inland ports in the TEN-T Comprehensive Network

The inland waterways TEN-T Core Network in Portugal is 274 km long.

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Lisboa, Porto-Sá Carneiro)
- 13 airports in the TEN-T Comprehensive Network

5.23 Romania (RO)

5.23.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Romanian NPF, the Commission concluded:

The Romanian NPF addresses partly the requirements of Article 3 of the Directive. For most mandatory fuels and modes, it establishes targets but it does not contain a target for LNG refuelling points to be put in place along the road TEN-T Core Network for heavy-duty vehicles. It contains a discussion of the current state and future scenarios for alternative fuels in the transport sector. The Romanian NPF indicates global AF targets for infrastructure in 2020 and vague targets for electricity and CNG in road transport related only to urban agglomerations and the TEN-T Core Network. The NPF contains only general estimates of percentage increase for AFV in the future.

The Romanian NPF lacks concrete targets for EV infrastructure and information about the future EV vehicle market development. It only mentions a target for urban agglomerations in 2020 and one for the TEN-T Core Network in 2030. According to the Romanian NPF, the distance between two directly neighbouring high power-recharging points along the TEN-T Core Network will be approximately 70 km in 2030, which seems insufficient. If implemented, the proposed set of measures could support electro-mobility since it was evaluated as being comprehensive and having a medium assessment score. There are plans for the public procurement of 107 electric buses for public transport in three main urban agglomerations.

For shore-side electricity, the NPF does not contain concrete targets but mentions ongoing studies for Bucharest Airport "Henri Coandă" to investigate the possible extension of the existing network. The Romanian NPF provides targets for supplying shore-side electricity in its TEN-T Core Network ports.

The NPF shows the ambition of increasing the number of CNG refuelling stations with 23 new ones in selected urban agglomerations and 30 new ones along the TEN-T Core Network before the end of 2020. The targeted number of CNG refuelling stations can be considered sufficient, although the NPF does not provide future estimates for CNG vehicles. Since the average distance between them is foreseen to be 150 km along the TEN-T Core Network, it seems that the 2025 minimum coverage requirements will be fulfilled even though their precise spatial distribution information is not provided.

No infrastructure targets are given in terms of LNG for road transport, for 2025, the NPF is only mentioning as objective the assessment of the feasibility of deploying such an infrastructure.

The Romanian NPF does not provide targets for hydrogen refuelling infrastructure but mentions that research and development in this field will be encouraged since Romania is part of the group of countries who traditionally produce hydrogen.

The Romanian NPF, intending to accelerate the AF deployment in transport, contains a large portfolio of measures with more than half of the presented measures being of administrative, legislative and regulatory type. In the case of the assessed measures, most of them are under consideration and only few are already in place while the lack of concrete information makes it difficult to evaluate the scope according to our methodology. A medium overall assessment *score is derived for electric vehicles as well as for alternative fuels in public transport services. Electro-mobility is promoted through substantial direct incentives for purchase of vehicles that are in place since 2016. However, these incentives are only approved for one year at a time and this could be perceived by market actors as a lack of predictability in terms of stability of support measures.*

The NPF provides a detailed current situation and assessment of the need for investment in public transport services. Measures and plans to increase to more than 30 % the share of electricity-powered vehicles (including tramways, trolleybuses, buses and microbuses) in the urban public transport fleet in 2020 are presented.

Five ministries and a series of relevant central public institutions were involved in the drafting of the Romanian NPF. It has been established respecting the interests of regional and local authorities. An inter-ministerial coordination council has been set up in order to ensure the monitoring of the implementation actions and cooperation between the relevant authorities.

Evidence of Romania's collaboration with other MSs has been found mainly in the frame of EU projects regarding the inland navigation sector (INNOVATIVE DANUBE VESSEL, PROMINENT, the LNG Master Plan for Rhine-Main-Danube). Beyond these projects, the NPF does not mention any cooperation or coordination with the neighbour MSs in the field of alternative fuels. It is advised to provide evidence of existing collaborations and planning or to engage in such cooperation to ensure AFI cross-border continuity.

5.23.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.23.2-1 Checklist Table

Part of the Directive 2014/94/EU	**Requirement**	**Mode of transport / Alternative Fuel (provided in the NIR)**		**Yes / No**
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, Water, Air / Electricity, CNG, LNG, H2, Biofuels, LPG		Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, Water, Air / Electricity, CNG, LNG, H2, Biofuels, LPG		Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / Electricity		Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.			N
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road, Rail, Air / Electricity, CNG, LPG		Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG		Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes			N
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / Electricity, LPG, AF (in general)		y

The checklist shows that not all the requirements of Annex I from the Directive are covered.

The Romanian NIR does not offer quantitative future AFI targets. Regarding the combination of AF/AFV/AFI with transport mode, electricity is partially covered for road, rail and air; CNG, hydrogen, biofuels and LPG are partially covered for road transport; LNG is partially covered for waterborne transport; other combinations being either absent or not applicable.

The Romanian NIR reports 28 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify six AF/transport mode clusters of measures, all assessable.

5.23.3 *Quantitative assessment: Vehicles and infrastructure*

The Romanian NPF had AFV estimations only as total number, and not discriminated by AF, while the RO NIR provides estimates for EVs and CNG vehicles. Instead, the RO NPF contained targets for electricity/road, electricity/water (maritime and inland), CNG/road and LNG/water (maritime and inland), while the NIR does not contain any AFI targets (with exception of the pair electricity/air).

Therefore, in order to be able to carry out the assessment of the Romanian NIR, the targets presented in the NPF have been considered.

Table 5.23.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	18,067[1] 1,448[2]	335	21,074[1]	292[3]	31,611[1]	NA	42,148[1]	362[3]
	Change NIR vs NPF [%]				0.00%				0.00%
	Attainment [%]			85.73%	114.73%	57.15%		42.87%	92.54%
CNG / road	NIR	295[4] 2,183[5]	3	406[4]	55[3]	609[4]	NA	812[4]	NA
	Change NIR vs NPF [%]				0.00%				
	Attainment [%]			72.66%	5.45%	48.44%		36.33%	
LNG / road	NIR	0[6]	0[6]	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LNG / water (maritime)	NIR	NA	NA	NA	NA	NA	1[3]	NA	2[3]
	Change NIR vs NPF [%]						0.00%		0.00%
	Attainment [%]								
LNG / water (inland)	NIR	NA	NA	NA	NA	NA	1[3]	NA	2[3]
	Change NIR vs NPF [%]						0.00%		0.00%
	Attainment [%]								
Electricity supply / air (stationary airplanes)	NIR		28		31		78		131
	Change NIR vs NPF [%]								
	Attainment [%]				90.32%		35.90%		21.37%
LPG / road	NIR	261,504	1,990	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

(1) value provided in the RO NIR (in this assessment it is assumed this value corresponds to BEV+PHEV+HEV); (2) values from EAFO (BEV+PHEV); (3) values from RO NPF; (4) mono-fuel CNG vehicles; (5) total CNG vehicles (sum of mono-fuel and bi-fuel vehicles) (6) values from EAFO.

5.23.3.1 Road transport

5.23.3.1.1 Electricity

Vehicles

Romania reported a total of 18,067 electric vehicles in use in 2018 (Table 5.23.3-1), of which 17,352 were passenger cars (1,802 BEV and 15,550 PHEV - but this number probably includes also HEVs, which do not fall under the scope of this assessment), 71 LCVs, 5 HCVs and 639 buses and coaches (but this number probably includes also trolleybuses, which do not fall under the scope of this assessment). On top of that, the RO NIR reports also 107 electric PTWs in use in 2018. According to EAFO, there were 1,448 EVs (excluding PTWs) in use in Romania at the end of 2018. In contrast to the NPF that did not include any EV estimates, the RO NIR contains EV estimates for the next decade (21,074 in 2020, 31,611 in 2025 and 42,148 in 2030)[5].

The 2018 ***attainment*** of future EV (probably including also HEVs) estimates is 85.73% for 2020 and 42.87% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Romania is equal to 13%.

Infrastructure

Romania recorded 335 publicly accessible recharging points in 2018, of which 207 were normal power (≤22kW) and 128 high power (>22kW) recharging points (38.21%). The RO NIR does not contain any information on targets for the next decade. The NPF had presented two targets: at least 292 recharging points by 2020 (achieved already in 2018) and at least 362 by 2030.

The 2018 ***attainment*** of future public recharging infrastructure targets is 114.73% for 2020 and 92.54% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Romania is equal to 6%.

Ratio

Based on RO NIR[6] and EAFO data, the following table shows the ratio between the number of electric vehicles and number of publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. The sufficiency index is well below 10 for the computable years 2016 and 2018, thus it can be considered adequate[7].

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	2.25*		4.32**			

* based on AFV and AFI data from EAFO; ** based on AFV data from EAFO and AFI data from RO NIR

Information on charging efficiency

[5] However, it is not clear whether this number includes also HEVs.
[6] The values reported in the RO NIR for EVs have not been used since it is not clear whether they include also HEVs, which do not require recharging infrastructure.
[7] The values of the ratio have been computed using AFV data representing EV+PHEV (available only for 2016 and 2018).

Information is not available in the Romanian NIR.

5.23.3.1.2 CNG

Vehicles

The Romanian NIR reports 295 mono-fuel CNG vehicles in 2018, of which 167 were passenger cars, 78 LCVs, 11 HCVs and 39 buses and coaches. Additionally, the RO NIR states that at the end of 2018 there were 1,888 bi-fuel (CNG+gasoline) vehicles in use (1,755 passenger cars and 133 LCVs). In contrast to the NPF that did not include any estimates, the RO NIR contains estimates for mono-fuel CNG vehicles for the next decade (406 in 2020, 609 in 2025 and 812 in 2030).

The 2018 ***attainment*** of future estimates of mono-fuel CNG vehicles is 72.66% for 2020 and 36.33% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching the envisaged estimates of mono-fuel CNG vehicles. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the evolution of the fleet of mono-fuel CNG vehicles planned by Romania is equal to 12%.

Infrastructure

In 2018, Romania recorded three publicly accessible CNG refuelling points (Table 5.23.3-1). The RO NIR does not provide targets for the next decade but mentions that there is "*a potential of extension in the near future with nine CNG fuelling stations throughout the TEN-T corridor*", including a series of cities from Arad, via Bucharest, up to Constanța. The RO NPF had presented a target of 55 publicly accessible CNG refuelling points by 2020.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 5.45% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Romania is equal to 129%.

Ratio

Based on the Romanian NIR and NPF, the following table shows the ratio between total CNG vehicles (mono-fuel and bi-fuel) and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. The sufficiency index is below the indicative value of 600 for 2016 and thus can be considered adequate (see Section 2.1.5). In 2018, the index is above this indicative value and in the future the index should be monitored in order not to become a barrier for the further market deployment of CNG vehicles.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**CNG**	200.00*		727.67			

* calculated using AFV data from EAFO and AFI data from RO NPF

5.23.3.1.3 LNG

Vehicles

Similarly to the NPF, the Romanian NIR does not contain any information about the past or future situation of LNG vehicles. According to EAFO, there were no LNG vehicles deployed in 2018 in Romania. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Similarly to the NPF, the Romanian NIR does not contain any information about past or future situation of LNG refuelling points for road transport. According to EAFO, there were no LNG refuelling points for road transport deployed in 2018 in Romania. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Since there are no LNG vehicle or infrastructure data provided in the Romanian NIR, it is not possible to calculate the sufficiency index.

5.23.3.1.4 Hydrogen

The Romanian NIR considers that hydrogen used as alternative fuel is at the research-development stage, and no specific regulations have been implemented in Romania for hydrogen refuelling of vehicles, despite the fact that the transport of hydrogen by road from the place of production to the refuelling station is regulated.

Vehicles

Similarly to the NPF, the Romanian NIR does not contain any quantitative information about the past or future situation of hydrogen vehicles. According to EAFO, there were no hydrogen vehicles deployed in 2018 in Romania. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Similarly to the NPF, the Romanian NIR does not contain any quantitative information about past or future situation of hydrogen refuelling points for road transport. According to EAFO, there were no hydrogen refuelling points deployed in 2018 in Romania. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

The RO NIR mentions an existing policy measure that was announced in the NPF on establishing the technical characteristics for defining and possibly facilitating the authorisation of hydrogen refuelling stations, and for the authorisation of supply with this type of alternative fuel. The Ministry of Energy initiated consultations with the national natural gas transmission operator, which proposed to establish a research topic regarding the technical reliability of hydrogen injection in the natural gas network.

Ratio

Since there are no quantitative hydrogen vehicle or infrastructure data provided in the Romanian NIR, it is not possible to calculate the sufficiency index.

5.23.3.1.5 Biofuels

Vehicles

Similarly to the NPF, the Romanian NIR does not contain any quantitative information about past or future situation of vehicles fuelled by biofuels. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Similarly to the NPF, the Romanian NIR does not contain any quantitative information about past or future situation of refuelling points dedicated to biofuels. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Since there are no quantitative biofuels vehicle or infrastructure data provided in the Romanian NIR, it is not possible to calculate the sufficiency index.

5.23.3.1.6 LPG

Vehicles

The RO NIR only reports that, according to the Periodic Roadworthiness Test results, the total number of vehicles equipped with LPG systems in use in 2018 was 261,504, of which 254,275 vehicles equipped with retrofitted LPG fuelling units and 7,229 vehicles equipped with petrol + LPG fuelling units by the vehicle manufacturer. Due to the lack of data, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Romanian NIR reported approximately 1,990 public LPG refuelling points in 2018 and, similarly to the NPF, no information regarding future targets. Because there are no LPG refuelling points targets provided in the RO NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the RO NIR and EAFO data, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LPG	158.33*		131.41			

* calculated using AFV and AFI data from EAFO

5.23.3.2 Rail transport

5.23.3.2.1 Electricity

Vehicles

Based on data from the Ministry of Transport, Infrastructure and Communications, the Romanian NIR indicates that the stock of electric locomotives has a descending trend, from 542 in 2016 to 526 in 2018, with 210 being estimated for 2020. For 2025 and 2030, it is stated that no predictions can be made because the active fleet of locomotives will depend on the rail traffic chart of that year.

Infrastructure

Information is not available in the Romanian NIR.

5.23.3.3 Waterborne transport (maritime)

5.23.3.3.1 Electricity

Vessels

Similarly to the NPF, information is not available in the Romanian NIR related to electric seagoing ships.

Infrastructure

The Romanian NIR does not contain any information about past or future situation of shore-side electricity supply for maritime ports. The RO NPF had provided two targets for maritime and inland ports together: one port for 2025 and six ports by 2030. Since the situation in 2018 is not described in the RO NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

5.23.3.3.2 LNG

Vessels

Similarly to the NPF, no quantitative data are provided regarding LNG seagoing ships in the Romanian NIR. However, two studies are mentioned: one on the "*possibility of adapting the Navrom Galati fleet to using LNG*" (under the LNG MASTER PLAN project) and an opportunity study for the construction and refurbishment of ships using LNG. The NIR mentions that "*the opportunity of refurbishing Diesel propelled ships for the use of LNG is considered not a feasible solution for the time being, constituting a potential option only for newly built ships, in particular ships designed for such type of fuel*".

Infrastructure

No quantitative data are provided in the Romanian NIR regarding LNG supply in the maritime ports, while the NPF contained two targets (1 port in 2025 and 2 ports in 2030). Under the LNG MASTER PLAN project, a pre-feasibility study was prepared on the construction of a small capacity LNG terminal in Constanţa Port (maritime and inland) and a study on the construction of an LNG terminal in Galaţi Port (maritime and inland). The Romanian NIR considers as priority the identification of investors to concession the management of LNG terminals to port operators.

5.23.3.4 Waterborne transport (inland)

5.23.3.4.1 Electricity

Vessels

Similarly to the NPF, information is not provided in the Romanian NIR related to electric inland waterways vessels.

Infrastructure

The Romanian NIR does not contain any information about past or future situation of shore-side electricity supply for inland ports. The RO NPF had provided two targets for maritime and inland ports together: 1 port for 2025 and 6 ports by 2030. Since the situation in 2018 is not described in the RO NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

5.23.3.4.2 *LNG*

Vessels

Similarly to the NPF, no quantitative data are provided regarding LNG inland waterways in the Romanian NIR. However, a study is mentioned on the "*possibility of adapting the Navrom*[8] *Galati fleet to using LNG*" (under the LNG MASTER PLAN project). In Section 5.23.3.3.2 more details are provided on another developed study regarding LNG use in waterborne transport.

Infrastructure

No quantitative data are provided in the Romanian NIR regarding LNG supply in the inland ports, while the NPF contained two targets (one port in 2025 and two ports in 2030). In Section 5.23.3.3.2, some details on two studies regarding LNG terminals construction are presented. Since the situation in 2018 is not described in the RO NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

5.23.3.5 Air transport

5.23.3.5.1 Electricity

Airplanes

The only information found in the Romanian NIR relates exclusively to unmanned aircraft equipped with an electric motor – drones. Their number presents an increasing trend for the period 2016 – 2030 (from 542 in 2016 and 379 in 2018 to 800 foreseen in 2020, 1,200 in 2025 and 2,000 in 2030).

[8] Romanian River Shipping Company Navrom that has most of its fleet on the Rhine River, where many LNG terminals are operable, whereas only a small number of ships are on the Danube River.

Infrastructure (for stationary airplanes)

The Romanian NIR reports that 28 electricity supply points for stationary airports were in use in 2018. Targets for the next decade are provided as well: 31 in 2020, 78 in 2025 and 131 in 2030. The Romanian NIR provides also detailed information from the National Company of Airports that at the TEN-T Core "International Henri Coandă Airport" in Bucharest, which performs more than 50,000 aircraft movement per year, there are 16 electricity generators for parked aircraft at the 14 air bridges. The 16 electricity generators have an installed capacity of 90 kVA and, depending on the load, the average power demand is approximately 45 kW. As regards energy consumption, approximately 170 parking operations per air bridge per month are estimated and the electricity consumption is approximately 33.75 kWh per operation.

The 2018 ***attainment*** of future targets of electricity supply points for stationary airports is 90.32% for 2020 and 21.37% for 2030. According to the assessment methodology described in Section the ***progress*** obtained by Romania from 2016 until 2018 for the deployment of electricity supply points for stationary airports is 3.74% of the overall planned deployment during the period 2016-2030.

5.23.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is not available in the RO NIR. It is mentioned that no aircraft using alternative fuels is recorded in the Romanian air transport sector.

Infrastructure

Information is not available in the Romanian NIR on the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network.

5.23.4 ***Measures assessment***

The Romanian NIR contains a medium size portfolio of measures, most of them focusing on electricity/road. This situation results from the fact that the Romanian NIR presents only new measures in place after 2017 and none of the measures presented in the NPF as in place at that time is mentioned anymore. The NIR mentions that the presented measures are listed in the Annex to Government Decision No 87 of 7 March 2018 approving the "*NPF strategy for developing the alternative fuels market in the transport sector and deploying the relevant infrastructure in Romania and establishing the Inter-ministerial Coordination Council for developing the Alternative Fuels Market*".

Around half of all the measures in the NIR are Legal measures, mainly of legislative and regulatory category, presenting either current or under discussion legislation.

5.23.4.1 Legal measures

The Romanian NIR contains the description of 11 legal measures in place, a subset from the 19 measures that were listed as future intentions in the Romanian NPF. The remaining 10 measures presented in the NPF as in place at that time are not mentioned anymore in the NIR.

Nine NIR legal measures concern AFI deployment. For AFV and AF, there is one measure for each thematic. All AF types are relatively uniformly covered (two for electricity, one for CNG, one for LNG, three for LPG, two for hydrogen, one for biofuels and one for AF combinations). As transport mode, road is the most frequently mentioned. All measures have 2018 as starting year and are applied at national level.

Considering all the legal measures, they appear to be fit, if fully implemented, to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR. Taking into account that all the legal measures presented in the NIR were announced in the NPF (and proposed for the future), it is considered that the level of policy ambition of the legal measures is similar in the NIR compared to the NPF.

5.23.4.1.1 Legislative & Regulatory

From the nine measures of this category described in the Romanian NIR, three are of type norms and requirement while six regard national targets. The measures concern developing, revising, supplementing and streamlining the legal framework for alternative fuels deployment in transport, including:

- establishing a common method and/or measurement unit for the public recharging service,
- ensuring the installation of normal power (≤22kW) recharging points in classical fuel stations,
- revising the authorisation procedure of refuelling stations (CNG, LPG),
- conditions of safety and environmental protection for the refuelling process (CNG, LNG, Hydrogen),
- compulsory percentages of biofuels in fossil fuels (in accordance with national and EU legislation),
- revising the concession of spaces designated for the deployment of refuelling/recharging stations/points.

All AF types are present, and from the transport mode point of view, road is covered in all the measures (5 times expressly mentioned). Seven measures concern AFI and cover the following AFs: electricity, CNG, LNG, biofuels, hydrogen and LPG.

5.23.4.1.2 Administrative

Of all the measures described in the Romanian NIR, six can be categorised as administrative measures. Two of them[9] regard AFI deployment and AFV purchase. One refers to an assessment of the development of LNG infrastructure, covering economic feasibility and cost-benefit proportionality, including environmental aspects. The other concerns the assessment of the opportunity to establish financial instruments (such as guarantee funds, bonds, public-private partnerships) for legal persons intending to develop recharging/refuelling points/stations, and to purchase alternative fuels vehicle fleets.

[9] Included by the RO NIR in the category Legal measures - Administrative

The Romanian NIR lists as well two measures[10] regarding the establishment of information points and a monitoring system to provide the geographical locations and information on real-time accessibility, historical and real-time information on recharging/refuelling for alternative fuels infrastructure[11]. Other two measures concern local authorities: preparation of guidelines by adapting and integrating good practices tested in other European cities and promotion of funding lines available under the 2014-2020 Regional Operational Programme and intended for the development of local projects, with focus on the development of the alternative fuels infrastructure.

5.23.4.2 Policy measures

The Romanian NIR contains ten policy measures in place, the majority of which were announced as future measures in the NPF. Taking into account that some of them have been revised or have become more concrete, their overall level of ambition is considered increased. Some measures lack details in their description (e.g. budget) that are needed to perform an accurate assessment according to the methodology described in Section 2.2. From the transport mode point of view, nine regard specifically road and one the combination of all modes. Regarding the AF covered, six measures concern different combinations of fuels, three electricity, and one biofuels. They are in majority financial measures and in seven cases they apply at a national level, while in three cases they apply at local level.

5.23.4.2.1 Measures to ensure national targets and objectives

Road transport

The RO NIR presents seven policy measures meant to support the achievement of the Romanian AF objectives in road transport (one measure appears only in the NIR, 6 are common to the NIR and NPF). They are all in place and the majority of them are financial incentives.

Within the measures in place targeting electricity/road pair, which is the focus of the Romanian strategy, the NIR lists:

- purchase subsidies ("Rabla Plus" programme - grants of €10,000 for the private purchase of a new BEV and of €4,250 for the private purchase of a new PHEV),
- scrappage schemes ("Rabla" programme - €1,250 for scrapping an old vehicle at national level and additionally around €2,000 in Bucharest)
- tax reductions/exemptions
    - Ownership tax exemption

The NIR also mentions that the Administration Office of the Environmental Fund is reviewing the possibility of including vehicles using CNG, LNG and hydrogen in the "Rabla Plus" purchase incentive programme in the following years and encouraging the purchase by freight and passenger transport operators of vehicles that can operate on E10 fuel.

A favourable regime for the parking of vehicles using alternative fuels in the main urban areas is mentioned as being under preparation. From the total number of approximately 481,036 parking spaces registered in the administrative territorial units[12], approximately 400 of these

[10] In order to comply with the classification used in this assessment, four of the measures presented by the RO NIR as RTD&D measures are reclassified and assessed as Legal measures (Administrative).
[11] Data on 258 recharging points were inputted in the records of the Ministry of Energy at the date of drafting the NIR.
[12] Source: data taken from the letters received from the 41 administrative territorial units (ATU) included in the National Policy Framework Strategy for developing the alternative fuels market;

are intended exclusively for vehicles using alternative fuels (150 additional under consideration). The NIR mentions that in 12 of the 41 administrative territorial units, including Bucharest Municipality, a series of benefits were granted to natural and legal persons owning alternative fuels vehicles, which consisted in reduction of payment or gratuity for use of parking spaces.

Other transport modes

The Romanian NIR presents as an education/information measure the organisation of events to promote mobility based on alternative fuels.

5.23.4.2.2 Measures that can promote AFI in public transport services

In accordance with Law No 37/2018 on the promotion of green transport, local public authorities, autonomous administrations and companies subordinated to administrative territorial units will purchase AF (electricity – HEV, PHEV and BEV; CNG; LNG; hydrogen) vehicles for passenger transport in a minimum rate of 30% of the demand for future procurements. Privately owned companies providing public local and metropolitan transport services or those in an inter-community development association, including taxi companies, will purchase, as from 2020, AF vehicles (electricity – HEV, PHEV and BEV; CNG; LNG; hydrogen) for passenger transport in a rate of 30% of the demand for future procurements. Annual procurements of vehicles by public authorities to supply their own fleet must include AF passenger cars (electricity – HEV, PHEV and BEV; hydrogen) at a minimum rate of 20%.

5.23.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Information is not available in the Romanian NIR.

5.23.4.3 Deployment and manufacturing support

Within the Romanian NIR, four measures have been identified to relate to deployment and manufacturing support in the area of alternative fuels in transport, however, the absence of the necessary financial data makes impossible an appropriated assessment.

5.23.4.3.1 AFI deployment

Since 2018, there is in place a support scheme for deployment of recharging stations for electrical vehicle in the county capital cities. The maximum amount financed by the Authority for the installation of a recharging station (2 high power recharging points – one AC with power >22 kW and one DC with power ≥50 kW) is approximately €40,000, representing 90% of the eligible expenditure.

The Romanian NIR reports one measure regarding the improvement of the methodology for replacing and recycling EV and HEV batteries in order to mitigate any potential negative impact on the environment and public health.

Another measure concerns the identification of funding solutions for power supply infrastructure deployment programmes for stationary aircraft. The administration office of the International Henri Coandă Airport in Bucharest that performs more than 50,000 aircraft movements/year will review the opportunity and the need to deploy power supply sources without using fossil fuel-based supply sources.

5.23.4.3.2 Support of manufacturing plants for AF technologies

The Romanian NIR contains only one measure in this direction. It regards the assessment of the possibility of allocating an annual budget to support the units developing alternative fuels technologies and reviewing any special needs concerning the use of such technologies by public institutions, the accessing of European funds and communication of any potential benefits for the environment and the economic efficiency of these technologies for the final user.

5.23.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Romanian NIR, except the mention that "*special needs at the initial stage of deployment of the alternative fuels infrastructure were also considered*" while preparing the deployment and manufacturing support measures.

5.23.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.23.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. Five clusters of measures were identified for road transport and one for air transport. Three clusters contain dedicated measures (electricity/road, electricity/air, and biofuels/road) while the other three contain general measures addressing combinations of several alternative fuels. No measure could be identified for the pairs LNG/water (maritime and inland). Five clusters can be considered comprehensive because they cover different categories of measures and different directions of alternative fuels deployment.

In line with the overall focus on road electrification reported in the NIR, the most numerous cluster concerns electricity/road containing a comprehensive set of 10 measures, of which 3 are new measures, displaying a high overall score. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact and the measures for the pair hydrogen/road to have a medium impact. For all the other identified clusters of measures, the overall low score results in a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for electricity/road, CNG/road, LNG/road and hydrogen/road, and has remained the same for biofuels/road and electricity/air.

Table 5.23.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	L	C	**L**	+
LNG	Road	L	C	**L**	+
	Water - maritime				
	Water - inland				
H2	Road	M	C	**M**	+
Biofuels	Road	L	C	**L**	=
Electricity	Air	L	N	**L**	=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.23.4.5 Research, Technological Development & Demonstration

The Romanian NIR presents a list of eight RTD&D measures[13], however only three of them have been considered as actual RTD&D measures. They represent activities appearing in the NPF as future plans, while the three EU projects on waterborne transport that were presented in the NPF are not mentioned anymore. All three measures are in force but no budget information is presented. As transport mode, two measures address road and one addresses combinations of modes. Regarding the targeted AF, one measure is specific for hydrogen and two for combinations of fuels.

The activities covering specifically hydrogen relate to the assessment of the possibilities of using it as alternative fuel in transport (including by a re-profiling of the current industrial potential of production) and of supporting research activities (including by facilitating access to European funding mechanisms like FCH JU), to develop the required refuelling and propelling systems. The NIR mentions that a technical possibility was identified as regards production of hydrogen in the three refineries within the Romanian territory, through the units producing hydrogen in the petrochemical industry and in the agro-chemical industry as a by-product. In this situation, the NIR level of ambition is consider increased in comparison with the NPF.

One measure is represented by the assessment of the possibility of supporting research activities concerning alternative fuels in general, including by accessing European financing mechanisms (main identified financing means listed are Horizon 2020, Innovation Fund, Connecting Europe Facility (CEF)).

Another RTD&D activity mentioned is the organisation of events to enable testing of buses using alternative fuels for the purpose of procurement for public transport.

[13] In order to comply with the classification used in this assessment, four of these measures are assessed as Legal measures (Administrative) and one as Policy measure.

5.23.5 *Additional information on alternative fuels infrastructure developments*

The Romanian NIR contains information on the fuels use in the transport sector only for the period 2016-2018 (see Table 5.23.5-1). Electricity presents a stable trend while LPG a slightly increasing one in the three years covered. The other AFs (presumably biofuels) are around 5%.

Table 5.23.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline	24.15%	22.69%	21.82%			
	Diesel	69.51%	70.41%	71.43%			
	Electricity	0.06%	0.06%	0.06%			
	LPG	1.36%	1.53%	1.55%			
	Other AF	4.92%	5.30%	5.14%			
	Total Road	**100.00%**	**99.99%**	**100.00%**	**0.00%**	**0.00%**	**0.00%**
Maritime	Marine gas oil	8.33%	1.40%	2.10%			
	Marine diesel oil	91.67%	98.60%	97.90%			
	Total maritime	**100.00%**	**100.00%**	**100.00%**	**0.00%**	**0.00%**	**0.00%**

5.23.6 *Summary of the assessment*

Tabular overview

Table 5.23.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	6,423[1] 337[2]	142[4] 400[6]	0[6]	NA	NA	0[6]	190,000[6]
		Situation (2018)	18,067[1] 1,448[2]	295[4] 2,183[5]	0[6]	NA	NA	0[6]	261,504
		Estimate (2030)	42,148[1]	812[4]	NA	NA	NA	NA	NA
		Future share (2030) [%]	0.56%	0.01%					
		Estimate attainment (2018 vs 2030) [%]	42.87%	36.33%					
		Progress (2018)	fast	fast					
Publicly accessible AF Infrastructure		Past situation (2016)	150[3]	2[3]	0[6]	0[3]	0[3]	0[6]	1,200[6]
		Situation (2018)	335	3	0[6]	NA	NA	0[6]	1,990
		Target (2030)	362[3]	NA	NA	2[3]	2[3]	NA	NA
		Target attainment (2018 vs 2030) [%]	92.54%						
		Progress (2018)	fast	slow					
Sufficiency Index		2016	2.25	200					158.33
		2018	4.32	727.67					131.41
		2020							
		2025							
		2030							
Measures	Legal measures	Ambition (NIR vs NPF)	=	=	=	=	=	=	=
	Policy measures + Deployment & manufacturing support	Score	H	L	L			M	
		Comprehensiveness	C	C	C			C	
		Impact	H	L	L			M	
		Ambition (NIR vs NPF)	+	+	+			+	
	RTD&D	Ambition (NIR vs NPF)						+	

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

[(1)] value provided in the RO NIR (in this assessment it is assumed this value corresponds to BEV+PHEV+HEV); [(2)] values from EAFO (BEV+PHEV); [(3)] values from RO NPF; [(4)] mono-fuel CNG vehicles; [(5)] total CNG vehicles (sum of mono-fuel and bi-fuel vehicles) [(6)] values from EAFO.

The Romanian NIR does not cover all the requirements of Annex I from the Directive and does not offer any quantitative future AFI targets.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for road, rail and air; CNG and LPG for road transport; hydrogen and biofuels are partially covered for road transport; LNG is partially covered for waterborne transport; other combinations being either absent or not applicable.

The main outcomes of the technical assessment of the Romanian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Romania reported a total of 18,067 electric vehicles in use in 2018 (but this number probably includes also HEVs that do not fall under the scope of this assessment). According to EAFO, there were 1,448 EVs (excluding PTWs) in use in Romania in 2018. In contrast to the NPF that did not include any EV estimates, the RO NIR contains EV estimates for the next decade (21,074 in 2020, 31,611 in 2025 and 42,148 in 2030)[14]. Romania recorded 335 publicly accessible recharging points in 2018, of which 38.21% were high power (>22kW) recharging points. The RO NIR does not contain any information on targets for the next decade, but the NPF had included two targets: at least 292 recharging points by 2020 (achieved already in 2018) and at least 362 by 2030. The progress in 2018 results to be fast both for EVs and for infrastructure. The ratio AFV to AFI is below 10 for the computable years 2016 and 2018, thus is considered adequate.
- **CNG** – The RO NIR reports 295 mono-fuel CNG vehicles and 1,888 bi-fuel (CNG+gasoline) vehicles in use in 2018. In contrast to the NPF that did not include any estimates, the RO NIR contains estimates for mono-fuel CNG vehicles for the next decade (406 in 2020, 609 in 2025 and 812 in 2030). In 2018, Romania recorded three publicly accessible CNG refuelling points. The RO NIR does not provide targets for the next decade but the RO NPF had included a target of 55 publicly accessible CNG refuelling points by 2020. The progress in 2018 is fast for CNG vehicles and slow for the infrastructure. The sufficiency index is below the indicative value of 600 for 2016 and above it in 2018, and should therefore be monitored in order not to become a barrier for the further market deployment of CNG vehicles.
- **LNG** – Similarly to the NPF, the Romanian NIR does not contain any information about past or future situation of LNG vehicles and infrastructure.
- **Hydrogen** – The Romanian NIR considers that hydrogen used as alternative fuel is at the research-development stage, thus no specific regulations have been implemented yet in Romania for hydrogen refuelling of vehicles, but some are in planning phase. Similarly to the NPF, the Romanian NIR does not contain any quantitative information about past or future situation of hydrogen vehicles and infrastructure.
- **Biofuels** – No specific information regarding vehicles and/or biofuels refuelling points was found in the RO NIR.
- **LPG** – The RO NIR reports that, according to the Periodic Roadworthiness Test results, the total number of vehicles equipped with LPG systems in use in 2018 is 261,504, mainly with retrofitted LPG fuelling units. The Romanian NIR reported approximately 1,990 public LPG refuelling points in 2018 and, similarly to the NPF, no information regarding future targets.

Rail transport

- **Electricity** – The Romanian NIR indicates that the stock of electric locomotives has a descending trend, from 542 in 2016 to 526 in 2018, and 210 are estimated for 2020 (while for 2025 and 2030 no predictions can be made because the active fleet of locomotives will depend on the rail traffic chart of those years).

[14] However, it is not clear whether these numbers include also HEVs which do not fall under the scope of this assessment.

Waterborne transport (maritime)

- **Electricity -** Similarly to the NPF, information is not available in the Romanian NIR related to electric seagoing ships. The Romanian NIR does not contain any information about past or future situation of shore-side electricity supply for maritime ports, but the RO NPF had provided two targets for maritime and inland ports together: one port for 2025 and six ports by 2030.
- **LNG** – Similarly to the RO NPF, no quantitative data are provided in the Romanian NIR regarding LNG seagoing ships. However, an opportunity study for the construction and refurbishment of ships using LNG is mentioned. No quantitative data are provided in the Romanian NIR regarding LNG supply in the maritime ports, while the NPF contained two targets (one port in 2025 and two ports in 2030). Under the LNG MASTER PLAN project, a pre-feasibility study was prepared on the construction of a small capacity LNG terminal in Constanţa Port (maritime and inland) and a study on the construction of an LNG terminal in Galaţi Port (maritime and inland).

Waterborne transport (inland)

- **Electricity** – Similarly to the NPF, no information is provided in the Romanian NIR related to electric inland waterways vessels. The Romanian NIR does not contain any information about past or future shore-side electricity supply points for inland ports, whilst the RO NPF had provided two targets for maritime and inland ports together: 1 port for 2025 and 6 ports by 2030.
- **LNG** – Similarly to the RO NPF, no quantitative data are provided regarding LNG inland waterways in the Romanian NIR. However, a study is mentioned on the "*possibility of adapting the Navrom*[15] *Galati fleet to using LNG*" (under the LNG MASTER PLAN project). No quantitative data are provided in the Romanian NIR regarding LNG supply in the inland ports, while the NPF contained two targets (1 port in 2025 and 2 ports in 2030).

Air transport

- **Electricity** – The Romanian NIR relates exclusively to unmanned aircraft equipped with an electric motor (drones), and foresees and an increasing trend for them. The Romanian NIR reports that 28 electricity supply points for stationary airports were in use in 2018, mentioning that there are 16 electricity generators for parked aircraft at 14 air bridges "International Henri Coandă Airport" in Bucharest. Targets for the next decade are provided: 31 in 2020, 78 in 2025 and 131 in 2030.

- **Biofuels** – No aircraft using alternative fuels are recorded in the Romanian air transport sector. Information is not available in the Romanian NIR on the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network.

The Romanian NIR contains around 30 **measures**, a medium size portfolio of measures. The NIR presents only measures in place after 2017 and none of the measures presented in the NPF as in place at that time is mentioned anymore. The NIR mentions that the presented measures are listed in the Annex to Government Decision No 87 of 7 March 2018 approving the "*NPF*

[15] Romanian River Shipping Company Navrom that has most of its fleet on the Rhine River, where many LNG terminals are operable, whereas only a small number of ships are on the Danube River.

strategy for developing the alternative fuels market in the transport sector and deploying the relevant infrastructure in Romania".

The majority of the measures address road transport and focus on the development of electro-mobility. Around half of the presented measures are Legal measures, mainly of legislative and regulatory category presenting current or under discussion legislation.

Concerning the policy measures, most of the presented measures in the RO NIR were announced as future plans in the NPF. Since some measures have been revised or have become more concrete, their overall level of ambition is considered increased. They cover financial aspects (e.g. purchase and scrappage subsidies, tax incentives) but also non-financial (e.g. favourable parking regimes) and information ones (organisation of events to promote mobility based on alternative fuels).

The AFI deployment measures address the electricity/road and electricity/air pairs.

Concerning the Policy and Deployment & Manufacturing support measures, in the NIR compared with the NPF, the level of ambition has increased for electricity/road, CNG/road, LNG/road and hydrogen/road pairs, and has remained the same for biofuels/road and electricity/air pairs. The most complete and numerous cluster of measures is for the pair electricity/road. The expected impact of the measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR is high for the electricity/road pair, medium for hydrogen/road while for the other pairs (CNG/road, LNG/road, biofuels/road and electricity/air) it results to be low.

Three measures have been identified as RTD&D, all being in place but none containing budget information. One of them covers specifically hydrogen and relates to the assessment of the possibilities of using it as alternative fuel in transport (including by a re-profiling of the current industrial potential of production) and of supporting research activities to develop the required refuelling and propelling systems. Another RTD&D activity mentioned is the organisation of events to enable testing of buses using alternative fuels for the purpose of procurement for public transport.

5.23.7 *Final remarks*

The Romanian NIR provides a rather limited report on the efforts to implement the Directive. The NIR meets, to a certain extent, the requirements of Annex I to the Directive, but it lacks information on the targets for CNG refuelling points by 2025 and 2030 and for LNG refuelling points for vehicles by 2020, 2025 and 2030. It also lacks information on estimates LNG vehicles and vessels in 2020, 2025 and 2030. Future reporting should provide further information on measures to support alternative fuels ramp up in other modes of transport than road and with special attention for waterborne transport.

Regarding electricity, the NIR does not provide detailed information. This assessment has been based on information provided already in the NPF. On this basis, it is estimated that by 2030 there could be about 42,000 electric vehicles on the roads, representing about 0.6% of the future vehicle fleet. Taking into account the current situation expected trends, this level of ambition appears too low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. The targets for publicly accessible recharging infrastructure correspond to the low estimated number of vehicles. Higher ambition would contribute to better meeting the objective of realising a dense, wide-spread and easy to use network of recharging and refuelling infrastructure throughout the EU. No information on charging efficiency is provided. The NIR does not provide estimates on shore-side electricity supply in maritime and inland ports. Following the NPF, one port should be equipped accordingly by 2025 and six ports by 2030. Romania should provide updated information in this regard in future reporting. In 2018, 28 electricity supply points for stationary airplanes were already in use; 131 are expected by 2030. The number of electric locomotives has been decreasing, from 542 in 2016 to 526 in 2018, while 210 are expected for 2020. Further information as regards the current electrification of railways and future planning should be provided in future reporting.

Concerning hydrogen for road transport, the Romanian NIR does not contain any quantitative targets for hydrogen vehicles and refuelling points. It would be relevant that Romania provides more information on how to ensure EU-wide connectivity for HCEV.

Regarding natural gas for transport, there was a negligible fleet of CNG vehicles (295 mono-fuel and 2,183 bi-fuel, CNG-petrol) in Romania in 2018. By 2030, Romania expects 812 mono-fuel CNG vehicles. The NIR does not provide information on future targets for CNG refuelling points for vehicles. The NPF had provided the target of 55 refuelling points by 2020. Moreover, the NIR neither provides targets for LNG vehicles and vessels by 2020, 2025 and 2030, nor for road and port LNG infrastructure in the same years. In comparison. The NPF had indicated that one port should be equipped with a LNG refuelling point by 2025 and two ports by 2030.

As regards LPG in road transport, there was already a significant fleet of 261,504 and 1,990 refuelling points in 2018. However, the Romanian NIR does not contain any further targets for vehicles and infrastructure by 2020, 2025 and 2030.

As far as biofuels are concerned, the NIR does not provide quantitative information on the use of biofuels in road transport. Romania should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.23.8 *ANNEX - Description of the Member State*

On a surface area of 238,400km², Romania has a population of 19.531 million people in 2018, which makes up for a population density of 82 inhabitants/km².

Number of main urban agglomerations

- 35 urban agglomerations > 50,000 inhabitants

In 2018, Romania achieves a per capita gross domestic product at market prices of €10,510, which represents a per capita gross domestic product in purchasing power standards of 63 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Romania is 2.564 km. The total road network length is 52.787 km, of which 823 km are motorways. The length of the total road network in Romania is 52,787 km.

The following lengths of the TEN-T Road Corridor network are present in Romania: 8 % (418 km) of the Orient / East - Mediterranean Corridor and 32 % (1,435 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, Romania is connected with the following member states:

- Hungary (through the Orient / East Mediterranean and the Rhine - Danube Corridor)

- Bulgaria (through the Orient / East Mediterranean Corridor)

Number of registered road vehicles

At the end of 2017, Romania accounts for 7,665,962 registered road vehicles of which 6,452,536 are categorized as passenger cars, 753,029 as light goods vehicles, 281,295 as heavy goods vehicles and 51,802 as buses, coaches or trolley-buses. The motorisation rate is 330 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 2 maritime ports in the TEN-T Core Network (Constanța, Galați)
- 3 maritime ports in the TEN-T Comprehensive Network (Brăila, Sulina, Tulcea)
- 6 inland ports in the TEN-T Core Network (Calafat, Cernavodă, Constanța, Drobeta Turnu Severin, Galați, Giurgiu)

The inland waterways TEN-T Core Network in Romania is 1,294 km long.

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Bucureşti-Henri Coandă, Timişoara)
- 10 airports in the TEN-T Comprehensive Network (Bacău, Baia Mare, Cluj-Napoca, Constanța, Craiova, Iași, Oradea, Sibiu, Suceava, Tulcea)

5.24 Slovenia (SI)

5.24.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Slovenian NPF the Commission concluded:

The Slovenian NPF addresses most of the requirements of Article 3. For most fuels and modes, it establishes infrastructure targets and vehicle estimates for 2020, 2025 and 2030.

The Slovenian NPF puts emphasis on the development of the market for electric vehicles. It estimates a share of roughly 1% electric passenger cars on the road in 2020 and 16.9% in 2030. The 2030 estimations are also optimistic for electric light commercial vehicles (12.4%) and electric buses (6.3%). Measures are already in place or planned to reach these estimated shares (several tax exemptions and benefits, attractive incentives for purchase and for use of electric vehicles). Slovenia already today has a well-developed recharging infrastructure, with a ratio of one public recharging point per only 1.64 electric vehicles. It plans to further increase the number of recharging points, its targets being in line with the requirements of the Directive and they seem sufficient to cover appropriately the needs of electric vehicles in terms of distance requirements. The Slovenian NPF mentions that electricity supply will be in place in all 3 airports of the TEN-T network by the end of 2025. Regarding shore-side electricity, studies are ongoing and measures are planned to build new power lines for the needs of the Port of Koper.

CNG is considered to be the key alternative fuel for buses in the future with estimated shares of CNG buses in the total buses fleet of around 9.3% (2020), 19.7% (2025) and 33.9% (2030) and measures are planned to ensure that these objectives are realised. The NPF mentions that CNG recharging infrastructure will be deployed in all municipalities and their targets for 2020 and 2025 are considered appropriate since they pass the sufficiency threshold.

A target of 3 LNG refuelling points for heavy-duty vehicles is foreseen for 2020 that will also ensure the fulfilment of the distance requirement on the TEN-T Core Network in Slovenia. The LNG road infrastructure will be built in the framework of two European projects, namely SiLNGT (2015-EU-TM-0104-S Mediterranean Corridor) and cHAMeleon.

LNG refuelling is planned for the only maritime port in the TEN-T Core Network, the port of Koper. Two studies were performed within the projects POSEIDON MED II and GAINN4MOS to find appropriate solutions for supplying ships with LNG in the port of Koper.

A target of 5 to 9 hydrogen refuelling points is established for 2025 for which full subsidies for installation are considered necessary by the NPF (in particular, grants from EU funds are mentioned).

The Slovenian NPF contains a wide range of measures, but the majority of the measures are under consideration whilst a reduced amount is already in place. The presented measures cover a wide variety of types, addressing many deployment barriers. However, information concerning their implementation status, validity periods, or appropriated budget is often lacking.

A medium overall assessment score is derived for electric road transport where the mentioned existing and planned measures seem to have the potential to contribute towards reaching the committed targets and objectives.

The NPF mentions that incentives will be available to replace public transport vehicles of EURO IV or lower standards with less polluting vehicles powered by alternative fuels, in particular in areas with poor air quality. With regard to buses, CNG is stated to be the key alternative and subsidies are being considered for the purchase of CNG buses for a period of two to five years.

The Slovenian government established an inter-ministerial working group for drafting the NPF. The Slovenian NPF considers that the local communities and other stakeholders will have an important role in implementing the planned measures.

Slovenia shows intentions to cooperate with the neighbouring countries to ensure EU-wide circulation of AF vehicles and vessels. For setting up infrastructure for the supply of ships with LNG, Slovenia cooperates with neighbouring Member States within the European projects POSEIDON MED II and GAINN4MOS.

5.24.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.24.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road / electricity, CNG, LNG, H2, LPG		Y
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road / electricity, CNG, LNG, H2, LPG		Y
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network			N
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road / electricity, CNG, LNG, H2		Y
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			N
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			N
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Combination / All		Y
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / electricity, CNG, LNG, H2, LPG		Y
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / electricity, CNG, LNG, H2, LPG		Y
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road / electricity, CNG, LNG, H2		Y
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points			N
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)			N

The checklist shows the requirements of Annex I from the Directive that are covered in the SI NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity, CNG, LNG, hydrogen and LPG are covered for road transport; all the other combinations are either absent or not applicable.

The Slovenian NIR reports 37 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify five AF/transport mode clusters of measures, all assessable.

5.24.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.24.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	1,902	328	11,750	1,200	69,972	7,000	213,007	22,300
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Attainment [%]			16.19%	27.33%	2.72%	4.69%	0.89%	1.47%
CNG / road	NIR	467	4	3,030	14	6,593	14	9,552	14
	Change NIR vs NPF [%]			3.48%	0.00%	3.65%	0.00%	4.09%	0.00%
	Attainment [%]			15.41%	28.57%	7.08%	28.57%	4.89%	28.57%
LNG / road	NIR	8	1	179	3	1,906	3	4,337	3
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Attainment [%]			4.47%	33.33%	0.42%	33.33%	0.18%	33.33%
LNG / water (maritime)	NIR	0*	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	0	1	86	2	1,240	7	6,871	7
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Attainment [%]				50.00%		14.29%		14.29%
LPG / road	NIR	10,670	115	33,295	NA	41,145	NA	36,440	NA
	Change NIR vs NPF [%]			0.00%		0.00%		0.00%	
	Attainment [%]			32.05%		25.93%		29.28%	

Legend:		
	(grey)	not applicable
	(blank)	the value could not be computed
	NA	no value/information provided/available in the NIR

* From EAFO (absent in the NIR)

5.24.3.1 Road transport

5.24.3.1.1 Electricity

Vehicles

Slovenia recorded 1,902 electric vehicles in 2018 (Table 5.24.3-1), of which 1,834 were passenger cars, 64 LCVs and 4 buses and coaches. For the period 2020-2030, the SI NIR confirms the NPF estimates (11,750 EVs in 2020, 69,972 in 2025 and 213,007 in 2030). The NPF plan is fully confirmed also in terms of vehicle categories and relative share of BEV vs. PHEV. For example, in 2030 the SI NIR confirms the estimates of 129,690 (BEV) and 71,664 (PHEV) passenger cars, of 11,020 LCVs (all BEV), of 258 (BEV) and 160 (PHEV) HCVs and of 215 buses and coaches (all BEV).

The 2018 ***attainment*** of future EV estimates is 16.19% for 2020 and 0.89% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Slovenia is equal to 50%.

Infrastructure

Slovenia recorded 328 publicly accessible recharging points in 2018, of which 297 were normal power (≤22kW) and 31 high power (>22 kW) recharging points (the latter being all deployed on the TEN-T Core road network). For the next decade, in line with the EVs estimates, the SI NIR confirms the NPF targets (1,200 recharging points in 2020, 7,000 in 2025 and 22,300 in 2030). It is worth mentioning that the share of high power recharging points will remain quite low (300 foreseen in 2030).

The 2018 ***attainment*** of future public recharging infrastructure targets is 27.33% for 2020 to 1.47% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Slovenia is equal to 39%.

Ratio

Based on the SI NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. It can be seen that the foreseen sufficiency index is always below or equal to 10, thus it can be considered adequate for the next decade.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**Electricity**	2.75	3.92	5.80	9.79	10.00	9.55

Information on charging efficiency

Information is not available in the Slovenian NIR.

5.24.3.1.2 CNG

Vehicles

Slovenia recorded 467 CNG vehicles in 2018, of which 244 were passenger cars, 74 LCVs, 60 HCVs and 89 buses and coaches. For the next decade, the SI NIR presents a slightly upward revision of the CNG vehicles estimate compared to the NPF, with 9,552 vehicles in 2030 (of which 355 LCVs, 355 HCVs and 1,154 buses and coaches). This represents an increase of 4.09% compared to the NPF.

The 2018 ***attainment*** of future CNG vehicles estimates is 15.41% for 2020 and 4.89% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Slovenia is equal to 25%.

Infrastructure

In 2018, Slovenia recorded 4 publicly accessible CNG refuelling points (Table 5.24.3-1). The SI NIR confirms the NPF targets over the period 2020-2030, which consisted in 14 refuelling stations from 2020 onward.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is constant and equal to 28.57% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Slovenia is equal to 8%.

Ratio

Based on the SI NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that sufficiency index is well below the indicative value of 600 until 2025 and can be considered adequate also until 2030 (see Section 2.1.5).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**CNG**	82.00	105.25	116.75	216.43	470.93	682.29

5.24.3.1.3 LNG

Vehicles

Slovenia recorded eight LNG HCVs in 2018 (Table 5.24.3-1). For the next decade, once again the SI NIR fully confirms the NPF estimates (179 HCVs in 2020, 1,906 HCVs in 2025 and 4,337 HCVs in 2030).

The 2018 ***attainment*** of future LNG vehicles estimates is 4.47% for 2020 and 0.18% for 2030. According to the assessment methodology described in Section, the ***progress*** obtained by Slovenia from 2016 until 2018 for LNG vehicles deployment is 0% of the overall planned deployment during the period 2016-2030 because there has been no increase between 2016 and 2018.

Infrastructure

The Slovenian NIR reports one publicly accessible LNG refuelling point in 2018 and confirms the NPF target for the next decade (three refuelling points from 2020 until 2030) (Table 5.24.3-1).

The 2018 ***attainment*** of future public LNG refuelling infrastructure targets is constant and equal to 33.33% for 2020, 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Slovenia from 2016 until 2018 for public LNG refuelling infrastructure deployment is 33.33% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the SI NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LNG		8.00	8.00	59.67	635.33	1445.67

5.24.3.1.4 Hydrogen

Vehicles

There were no hydrogen vehicles recorded in Slovenia in 2018 (Table 5.24.3-1). Similarly to the other AFs, the SI NIR confirms the NPF estimates for the next decade (86 in 2020, 1,240 in 2025 and 6,871 in 2030). The majority of these vehicles will be light-duty vehicles (i.e. passenger cars and light commercial vehicles) but 800 HCVs and 57 buses and coaches are also foreseen in 2030.

Since at the end of 2018 there are no hydrogen vehicles deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

Slovenia had one publicly accessible hydrogen refuelling point in 2018 and for the future the SI NIR confirms the NPF targets (two refuelling points in 2020 and seven refuelling points from 2025 until 2030). The SI NIR also mentions a project (RESHUB), headed by the Ministry of Defence and dedicated to the establishment of 15 hydrogen refuelling points in Slovenia for strategic independence. This is linked to a project of zero emission corridors in Slovenia and will allow civilian hydrogen-powered mobility to make use of the hydrogen refuelling points of the Slovenian army. It is not clear how these 15 refuelling points relate to the seven public refuelling points mentioned above.

The 2018 ***attainment*** of future public hydrogen refuelling infrastructure targets is 50% for 2020 and 14.29% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Slovenia from 2016 until 2018 for the deployment of public hydrogen refuelling infrastructure is 0% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the SI NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**H2**	0.00	0.00	0.00	43.00	177.14	981.57

5.24.3.1.5 Biofuels

Vehicles

Information is not available in the Slovenian NIR.

Infrastructure

Information is not available in the Slovenian NIR.

5.24.3.1.6 LPG

Vehicles

Slovenia recorded 10,670 LPG vehicles in 2018 (of which 10,246 passenger cars, 410 LCVs and 14 HCVs). The SI NIR confirms the NPF estimates for the next decade, which include a peak of 41,145 LPG vehicles in 2025 (Table 5.24.3-1). In 2030, the total LPG fleet of 36,440 vehicles will be composed by 31,374 passenger cars, 224 LCVs and 4,842 HCVs.

The 2018 ***attainment*** of future LPG vehicles estimates is 32.05% for 2020 and 29.28% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Slovenia from 2016 until 2018 for LPG vehicles deployment is 3.08% of the overall planned deployment during the period 2016-2030.

Infrastructure

The Slovenian NIR reported 115 public LPG refuelling points in 2018 and, similarly to the NPF, no information regarding future targets. The NIR declares that "*Refuelling infrastructure has been deployed to a satisfactory extent; users trust it and are using it….That is why there is no provision in the Strategy for the development of refuelling infrastructure using public funds*". This would imply that the LPG infrastructure should remain roughly the same also for the next decade.

In the absence of detailed targets, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the SI NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road. Of course, only the sufficiency index until 2018 could be computed.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LPG**	85.65	90.63	92.78			

5.24.3.2 Rail transport

5.24.3.2.1 Electricity

Vehicles

Information is not available in the Slovenian NIR.

Infrastructure

Information is not available in the Slovenian NIR.

5.24.3.3 Waterborne transport (maritime)

5.24.3.3.1 Electricity

Vessels

Information is not available in the Slovenian NIR.

Infrastructure

The SI NIR explains that the Port of Koper is connected to the electricity network through the 20 kV distribution network. This is sufficient for the current electricity needs at the port. For the future, an increased request of electric energy is foreseen, which might not be satisfied by the existing electricity network. For this reason, the SI NIR refers that, as part of the European project POSEIDON-MED, a document was prepared (*Feasibility of connecting the Port of Koper to the 110 kV network*). On this basis the NIR concludes that "*Measures are planned to build new power lines to connect to the 110 kV transmission network in order to realise objectives linked to supplying ships with electricity from the shore-side for the needs of the Port of Koper and to assess how much to charge for electricity to supply ships from the shore-side*."

5.24.3.3.2 LNG

Vessels

Information is not available in the Slovenian NIR.

Infrastructure

The SI NIR makes reference to the obligation set in the Directive to deploy, by 31 December 2025, an adequate number of LNG refuelling points at maritime ports in the TEN-T Core Network, which for Slovenia relates to the Port of Koper. The NPF that had set a target of one LNG refuelling point in 2025, however the SI NIR does not provide any confirmation/modification of this plan.

5.24.3.4 Waterborne transport (inland)

Not applicable since Slovenia has no inland ports in the TEN-T Core Network.

5.24.3.5 Air transport

5.24.3.5.1 Electricity

Airplanes

Information is not available in the Slovenian NIR.

Infrastructure (for stationary airplanes)

The Slovenian NIR refers that at the TEN-T Core "Jože Pučnik" airport of Ljubljana-Brnik, all stationary aircraft already have a supply of electric power. At Maribor and Portorož airports from the TEN-T Comprehensive Network, the supply will be in place by the planned deadline (i.e. 31 December 2025).

5.24.4 ***Measures assessment***

With reference to the measures to support the uptake of AF vehicles and infrastructures, the SI NIR shows an effort to select and tailor them according to Slovenia's objectives for 2030. However, at the moment this effort is totally concentrated on road transport only, while rail, waterborne and air transport are either just mentioned or not considered. The NPF had presented a large number of measures of all types, but most of them were only under consideration. The SI NIR presents a lower number of Legal and Policy/Deployment measures compared to the NPF, but the majority of these measures are in place or are being adopted. It is also worth mentioning that Slovenia had some measures to support the uptake of AF vehicles and infrastructure even before the introduction of the Directive. These measures have become part of the NPF and are included also in the NIR. Finally, it is noteworthy the remarkable increase in the number of RDT&D projects/measures presented in the NIR, compared to the NPF.

5.24.4.1 Legal measures

The SI NIR presents a list of five Legislative & Regulatory measures and no Administrative measures. Three of them were in place before the publication of the Directive. The other two are a consequence of the Directive. The level of ambition has generally increased compared to the NPF.

5.24.4.1.1 Legislative & Regulatory

The five Legislative & Regulatory measures are quite different in the scope and some of them contain also elements that could be considered as direct policy actions. In particular, there are:

- The Decree on the deployment of infrastructure for alternative transport, which transposes Directive 2014/94/EU into Slovenian law, entered into force on 12 August 2017;
- The Motor Vehicle Duties Act (2017), which updates the previous Annual Fee for Use of Motor Vehicles Act (in place since 2008) whereby motor vehicles with only an electric propulsion engine are exempt from annual vehicle duty;

- The Act amending the Motor Vehicles Tax Act, allowing a minimum tax rate (0.5%) for all vehicles emitting CO_2 up to and equal to 110 g/km, including alternatively powered vehicles (in place since 2010);
- The Personal Income Tax Act (that applies from 1 January 2020), where an employer provides an employee with an electric vehicle for private use, regardless of whether the vehicle is actually used for private purposes, the employee's taxable base has to include 0.3% of the purchase value of the vehicle per month, instead of 1.5% that applies to normal vehicles;
- The Corporate Income Tax Act, allowing a reduction of the tax base up to 40% of the purchase value of electric vehicles (BEV and PHEV) or of electric buses (BEV and PHEV).

5.24.4.1.2 Administrative

No Legal measure is present under this heading in the SI NIR.

5.24.4.2 Policy measures

With regards to the Policy measures, the SI NIR contains a total of 14 measures versus the 20 measures in the NPF. However, as mentioned earlier, these 14 measures are all in place or in the process of adoption, while the NPF included several measures under consideration (thus with low impact by default). Two things shall be highlighted here: first, all the measures are related to road transport only; second, the SI NIR has listed Policy and Deployment measures all together under the Policy heading, but this is not a problem for their assessment.

5.24.4.2.1 Measures to ensure national targets and objectives

Road transport

Ten out of the 14 Policy measures are dedicated to ensure national targets and objectives. Nine of these are financial incentives (either non-repayable, or favourable loans). The most relevant is the incentive scheme for the purchase of AF vehicles:

- €7,500 for a new electric vehicle without CO_2 emissions or an electrically processed vehicle, category M1;
- €4,500 for a new electric vehicle without CO_2 emissions or a power-driven vehicle, category N1 or L7e;
- €4,500 for a new plug-in hybrid vehicle or a new electric vehicle with a range extender, with CO_2 emissions at a discharge of less than 50g/km, category M1 or N1;
- €3,000 for a new electric vehicle without CO_2 emissions or a power-driven vehicle, category L6e.
- €1,000 for a new electric vehicle without CO_2 emissions of category L3e or L4e or L5e;
- €500 for a new electric vehicle without CO_2 emissions of category L1e-B or L2e;
- €200 for a new electric vehicle without CO_2 emissions of category L1e-A.

Other measures are related to providing incentives to municipalities for deploying publicly accessible recharging infrastructure; incentives to municipalities to support the purchase of AF vehicles for public transport and relative recharging/refuelling points; incentives to support public administration to purchase AF vehicles.

Other transport modes

The SI NIR does not provide measure addressing other transport modes (rail, waterborne, air).

5.24.4.2.2 Measures that can promote AFI in public transport services

The Slovenian NIR lists four measures to promote AFI in public transport services. They are related to providing direct incentives for the purchase of AF vehicles (BEV, PHEV and CNG) and for building recharging/refuelling infrastructure for these vehicles. A measure is under adoption for the construction of a hydrogen refuelling station in the municipality of Velenje.

5.24.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The SI NIR explains that at the moment it does not provide measures to promote private infrastructure for electro-mobility, because the State aid scheme for the private sector has not been set up yet. The plan is to have this scheme in 2020 on the basis of an amendment to the Energy Act.

5.24.4.3 Deployment and manufacturing support

5.24.4.3.1 AFI deployment

As mentioned earlier, the SI NIR has not distinguished between Policy and Deployment measures, listing all of them under the Policy measures heading.

5.24.4.3.2 Support of manufacturing plants for AF technologies

Information is not available in the SI NIR.

5.24.4.3.1 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the SI NIR.

5.24.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.24.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, five clusters of measures could be identified in the Slovenian NIR on electricity, CNG, LNG, hydrogen and LPG, all for road transport. No measure was found regarding LNG for waterborne transport, nor for rail or air. All the clusters obtained a medium or a low score and only the ones for the pair electricity/road and CNG/road resulted to be comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road and CNG/road have a medium impact, while those for the pairs LNG/road, hydrogen/road and LPG/road have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has generally increased for all the assessed pairs.

Table 5.24.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	M	C	**M**	+
CNG	Road	M	C	**M**	+
LNG	Road	L	N	**L**	+
	Water - maritime				
H2	Road	M	N	**L**	+
LPG	Road	L	N	**L**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.24.4.5 Research, Technological Development & Demonstration

The SI NIR shows a remarkable increase of RTD&D projects compared to the NPF. In the latter, only two projects were listed, while the NIR presents 18 projects that, for the period 2016 to 2019, received a total funding of 2.95 million €. These projects cover all the alternative fuels indicated in the Directive, except LPG. In particular, five RTD&D projects address electricity, one is related to the direct conversion of natural gas to higher hydrocarbons, two projects are focused on hydrogen, five projects on biofuels and five on synthetic & paraffinic fuels.
This clearly is assessed as showing a higher level of ambition compared to the NPF.

5.24.5 *Additional information on alternative fuels infrastructure developments*

Information is not available in the Slovenian NIR.

5.24.6 *Summary of the assessment*

Tabular overview

Table 5.24.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	626	328	8	NA	0	9,850
		Situation (2018)	1,902	467	8	0**	0	10,670
		Estimate (2030)	213,007	9,552	4,337	NA	6,871	36,440
		Future share (2030) [%]	17.53%	0.79%	9.09%		0.57%	3.00%
		Estimate attainment (2018 vs 2030) [%]	0.89%	4.89%	0.18%			29.28%
		Progress (2018)	adequate	slow	0.00%			3.08%
Publicly accessible AF Infrastructure		Past situation (2016)	228	4	0	0*	1	115
		Situation (2018)	328	4	1	NA	1	115
		Target (2030)	22,300	14	3	NA	7	NA
		Target attainment (2018 vs 2030) [%]	1.47%	28.57%	33.33%		14.29%	
		Progress (2018)	slow	slow	33.33%		0.00%	
Sufficiency Index		2016	2.75	82.00			0.00	85.65
		2018	5.80	116.75	8.00		0.00	92.78
		2020	9.79	216.43	59.67		43.00	
		2025	10.00	470.93	635.33		177.14	
		2030	9.55	682.29	1445.67		981.57	
Measures	Legal measures	Ambition (NIR vs NPF)	+	+	+		+	=
	Policy measures + Deployment & manufacturing support	Score	M	M	L		M	L
		Comprehensiveness	C	C	N		N	N
		Impact	M	M	L		L	L
		Ambition (NIR vs NPF)	+	+	+		+	+
	RTD&D	Ambition (NIR vs NPF)	+	+	+	+	+	+

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken or calculated from SI NPF. ** Value taken from EAFO (absent in NIR).

The Slovenian NIR addresses several requirements of Annex I from the Directive but only for road transport. The level of attainment in terms of AFV and AFI is reported for electricity, CNG, LNG, hydrogen and LPG. Vehicle estimates and infrastructure targets are provided for electricity, CNG, LNG and hydrogen.

For LPG, only vehicle estimates are provided. For all the other transport modes, the SI NIR does not report assessable information.

The main outcomes of the technical assessment of the Slovenian NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – Slovenia recorded 1,902 electric vehicles in 2018 (Table 5.24.3-1), of which 1,834 were passenger cars, 64 LCVs and 4 buses and coaches. The SI NIR confirms the NPF estimates for the next decade, also in terms of vehicle categories and ratio BEV/PHEV. For example, for 2030 the SI NIR confirms the estimate of 129,690 (BEV) and 71,664 (PHEV) passenger cars, of 11,020 LCVs (all BEV), of 258 (BEV) and 160 (PHEV) HCVs and of 215 buses and coaches (all BEV). The 2018 progress is adequate. As for the infrastructure, Slovenia recorded 328 publicly accessible recharging points in 2018. In line with the EVs estimates, the SI NIR confirms the NPF targets (1,200 recharging points in 2020, 7,000 in 2025 and 22,300 in 2030). In this case the progress is assessed as slow, but the sufficiency index is adequate for the whole period.

- **CNG** – Slovenia recorded 467 CNG vehicles in 2018, of which 244 were passenger cars, 74 LCVs, 60 HCVs and 89 buses and coaches. For the next decade, the SI NIR presents a slightly upward revision of the CNG vehicles estimate compared to the NPF, with 9,552 vehicles in 2030 (of which 355 HCVs and 1,154 buses and coaches). The 2018 progress is slow. The Slovenian NIR presents 4 publicly accessible CNG refuelling points in 2018 and a confirmation of the NPF targets over the period 2020-2030, which consisted in 14 refuelling stations from 2020 onward. The 2018 progress is slow also for CNG infrastructure, but the sufficiency index is adequate until 2030.
- **LNG** – The SI NIR lists eight LNG HCVs in 2018 and fully confirms the NPF estimates (179 HCVs in 2020, 1,906 HCVs in 2025 and 4,337 HCVs in 2030). On the infrastructure side, the Slovenian NIR reports one publicly accessible LNG refuelling point in 2018 and confirms the NPF target for the next decade (three refuelling points from 2020 until 2030).
- **Hydrogen** – In 2018, there were no hydrogen vehicles in Slovenia. The SI NIR confirms the NPF estimate (86 in 2020, 1,240 in 2025 and 6,871 in 2030). The majority of these vehicles will be light-duty vehicles, but 800 HCVs and 57 buses and coaches are also foreseen in 2030. Slovenia had one publicly accessible hydrogen refuelling point in 2018 and the SI NIR confirms the NPF targets (two refuelling points in 2020 and seven refuelling points from 2025 until 2030).
- **Biofuels** – Information is not available in the SI NIR.
- **LPG** – Slovenia recorded 10,670 LPG vehicles in 2018 (of which 10,246 passenger cars, 410 LCVs and 14 HCVs). For the next decade, the NPF vehicle estimates are confirmed. Concerning infrastructure, the SI NIR declares that the 115 public refuelling points in 2018 are sufficient also for the next decade, thus no further investment is foreseen.

Rail transport

Information is not available in the Slovenian NIR.

Waterborne transport (maritime)

- **Electricity** – The SI NIR explains that the Port of Koper is connected to the electricity network through the 20 kV distribution network. This is sufficient at the moment but in the future the request of shore-side electricity should increase. There is a plan to connect the Port of Koper to the 110kV transmission network, but no details concerning timetable and budget are provided.
- **LNG** – Contrary to the NPF that had set a target of one LNG refuelling point in 2025, the SI NIR does not provide any confirmation/modification of this plan.

Air transport

- **Electricity** - The Slovenian NIR refers that at the Jože Pučnik airport of Ljubljana-Brnik, all stationary aircraft already have a supply of electric power. At Maribor and Portorož airports the supply will be in place by the planned deadline (i.e. 31 December 2025).

With reference to the **measures** to support the uptake of AF vehicles and infrastructures, the SI NIR shows an effort to move from the wide list of measures under discussion in the NPF to a more limited but focussed set of measures. However, at the moment this effort is totally concentrated on road transport only, while rail, waterborne and air transport are either just mentioned or not considered.

The SI NIR presents a list of five Legislative & Regulatory measures and no Administrative measures. Three of them were in place before the publication of the Directive. The other two are a consequence of the Directive. The level of ambition has generally increased compared to the NPF.

As for the Policy and Deployment & Manufacturing measures, the SI NIR contains a total of 14 measures versus the 20 measures in the NPF. However, these 14 measures are all in place or in the process of adoption, while the NPF included several measures under consideration. The SI NIR has listed Policy and Deployment measures all together under the Policy heading. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pairs electricity/road and CNG/road have a medium impact, while those for the pairs LNG/road, hydrogen/road and LPG/road have a low impact. The level of ambition has generally increased for all the assessed pairs.

The SI NIR shows a remarkable increase of RTD&D projects compared to the NPF, with 18 projects (versus two in the NPF) that cover all the AFs (including biofuels and synthetic & paraffinic fuels) and all transport modes.

5.24.7 *Final remarks*

The Slovenian's NIR provides a rather comprehensive report on efforts to implement the Directive. It complies with most of the provisions of Annex I to the Directive, with the main exception being the lack of information on LNG infrastructure at the port of Koper, the only Slovenian port in the TEN-T Core Network. The measures provided by Slovenia target all fuels with varying scopes and impacts; but with a clear focus on road transport. Future reporting should better describe measures for other modes of transport, particularly for LNG in maritime transport.

With regard to electricity, the NIR estimates that by 2030 there could be 213,007 electric vehicles on the roads, representing about 17.5% of the fleet by that time, as well as 22,300 recharging points in the same year. Taking into account the current situation and expected trends, this level of ambition appears to be broadly consistent with the pace of deployment of electric vehicles considered necessary for the full transition to carbon neutrality by 2050. No information on charging efficiency is provided. The Port of Koper is connected to the electricity network. Electricity supply is provided to stationary airplanes in Ljubljana-Brnik airport "Jože Pučnik" and is planned to be made available in the Maribor and Portorož airports by 2025. The Slovenian NIR does not provide information on the share of the electrified rail network. More information on Slovenia's future plans for further electrification of this mode of transport should be provided.

Regarding hydrogen for transport, there is already one hydrogen refuelling point in Slovenia. The NIR estimates a small fleet of about 6,900 FCHVs for 2030. Further, it estimates seven hydrogen refuelling points by 2030. This number seems sufficient, taking into account the length of the TEN-T Core Network, provided that the refuelling stations are equally distributed along the network.

Concerning natural gas, 14 CNG refuelling points are planned for 2020 for a small fleet that is estimated to increase from 467 CNG vehicles in 2018 to about 9,552 in 2030. The number of CNG refuelling points is not expected to increase, as it is considered sufficient given the estimated size of the CNG fleet by 2030. One LNG refuelling point for road transport was recorded in Slovenia in 2018, three LNG refuelling points are planned in Slovenia for 2020. This seems sufficient considering the length of the TEN-T Core Network, provided that the refuelling points are widely distributed along the network. A significant increase in the number of LNG heavy-duty vehicles is foreseen (4,337 LNG HDVs by 2030). No information is provided on the LNG infrastructure at the port of Koper. To this end, Slovenia should clarify how it intends to ensure the supply of LNG in the port of Koper by 2025.

There are already 115 LPG refuelling points in Slovenia. It is not foreseen to build additional infrastructure, but an increase of the LPG fleet from 10,670 vehicles in 2018 to 36,440 in 2030 is estimated.

Slovenia should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.24.8 *ANNEX - Description of the Member State*

On a surface area of 20,300 km², Slovenia has a population of 2.067 million people in 2018, which makes up for a population density of 102 inhabitants/km².

Number of main urban agglomerations

- 2 urban agglomerations > 50,000 inhabitants

In 2018, Slovenia achieves a per capita gross domestic product at market prices of €22,080, which represents a per capita gross domestic product in purchasing power standards of 87 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Slovenia is 446 km. The total road network length is 20,051 km, of which 623 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Slovenia: 8% (433 km) of the Mediterranean Corridor and 7% (262 km) of the Baltic - Adriatic Corridor.

Through the TEN-T Road Corridors, Slovenia is connected with the following Member States:
- Austria (through the Baltic – Adriatic Corridor),
- Italy (through the Baltic – Adriatic and the Mediterranean Corridor),
- Hungary (through the Mediterranean Corridor),
- Croatia (through the Mediterranean Corridor).

Number of registered road vehicles

At the end of 2018, Slovenia accounts for 1,376,012 registered road vehicles of which 1,143,150 are categorised as passenger cars, 89,000 as light goods vehicles, 15,928 as heavy goods vehicles and 2,834 as buses and coaches. The motorisation rate is 553 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 1 maritime port in the TEN-T Core Network (Koper)
- No maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Ljubljana)
- 2 airports in the TEN-T Comprehensive Network

5.25 Slovakia (SK)

5.25.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Slovak NPF the Commission concluded:

The Slovak NPF addresses partly the requirements of Article 3. It contains a discussion of the current state and future scenarios for alternative fuels in the transport sector. For all the mandatory fuels and modes (electricity and natural gas), it establishes targets as required by Article 3 of the Directive. No measures have been taken or proposed to promote alternative fuels infrastructure in public transport services or to facilitate the deployment of recharging points not accessible to the public.

The Slovak NPF puts a comparably low emphasis on electric vehicles and estimates only 0.5% electric vehicles on the road in 2020. The number of electric recharging points foreseen for 2020 and 2025 seems not sufficient to cover the needs of Slovakia in terms of number of the estimated number of vehicles and distance requirements. This could evolve to become a barrier for the further deployment of electric vehicles in Slovakia and could also lead to market fragmentation within the EU. The spatial distribution of the recharging points is not given. According to the Slovak NPF, the greatest distance between any two directly neighbouring high power recharging points is at the moment approximately 80 km which seems insufficient. Also according to the Slovak NPF, South Slovakia is at the moment poorly – perhaps even inadequately – covered in terms of all types of recharging. It will be important to closely monitor this development and correct the infrastructure targets in line with the market developments. Purchase incentives have been defined to increase the number of electric vehicles in Slovakia. The Slovak NPF discusses electricity for stationary airplanes at the Bratislava TEN-T Core Network airport. It does not specify any quantitative targets for this. The Slovakian NPF does not include concrete plans for shore-side electricity supply for inland ports. However, it mentions that this will be further investigated in the future.

Regarding CNG, the NPF shows that the available number of CNG refuelling points and the ones planned for 2020 and 2025 are sufficient to pass the threshold value of one CNG refuelling point per 600 vehicles today and in the future. The distance requirement of at least one refuelling point every 150 km is met already today. The NPF shows also the ambition of increasing the number of CNG refuelling points with a specific plan on selected urban/suburban agglomerations. Some lower impact financial measures have been defined to promote the use of CNG vehicles on the roads.

The Slovak NPF considers that at least two LNG refuelling points for heavy-duty vehicles will be required and mentions that the ideal situation appears to be 3-5 public LNG refuelling points for road transport by 2025. If at least two LNG refuelling points were realised (one on each TEN-T Corridor; Bratislava area, Žilina area and/or Košice/Prešov area) this could guarantee that the maximum distance requirement for LNG refuelling points along the TEN-T Core Network would be fulfilled on Slovak territory.

The construction of LNG bunkering facilities in the two TEN-T Core Network inland ports (Bratislava and Komárno) is planned and measures are proposed to support the construction of these LNG facilities on the Slovak section of the River Danube.

The Slovak NPF does not include hydrogen but will analyse opportunities to further the advancement of hydrogen infrastructure.

According to the Slovak NPF, LPG is actually covered by a relatively large nationwide network of refuelling points (fulfilling the needs of vehicle operators) and the infrastructure of LPG refuelling points is constantly expanding. However, one of the main barriers preventing the development of LPG vehicles seems to be the restriction on parking in underground parking facilities.

The Slovak NPF contains a comprehensive list of support measures for electricity for vehicles, most already in place and for some a prolongation is foreseen. They can be considered having a low to medium impact on market actor's decisions. Longer periods for their validity could provide certainty for market actors and hence increase the likelihood that the national targets and objectives of the NPF can be reached. For other modes and fuels, the measures in the Slovak NPF seem to have a rather low impact and are not comprehensive. No measures are discussed to promote AFI in public transport services or to promote the deployment of private electro-mobility infrastructure.

The Slovak NPF has taken into consideration the interests of regional and local authorities, as well as other stakeholders during its drafting.

Slovakia has not listed specific cooperation programmes; however, some collaboration examples are given. Slovakia has cooperated with the Czech Republic within the Connecting Europe Facility programme and, since 2013, has also assisted in the implementation of the TEN-T project LNG Masterplan for the Rhine - Main - Danube Corridor.

5.25.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.25.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of Transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, waterborne (inland) / Electricity, CNG, LNG, H2, LPG		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, waterborne (inland) / Electricity, CNG, LNG, H2, LPG		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).			No
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Road, waterborne (inland) / Electricity		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, waterborne (inland) / Electricity, LNG		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG, LNG, H2, LPG		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, waterborne (inland) / Electricity, CNG, LNG, H2, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	All	Electricity	No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)			No

The checklist shows the requirements of Annex I from the Directive that are covered in the SK NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity, CNG, LNG, hydrogen and LPG are covered for road transport; LNG is just mentioned for inland water transport; hydrogen in mentioned for rail and inland water transport; all the other combinations are either absent or not applicable.

The Slovak NIR reports 17 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify six AF/transport mode clusters of measures, of which four were assessable.

5.25.3 *Quantitative assessment: Vehicles and infrastructure*

Table 5.25.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	1,691	237	10,000	750	19,950	1,500	34,900	3,000
	Change NIR vs NPF [%]			0.00%	0.00%	-0.25%	0.00%	-0.29%	
	Attainment [%]			16.91%	31.60%	8.48%	15.80%	4.85%	7.90%
CNG / road	NIR	2,454	12	4,500	18	14,300	76	24,000	114
	Change NIR vs NPF [%]			-10.00%	-56.10%	-4.67%	-15.56%	-20.00%	
	Attainment [%]			54.53%	66.67%	17.16%	15.79%	10.23%	10.53%
LNG / road	NIR	15	0	100	3	397	8	1,888	10
	Change NIR vs NPF [%]						300.00%		
	Attainment [%]			15.00%		3.78%		0.79%	
LNG / water (inland)	NIR	NA	0	NA	0	NA	1	NA	2
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	0	0	0	0	160	6	3,600	18
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / water (inland)	NIR	0	0	0	0	0	0	1	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / Rail	NIR	0	0	0	0	3	NA	10	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
LPG / road	NIR	52,219	362	55,514	362	61,017	365	66,022	365
	Change NIR vs NPF [%]								
	Attainment [%]			94.06%	100.00%	85.58%	99.18%	79.09%	99.18%

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

5.25.3.1 Road transport

5.25.3.1.1 Electricity

Vehicles

Slovakia recorded 1,691 battery-electric and plug-in hybrid electric vehicles in use in 2018 (see Table 5.25.3-1), of which 1,570 were passenger cars, 74 LCVs and 47 buses and coaches. Regarding EV estimates for 2020, 2025 and 2030, the SK NIR substantially confirms the estimates made in the NPF (10,000; 19,950 and 34,900 EVs in the NIR, versus 10,000; 20,000 and 35,000 in the NPF). The NIR also provides estimates for electric two-wheelers, which were not reported in the NPF (500, 1,000 and 2,000 two-wheelers respectively for 2020, 2025 and 2030). Concerning heavy-duty vehicles, the SK NIR estimates 200 electrified buses and coaches on the road by 2030 but no HCV.

The 2018 ***attainment*** of future EV estimates is 16.91% for 2020 and 4.85% for 2030. According to the assessment methodology described in Section 2.1, the state of play in 2018 corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Slovakia is equal to 31%.

Infrastructure

Slovakia recorded 237 publicly accessible recharging points in 2018 (Table 5.25.3-1). Concerning the targets for 2020 and 2025, the SK NIR confirms the NPF targets (750 and 1,500, respectively). For 2030 the NIR presents a new target (3,000). The SK NIR also shows for 2020 and 2025 a progressive shift from normal power (≤ 22 kW) to high power (>22 kW) recharging points compared to the NPF. For 2030, the new target of 3,000 recharging points should consist of 50% normal power and 50% high power.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 31.60% for 2020 and 7.90% for 2030. According to the assessment methodology described in Section 2.1, the state of play in 2018 corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Slovakia is equal to 24%.

Ratio

Based on the SK NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. For the next decade the foreseen sufficiency index is not far from a value of 10 that, considering the planned 50% share of high power recharging points in 2030, can be regarded as adequate.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**Electricity**	4.84	7.90	7.14	13.33	13.30	11.63

Information on charging efficiency

Information is not available in the Slovak NIR.

5.25.3.1.2 CNG

Vehicles

Slovakia recorded 2,454 CNG vehicles in use in 2018, of which 1,856 were passenger cars, 334 LCVs, 24 HCVs and 240 buses and coaches. As shown in Table 5.25.3-1, the NIR presents lower estimates of CNG vehicles for 2025 and 2030 than the NPF. In the latter, a total number of 30,000 CNG vehicles were estimated by 2030, while in the NIR this number has been revised to 24,000 CNG vehicles. With regard to the heavy-duty sector, the SK NIR estimates 800 HCVs and 200 buses and coaches by 2030.

The 2018 ***attainment*** of future CNG vehicles estimates is 54.53% for 2020 and 10.23% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Slovakia is equal to 20%.

Infrastructure

Slovakia recorded 12 publicly accessible CNG refuelling points in 2018 (see Table 5.25.3-1). For the next decade, the SK NIR shows a general reduction of the targets for publicly accessible CNG refuelling points over the period 2020-2025 compared to the NPF (-56.10% in 2020 and -15.56% in 2025). For 2030, the SK NIR presents a new CNG infrastructure target of 114 publicly accessible refuelling points that was absent in the NPF. According to the SK NIR "*the number of (CNG) refuelling points (in 2018) appears to be inadequate. The target situation, as defined in the National Policy Framework, is to achieve a critical mass of CNG refuelling point infrastructure that will trigger the spontaneous development of CNG use*".

The 2018 ***attainment*** of future publicly accessible CNG refuelling infrastructure targets is 66.67% for 2020 and 10.53% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by Slovakia is equal to 20%.

Ratio

Based on the SK NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. The sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the whole implementation period.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**CNG**	172.09	177.58	204.50	250.00	188.16	210.53

5.25.3.1.3 LNG

Vehicles

Slovakia recorded 15 LNG vehicles in 2018 (all HCVs). For the next decade, the SK NIR shows a series of LNG vehicles estimates (100, 397 and 1,888 vehicles, respectively for 2020, 2025 and 2030), all in the heavy-duty sector, which was completely absent in the NPF. Estimates for 2030 point to 1850 HCVs and 38 buses and coaches are estimated.

The 2018 ***attainment*** of future LNG vehicles estimates is 15.00% for 2020 and 0.79% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Slovakia from 2016 until 2018 for LNG vehicles deployment is 0.79% of the overall planned deployment during the period 2016-2030.

Infrastructure

The SK NIR does not report any LNG refuelling point in 2018, however it shows a new strategy on LNG infrastructure (similar to that for LNG vehicles). While in the NPF there was only a target of two refuelling points for 2025, the SK NIR shows a new set of targets for 2020, 2025 and 2030 (three, eight and ten refuelling points, respectively). The reason for this new approach is due to the need to provide the heavy-duty sector with a more CO_2 friendly solution (compared to diesel fuel) "*in connection with the adoption of the Regulation of the European Parliament and of the Council setting CO_2 emission performance standards for new heavy-duty vehicles*".

Since at the end of 2018 there are no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the SK NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LNG				33.33	39.70	134.86

5.25.3.1.4 Hydrogen

Vehicles

The SK NIR reports zero hydrogen vehicles in 2018, but shows estimates for 2025 and 2030 (160, and 3,600 vehicles, respectively), which were absent in the NPF. The plan for 2030 is to have 3,000 passenger cars, 250 LCVs, 150 HCVs and 200 buses and coaches.

Since at the end of 2018 there were no hydrogen vehicles deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Infrastructure

The SK NIR does not report any hydrogen refuelling point in 2018, but presents new targets for hydrogen infrastructure, which were not present in the NPF. The targeted hydrogen publicly accessible refuelling points for 2025 and 2030 are six and eighteen, respectively.

Since at the end of 2018 there were no hydrogen refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

Based on the SK NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair hydrogen/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	H2					26.67	200.00

5.25.3.1.5 Biofuels

Vehicles

Information is not available in the Slovak NIR.

Infrastructure

The Slovak NIR reports that, while the content of biofuel in diesel fuel is at the upper limit of the technical standard (7% by volume), for petrol there is scope to increase the share of biofuels from the present 7.4% to 9% by volume. Also, the introduction of high-biofuel blends in the form of E20, E85 and, if appropriate, B30 is expected to be considered in the near future in parallel to the development of electro-mobility. There is, however, no description of concrete planning into this direction and no indication of infrastructure implication.

5.25.3.1.6 LPG

Vehicles

The SK NIR recorded 52,219 LPG vehicles in 2018 (of which 49,083 were passenger cars, 3,125 were LCVs, 10 HCVs and 1 bus) and confirms the LPG vehicle estimates for 2020, 2025 and 2030 that were already in the NPF (see Table 5.25.3-1). Such estimate appears as an incremental increase from 55,514 vehicles in 2020 to the 66,022 vehicles in 2030, with an overall growth of 26% compared to 2018.

The 2018 ***attainment*** of future LPG vehicles estimates is 94.06% for 2020 and 79.09% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Slovakia from 2016 until 2018 for LPG vehicles deployment is 21.71% of the overall planned deployment during the period 2016-2030.

Infrastructure

The SK NIR reports 362 LPG refuelling points in 2018. In the NPF there was no mention of a targets for 2020, 2025 and 2030, while in the NIR (see Table 5.25.3-1) such plan appears as a substantial confirmation of the current situation regarding LPG refuelling points in Slovakia also for the period up to 2030 (365 LPG refuelling points).

The 2018 ***attainment*** of future publicly accessible LPG refuelling infrastructure targets is 100% for 2020 and 99.18% for 2030, reflecting a mature and stable situation. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Slovakia from 2016 until 2018 for LPG refuelling infrastructure deployment is already 95.38% of the overall planned deployment during the period 2016-2030.

Ratio

Based on the SK NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	**LPG**	161.31	153.51	144.25	153.35	180.88	180.88

5.25.3.2 Rail transport

5.25.3.2.1 Hydrogen

Vehicles

The SK NIR shows the plan to have three and ten hydrogen-fuelled locomotives by 2025 and 2030, respectively. This is new compared to the NPF.

Infrastructure

Information is not available in the Slovak NIR.

5.25.3.3 Waterborne transport (maritime)

Not applicable since Slovakia has no maritime ports in the TEN-T Core Network.

5.25.3.4 Waterborne transport (inland)

5.25.3.4.1 LNG

Vessels

Information is not available in the Slovak NIR.

Infrastructure

The SK NIR presents the target (absent in the NPF) to provide one LNG refuelling point for each port in the TEN-T Core Network (i.e. Blatislava and Komárno) by 2030.

Since at the end of 2018 there were no LNG refuelling points deployed, the 2018 ***attainment*** and ***progress*** have not been computed.

5.25.3.4.2 Hydrogen

Vessels

The Slovak NIR reports the plan to have one hydrogen-fuelled vessel by 2030.

Infrastructure

Information is not available in the Slovak NIR.

5.25.3.5 Air transport

5.25.3.5.1 Electricity

Airplanes

Information is not available in the SK NIR.

Infrastructure (*for stationary airplanes)*

Information is not available in the Slovak NIR.

5.25.3.5.2 Biofuels

Airplanes

Information on flights / airplanes powered by biofuels is unavailable in the SK NIR.

Infrastructure

The Slovak NIR provides no information on the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network.

5.25.4 ***Measures assessment***

The SK NIR presents a set of measures covering all the four categories (legal, policy, deployment & manufacturing and RTD&D) however they mostly focus on the development of electro-mobility. To a lower extent, also measures for CNG, LNG, and hydrogen refuelling infrastructure for road transport are present.

5.25.4.1 Legal measures

The most prominent legislative and regulatory initiatives taken by Slovakia are the approval of the Action Plan (the 'Action Plan') for the Development of Electro-mobility in the Slovak Republic (Resolution No 110/2019) and the revision of two legislative acts. The implementation report submitted by SK does not list all the initiatives taken in the Action Plan. Below is a summary of the initiatives mentioned in the SK NIR and those mentioned in the Action Plan only.

Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR. On the basis of the available information, it can be considered that the level of ambition remains constant between NPF and implementation report.

5.25.4.1.1 Legislative & Regulatory

SK NIR lists three legal measures: i) the Action Plan for the Development of Electro-mobility in the Slovak Republic (Resolution No 110/2019); ii) the Act No 162/2018, establishing terms and conditions for the operation of publicly accessible recharging points and refuelling points for AF; iii) the Amendment of Act No 71/2013 Coll., to allow subsidies and state aid to support the construction of AF infrastructure and subsidies for the purchase of AF vehicles.

5.25.4.1.2 Administrative

Although there is no mention of them in the SK NIR (probably because they were still under discussion), the Action Plan lists two administrative measures that, if approved, can provide a positive contribution to the development of AFV and AFI in Slovakia: i) simplification of the administrative process for the construction of recharging infrastructure; ii) legislative obligation to build recharging infrastructure in the construction of new parking spaces.

5.25.4.2 Policy measures

5.25.4.2.1 Measures to ensure national targets and objectives

Road transport

The implementation report lists a series of eight policy measures (six of which are financial, two non-financial), all related to road transport. One of these eight measures has expired in 2019, while the other seven are either in force or have been adopted for entry into force from 2020 onward. The six financial policy measures entail: subsidies for the purchase of BEV and PHEV (€5,000 and €3,000 respectively); subsidies (expired in 2019) for the purchase of EV by municipalities; subsidies for building EV recharging infrastructure by municipalities (up to €5,000 per each recharging point); reduction of 50% in the annual tax rate for hybrid, CNG, LNG and hydrogen vehicles; reduction of 50% in the registration fee for these same vehicles; reduced excise duty for CNG. The two non-financial policy measures involve the introduction of terms and conditions for establishing low-emission zones and the introduction of emission plaques for marking vehicles.

In addition to these eight measures, the Action Plan lists seven other policy measures that are either in force, in process of adoption, or under discussion.

Other transport modes

The SK NIR presents no measure concerning other transport modes (waterborne, air, rail).

5.25.4.2.2 Measures that can promote AFI in public transport services

The SK NIR presents no measure regarding the promotion of AFI in public transport.

5.25.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

The SK NIR presents no measure regarding the promotion of the deployment of private electro-mobility infrastructure.

5.25.4.3 Deployment and manufacturing support

5.25.4.3.1 AFI deployment

As part of the measures for the deployment of alternative fuels infrastructure, the SK NIR lists the state subsidies allocated to the municipalities for the build-up of publicly accessible recharging points, as set forth in Act No 71/2013 and the approved Scheme for the Build-up of Alternative Fuels Infrastructure (a de minimis aid scheme) – DM 6/2019. This measure is also listed as one of the financial policy measures.

In addition to the above initiative, SK NIR also mentions the update of the Operational Programme Integrated Infrastructure to incorporate alternative fuels into Priority Axis 6 – as a potential means of using financial instruments (as part of the National Development Fund II, which accounts for 3% of each operational programme).

5.25.4.3.2 Support of manufacturing plants for AF technologies

Concerning the support to manufacturing plants related to AFV/AFI, SK NIR reports the granting of investment aid in the form of tax concessions for two companies that manufacture electric vehicle components.

5.25.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Slovak NIR.

5.25.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.25.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, the pair electricity/road obtains an overall medium score and is considered comprehensive. None of the other pairs identified can be considered comprehensive. Support measures have a medium score for the pair CNG/road and low score for LNG/road and for hydrogen/road. For all the other pairs the measures are either absent or not assessable. In terms of expected impact of the assessable measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road have a medium impact, those for the pairs CNG/road, LNG/road and hydrogen/road have a low impact.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for the pairs CNG/road and hydrogen/road, although this does not appear to correlate with the vehicle estimates and infrastructure targets described in the previous Section 5.25.3.

Table 5.25.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (IR vs NPF)
Electricity	Road	M	C		**M**		=
CNG	Road	M	N		**L**		+
LNG	Road	L	N		**L**		=
	Water-inland						
H2	Road	L	N		**L**		+
Electricity	Water-inland	X					
Electricity	Air	X					

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.25.4.5 Research, Technological Development & Demonstration

Compared to the NPF, which only reported one RTD&D measure, the implementation report shows an increased effort to channel financial resources into the support of research, development and demonstration in the form of grant calls by the Slovak Research and Development Agency and via the Operational Programme Research and Innovation and the Operational Programme Integrated Infrastructure. Three RTD&D programmes have been launched concerning AFV for a total budget of €550,000, one programme is related to recharging points for EVs with a budget of €200,000, two programmes deal with the design of the LNG terminal at the public port of Bratislava for a total budget of €953,000.

The Action Plan mentions that a seventh RTD&D programme regarding battery manufacturing is under discussion.

5.25.5 *Additional information on alternative fuels infrastructure developments*

The Slovak NIR does not provide information on the changes in fuel use.

5.25.6 *Summary of the assessment*

Tabular overview

Table 5.25.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	CNG / road	LNG / road	LNG / water (inland)	H2 / road	LPG / road
AF Vehicles / Vessels		Past situation (2016)	557	1,893	0	NA	0	48,392
		Situation (2018)	1,691	2,454	15	NA	0	52,219
		Estimate (2030)	34,900	24,000	1,888	NA	3,600	66,022
		Future share (2030) [%]	1.42%	0.98%	1.33%		0.15%	2.69%
		Estimate attainment (2018 vs 2030) [%]	4.85%	10.23%	0.79%			79.09%
		Progress (2018)	adequate	slow	0.79%			21.71%
Publicly accessible AF Infrastructure		Past situation (2016)	115	11	0	0	0	300
		Situation (2018)	237	12	0	0	0	362
		Target (2030)	3,000	114	10	2	18	365
		Target attainment (2018 vs 2030) [%]	7.90%	10.53%				99.18%
		Progress (2018)	adequate	slow				95.38%
Sufficiency Index		2016	4.84	172.09				161.31
		2018	7.14	204.50				144.25
		2020	13.33	250.00	33.33			153.35
		2025	13.30	188.16	49.63		26.67	180.88
		2030	11.63	210.53	188.80		200.00	180.88
Measures	Legal measures	Ambition (NIR vs NPF)	=	=	=			
	Policy measures + Deployment & manufacturing support	Score	M	M	L		L	
		Comprehensiveness	C	N	N		N	
		Impact	M	L	L		L	
		Ambition (NIR vs NPF)	=	+	=		+	
	RTD&D	Ambition (NIR vs NPF)	+		+			

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

The SK NIR addresses several but not all the requirements of Annex I from the Directive.

Regarding the combination of AF/AFV/AFI with transport mode, electricity for road transport is the most comprehensively covered; CNG, LNG and hydrogen are also partially covered for road transport; LNG is just mentioned for inland water transport; all the other combinations are either absent or not applicable. As for LPG, Slovakia has already a quite developed combination of refuelling infrastructure and vehicles. The Slovak NIR does not provide information on the methodology applied to take account of the charging efficiency of high power recharging points nor any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Slovak NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** - The SK NIR confirms the NPF vehicles estimates and infrastructure targets for the period 2020-2030, thus showing the same level of ambition of the NPF. According to our methodology, the progress achieved between 2016 and 2018 to meet the 2030 objectives is adequate. The sufficiency index indicating the ratio between number of EVs and number of recharging points also remains adequate until 2030. With regards to heavy-duty vehicles, the SK NIR estimates 200 electrified buses and coaches on the road by 2030 but no HCV.

- **CNG** - The SK NIR reports an important revision of both the vehicle estimates and infrastructure targets for the period 2020-2030 compared to the NPF. The new objectives are both lowered (for example 24,000 CNG vehicles are now foreseen in the NIR for 2030, compared to 30,000 CNG vehicles in the NPF), representing a clear decrease of ambition. This is further confirmed by the progress for the period 2016-2018, assessed as slow for both vehicle and infrastructure deployment. However, the decrease in vehicle estimates and infrastructure targets for CNG/road is partially mitigated by a comparable increase of LNG/road and hydrogen/road objectives, combined. For the heavy-duty sector the SK NIR estimates 800 HCVs and 200 buses and coaches by 2030.
- **LNG** – Unlike the NPF, the SK NIR presents a strategy for LNG/road, which plans to have 1,888 heavy-duty vehicles and 10 LNG refuelling points by 2030.
- **Hydrogen** - Similarly to LNG, the SK NIR presents a strategy for the pair hydrogen/road that was not present in the NPF. In this case, 3,600 vehicles and 18 hydrogen refuelling points are foreseen by 2030. Most of the hydrogen-fuelled vehicles should be light-duty vehicles (3,250), but 150 HCVs and 200 buses and coaches are estimated too.
- **Biofuels** – The SK NIR reports that for petrol there is scope to increase the share of biofuels from 7.4% to 9% by volume. It also includes the possibility in the near future to introduce high-biofuel blends in the form of E20, E85 and, if appropriate, B30.
- **LPG** - The SK NIR presents a plan for the LPG/road, however this cannot be regarded as a consequence of the AFI Directive, because the LPG vehicles and infrastructure were already present on the Slovak territory before 2016 and the outlook presented in the NIR until 2030 shows a substantial confirmation of the present situation.

Rail transport

- **Hydrogen** - The SK NIR plans to have three and ten hydrogen-fuelled locomotives by 2025 and 2030, respectively. This is new compared to the NPF.

Waterborne transport (inland)

- **LNG** - The SK NIR presents the target (absent in the NPF) to provide by 2030 one LNG refuelling point for each port in the TEN-T Core Network (i.e. Blatislava and Komárno).

Air transport

- **Biofuels** – The Slovak NIR does not provide information related to the need of renewable jet fuel refuelling points in airports within the TEN-T Core Network.

With reference to the **measures**, the SK NIR shows a focus on the development of electro-mobility. To a lower extent, also measures addressing CNG, LNG, and hydrogen refuelling infrastructure are present.

The Legal measures are mainly dedicated to allowing the development of electro-mobility, in terms of both electric vehicles and recharging infrastructure. If fully implemented, these measures appear to be fit to support the realisation of the AFV/AFI objectives, as presented in the NPF and revised in the NIR. Based on the available information, the level of ambition remains constant between the NPF and the NIR.

The Policy and Deployment & Manufacturing measures, taken singularly, score low or medium, with the majority showing the same or higher level of ambition compared to the NPF. The most complete and comprehensive cluster of measures applies the pair electricity/road, followed by the pair CNG/road, while the LNG/road pair obtains the same overall score as in the NPF. As for hydrogen, there were no measures in the NPF, thus those in the NIR, although overall low scoring and not-comprehensive, represent an increase of ambition compared to the NPF. In terms of expected impact of the assessable measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road have a medium impact, those for the pairs CNG/road, LNG/road and hydrogen/road have a low impact.

With regards to the RTD&D measures, the implementation report shows an increased effort to channel financial resources into the support of research, development and demonstration, with focus on electro-mobility projects. This qualitatively scores as showing a higher ambition compared to the NPF.

5.25.7 *Final remarks*

The Slovak NIR provides a rather comprehensive report on the efforts to implement the Directive. The NIR meets many requirements of Annex I to the Directive, with some exceptions like the missing information on the use of shore-side electricity supply in inland ports and electricity supply for stationary aircraft in airports. There is also a lack of information on the measures to be implemented to promote other modes of transport than road.

The Slovak NIR plans for approximately 34,900 electric vehicles on the roads by 2030, representing about 1.4% of the fleet by that time. Taking into account the current situation and expected trends, this level of ambition appears quite low compared to the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. Furthermore, the targets for publicly accessible recharging infrastructure correspond to the low estimated number of vehicles and will hence not lead to an appropriate recharging network. An increase in ambition will contribute to better meeting the needs of a dense, wide-spread and easy to use network of recharging and refuelling infrastructure throughout the EU. No information on charging efficiency is provided. Further information should be provided on the electrification of waterborne, air and rail transport.

For hydrogen infrastructure, the NIR includes a strategy for developing hydrogen infrastructure for road transport. Such strategy was not considered in the NPF. The NIR targets around 3,600 FCHVs by 2030. A number of 18 hydrogen refuelling points is estimated for 2030. This number seems sufficient subject to future fleet development. The NIR also includes the plans of Slovakia to use hydrogen as a fuel for rail.

With regard to CNG vehicles and infrastructure, the NIR shows a slightly reduced level of ambition in comparison with the figures reported in the NPF. In any case, the estimated uptake of CNG is expected to result in about 24,000 vehicles by 2030, which will represent about 1% of the fleet by that time. The estimated number of CNG refuelling points by 2030 seems to be sufficient taking into account the estimated size of the CNG fleet in that year. Concerning LNG for road transport, the NIR includes a strategy to develop the LNG infrastructure for road transport, which had not been included in the NPF. The NIR estimates eight LNG refuelling points by 2025 and ten LNG refuelling points by 2030. The number of refuelling points seems sufficient, considering the length of the TEN-T Road Core Network, provided that the refuelling points are widely distributed along the network. Concerning the LNG infrastructure for inland ports, the NIR estimates one refuelling point for each port of the TEN-T Core Network, which is in line with the requirements of the Directive.

With regard to LPG infrastructure, the NIR reports a fleet of 52,219 LPG vehicles and a sufficient number of 362 refuelling points in Slovakia in 2018. According to the NIR, a slight increase of LPG vehicles and a constant number of LPG refuelling points is estimated by 2025 and 2030 compared to 2018. The estimated number of around 66,000 LPG vehicles will only make up approximately 2-3% of the fleet by 2030.

Regarding biofuels, Slovakia is also considering the use of higher blends of biofuels in road transport. The NIR expresses that there is scope to increase the share of biofuels in petrol from 7.4% to 9% by volume. Biodiesel is blended by 7%. The NIR does not provide information on the use of biofuels in aviation. Slovakia should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.25.8 *ANNEX - Description of the Member State*

On a surface area of 49,000 km², Slovakia has a population of 5.443 million people in 2018, which makes up for a population density of 111 inhabitants/km².

Number of main urban agglomerations

- 8 urban agglomerations > 50,000 inhabitants

In 2018, Slovakia achieves a per capita gross domestic product at market prices of €16,470, which represents a per capita gross domestic product in purchasing power standards of 73 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Slovakia is 832 km. The total road network length is 18,023 km, of which 413 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Slovakia: 7% (256 km) of the Baltic - Adriatic Corridor, 1% (81 km) of the Orient / East - Mediterranean Corridor and 9% (395 km) of the Rhine - Danube Corridor.

Through the TEN-T Road Corridors, Slovakia is connected with the following Member States:
- Austria (through the Baltic - Adriatic and the Rhine - Danube Corridor)
- Poland (through the Baltic - Adriatic Corridor)
- Czechia (through the Orient / East Mediterranean and the Rhine - Danube Corridor)
- Hungary (through the Orient / East Mediterranean and the Rhine - Danube Corridor)

Number of registered road vehicles

At the end of 2018, Slovakia accounts for 3,141,103 registered road vehicles of which 2,321,608 are categorized as passenger cars, 318,000 as light goods vehicles, 358,832 as heavy goods vehicles and 9,363 as buses and coaches. The motorisation rate is 427 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- No maritime ports
- 2 inland ports in the TEN-T Core Network (Bratislava, Komárno)
- No inland ports in the TEN-T Comprehensive Network

Through the 413 km inland waterways TEN-T Core Network, Slovakia is connected with Austria and Hungary by the Rhine - Danube Corridor.

Number of airports in the TEN-T Core Network

- 1 airport in the TEN-T Core Network (Bratislava)
- 2 airports in the TEN-T Comprehensive Network

5.26 Finland (FI)

5.26.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Finnish NPF the Commission concluded:

The Finnish NPF fully addresses the requirements of Article 3. It contains an extensive discussion of the current state and future scenarios for alternative fuels in the transport sector. For all fuels and modes, it establishes targets as required by Article 3 of the Directive. The Finnish NPF focuses on biofuels to meet the near-zero emission transport target by 2050, and states ambitious measures to achieve them. Low and high blends are planned to be used in different modes of transports, ensuring less fossil oil dependency and less GHG emissions.

The NPF states high recharging point targets and vehicle estimates, and contains some measures to deploy electricity in transport, such as tax reductions and direct investments for private and public electro-mobility. The given recharging points target and its spatial distribution seems to cover the needs of electric vehicles in terms of number of publicly accessible recharging points as well as distance requirements in Finland. The ratio of recharging points per estimated number of electric vehicles is on the borderline to sufficiency until 2030, and close monitoring may be needed to ensure sufficiency. In Finland, 22 electric buses have been procured for public transport for demonstration projects in 4 cities. The Finnish NPF contains targets to further promote and increase shore-side electricity in ports and ground power for stationary airplanes is already offered in the major airports.

Finland currently has a sufficient CNG infrastructure in terms of vehicles per refuelling point and will continue to have in 2025. The NPF provides a map of spatial CNG distribution where minimum coverage criteria does not hold on the TEN-T Core Network in 2020, and no information about CNG infrastructure until 2025 is provided. Thus, additional revision could be necessary to secure the minimum coverage criteria until 2025.

LNG with gradual increase of renewable share is foreseen as the main shipping and long-haul transport fuel. Six LNG refuelling points in maritime ports and one mobile inland waterway bunker are planned until 2030. Nine road LNG refuelling points on the TEN-T Core Network will ensure the minimum coverage criteria of one LNG refuelling point at least every 400 km for heavy-duty motor vehicles, already by 2020.

Furthermore, the Finnish NPF displays a strong commitment towards hydrogen. The deployment of 19 publicly accessible hydrogen refuelling points in addition to two existing is planned, ensuring the distance of 300 km between two points.

The Finnish NPF contains a comprehensive list of measures, with most already in place and foreseen to stay. Most of them could have a medium impact on electricity, CNG and LNG in the road transport, and high impact on LNG in shipping. However, some measures could not be assessed due to the limited information contained in the NPF. The NPF contains a comprehensive list of support measures that can promote the deployment of alternative fuels infrastructure in public transport services.

Finland considered regional and local authorities, stakeholders' interests and cooperation with other Member States in some instances.

5.26.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.26.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	All / All		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	All / All		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	All / All		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	All / All		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	All		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / electricity, CNG		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	All / All		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	All / All		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points			No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, rail, air / All		Yes

The checklist shows that most of the requirements of Annex I from the Directive are covered in the Finnish NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is partially covered for all modes. CNG, hydrogen and synthetic fuels are partially covered for road transport, LNG for road and waterborne transport. Biofuels are partially covered for road, waterborne and air transport, while all the other combinations are either absent or not applicable.

The Finnish NIR reports 52 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify 11 AF/transport mode clusters of measures, of which seven were assessable.

5.26.3 *Quantitative assessment: Vehicles and infrastructure*

In its accompanying Excel table, the FI NIR states that "the targets for public recharging points will need to be revised. However, no decisions have yet been made regarding new targets". For natural gas infrastructure, it indicates that "targets will be set in the near future, but no formal decisions have yet been made". For hydrogen refuelling points, the following can be read: "targets will need to be revised. However, no decisions have yet been made regarding new targets". Thus it was not entirely clear at the time of writing this assessment whether the government of Finland will endorse the NPF infrastructure targets for road electricity, CNG and hydrogen. For information purposes, when considered still relevant, these will be shown in Table 5.26.3-1.

Table 5.26.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	15,807	2,399	NA	NA (2,000*)	160,738	NA	382,790	NA (25,000*)
	Change NIR vs NPF [%]				0.00%	51.64%		45.55%	0.00%
	Attainment [%]					9.83%		4.13%	
CNG / road	NIR	6,307	40	NA	50	25,337	NA (55*)	52,788	NA
	Change NIR vs NPF [%]				-9.09%	49.04%	0.00%	-0.40%	
	Attainment [%]				80.00%	24.89%		11.95%	
LNG / road	NIR	25**	6**	NA	NA (9*)	NA	NA (11*)	NA	NA
	Change NIR vs NPF [%]				0.00%		0.00%		
	Attainment [%]								
LNG / water (maritime)	NIR	4	2	NA	NA	NA	6	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]						33.33%		
LNG / water (inland)	NIR	0	0	NA	NA	NA	NA	NA	1
	Change NIR vs NPF [%]								0.00%
	Attainment [%]								
H2 / road	NIR	1	NA	NA	NA	NA	NA	NA	NA
	Change NIR vs NPF [%]								
	Attainment [%]								
Other AF / road (E85)	NIR	4,132	140	NA	NA	NA	NA	NA	1,800
	Change NIR vs NPF [%]								620.00%
	Attainment [%]								7.78%

* Target from the FI NPF.
** Values taken from EAFO 2018 (absent in both NPF and NIR).

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

5.26.3.1 Road transport

The FI NIR states that the National Distribution Infrastructure Programme for Alternative Propulsion Systems in Transport has the goal that all new passenger cars and vans sold in Finland shall be compatible with an alternative propulsion system by 2030.

5.26.3.1.1 Electricity

Vehicles

Finland reported 15,807 battery-electric and plug-in hybrid electric vehicles in use in 2018 (see Table 5.26.3-1), of which 15,499 were passenger cars, 285 LCVs, 2 HCVs and 21 buses and coaches. Additionally, Finland also recorded 1,248 electric PTWs in 2018. The Finnish NIR estimates 160,738 EVs for 2025 and 382,790 for 2030, which are respectively 51.64% and 45.55% higher than in the NPF. In particular for 2030, the FI NIR foresees 364,346 passenger cars, 15,398 LCVs, 2,046 HCVs and 1,000 buses and coaches. This reflects a considerably higher policy ambition than in NPF. In contrast to the NPF, estimates for 2020 were not reported in the NIR.

The 2018 ***attainment*** of future EV estimates is 9.83% for 2025 and 4.13% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Finland is equal to 41%.

Infrastructure

Finland reported 2,399 publicly accessible recharging points in 2018 (Table 5.26.3-1), of which 413 were high power (>22kW) recharging points. For the next decade, the FI NIR does not provide targets and mentions that those in the NPF need to be revised. The 2020 target provided in the NPF of 2,000 points has been clearly achieved and exceeded already in 2018. Considering the NPF targets for 2020 and 2030 (25,000 points), the share of publicly accessible high power recharging infrastructure is foreseen to remain constant at a value of 10%.

The 2018 ***attainment*** of the future public recharging infrastructure targets (provided in the NPF) is higher than 100% for 2020 and 9.60% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible recharging infrastructure evolution planned by Finland in its NPF is equal to 29%.

Ratio

The following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. For the next decade only the 2030 value can be computed and results higher than 10, which can be regarded as potentially inadequate considering the foreseen low share of high power recharging points (10%).

Sufficiency Index		2016	2017	2018	2020	2025	2030
Electricity	road	5.08	5.61	6.59			15.31*

* Value computed with AFI target from the FI NPF.

Information on charging efficiency

Information is not available in Finnish NIR.

5.26.3.1.2 CNG

Vehicles

Finland reported 6,307 CNG vehicles in use in 2018 (Table 5.26.3-1), of which 5,599 were cars, 528 LCVs, 133 HCVs and 47 buses and coaches. In contrast to the NPF, the 2020 estimate is not reported in the NIR. The NPF estimate of 5,800 CNG vehicles in 2020 has been already achieved. The NIR presents a new estimate for 2025 (25,337 vehicles), which is 49.04% higher than in the NPF, while there is practically no change for 2030. For this latter year, the Finnish NIR expects a fleet of 52,788 CNG vehicles, composed by 43,745 passenger cars (82.9%), 7,177 LCVs (13.6%), 1,719 HCVs (3.25%) and 147 buses and coaches (0.28%).

The 2018 ***attainment*** of future CNG vehicles estimates is 24.89% for 2025 and 11.95% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Finland is equal to 26%.

Infrastructure

As Table 5.26.3-1 shows, Finland reported 40 publicly accessible refuelling points in 2018. The FI NIR provides only a new target of 50 CNG refuelling points for 2020, which means five refuelling points less in comparison to the NPF (i.e. 9.09% lower), and no target for 2025 and 2030. The NPF included also a target of 55 refuelling points for 2025 (similar to 2020), but this has not been confirmed in the NIR.

The 2018 ***attainment*** of future public CNG refuelling infrastructure targets is 80% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible CNG refuelling infrastructure evolution planned by Finland is equal to 20%.

Ratio

Based on the FI NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. It can be seen that the sufficiency index is always below the indicative value of 600 (see Section 2.1.5), even in 2025. The values for 2020 and 2030 could not be computed due to the lack of data.

Sufficiency Index		2016	2017	2018	2020	2025	2030
CNG	road	91.00	121.34	157.68		460.67*	

* Value computed with AFI target from the FI NPF.

5.26.3.1.3 LNG

Vehicles

The Finnish NIR does not report any information on LNG vehicles, either past data nor future estimates. Also the NPF had not reported any vehicle estimate for 2020-2030. The value shown in Table 5.26.3-1 of 25 LNG vehicles in 2018 is from EAFO. The FI NIR only briefly mentions about long-distance lorries using LNG and LBG (Liquid BioGas), but does not provide specific numbers.

Because there are no LNG vehicle estimates provided in the Finnish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Finnish NIR does not report any figure for road LNG refuelling points in 2018 (the value shown in Table 5.26.3-1 of 6 refuelling points is from EAFO), but declares that in autumn 2019 there were seven LNG refuelling points in use. The NPF had a target of 9 LNG refuelling points for 2020 and 11 for 2025. The FI NIR does not confirm them numerically, but states that for liquefied natural gas and biogas (LNG, LBG) the objective for Finland is to have by 2030 a nationwide network of LNG refuelling stations on the highway for heavy-duty vehicles.

Because there are no LNG refuelling point targets provided in the Finnish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

As no information has been provided for LNG vehicles/infrastructure in the FI NIR, the sufficiency index could not be computed. Using the EAFO numbers for 2018 the sufficiency index is equal to 4.17.

5.26.3.1.4 Hydrogen

Vehicles

In 2018, there was just one hydrogen passenger car on the road in Finland, since 2016. The FI NIR does not provide estimates for the next decade, thus the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Finnish NIR did not include hydrogen infrastructure provisions. According to the NPF, an objective for Finland was to have 21 hydrogen refuelling stations in main urban centres by 2030, with a distance between them of approximately 300 kilometres and a radius of influence of 150 kilometres each. Back in 2016, in Finland there were two hydrogen filling stations. By 2019, there was no longer any publicly accessible hydrogen refuelling station in Finland. The FI NIR states that it is unlikely that the network of hydrogen stations will grow in line with the targets set in 2016 (see also Section 5.26.4.2).

Because of the lack of hydrogen data in the Finnish NIR, the 2018 ***attainment*** and ***progress*** have not been computed.

Ratio

As no information has been provided for vehicles and infrastructure, the sufficiency index could not be computed.

5.26.3.1.5 Biofuels

Vehicles

The Excel file accompanying the FI NIR shows 4,132 vehicles powered by other alternative fuels in 2018, of which 94 were HCVs, 6 LCVs and the rest passenger cars. It is, however, unclear whether they refer to E85 vehicles only. The NIR states that around 4,300 E85 fuelled vehicles were in use in autumn 2019 (see Section 5.26.4.2.1 for information on vehicle conversions) but it also explains that not all the E85 vehicles are included in this statistics because there are conventional vehicles that are later converted to E85 and are not immediately ri-registered as such. The FI NIR also mentions that there are a few trucks used for refuse collection and freight distribution, as well as some buses used in public transport in Helsinki running on ED95.

The FI NIR indicates the following objectives for the share of vehicles being able to use some alternative mode of propulsion, including E85 and ED95 (see also Section 5.26.3.1.7):

- For new passenger cars and vans: the target is to have 20% of the vehicles in 2020, 50% in 2025 and 100% in 2030.
- For new heavy-duty vehicles (HCV and buses): 40% in 2020, 60% in 2025 and 100% in 2030.

The FI NIR also explains that, due to the absence of new E85 vehicle models on the market, the only way for E85 to contribute to the above objectives is through the conversion to E85 of the existing conventional vehicles, for which Finland provides subsidies.

Because there are no numerical E85 vehicle estimates in the Finnish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The FI NIR reports a network of 140 E85 refuelling stations (a map was also included in the NIR) and one ED95 refuelling point (with another one under construction)[16]. While for 2020 and 2025, both the NPF and the NIR indicate no targets, for 2030 the FI NIR has a new target of 1,800 refuelling points offering biofuels, which constitutes an increase of 620% compared to the NPF target of 250 refuelling points. In fact, the FI NIR states that "*An objective in the national distribution infrastructure programme for alternative propulsion systems in transport was that by 2030 all filling stations would include in their range of products a high blend fuel (such as 100% renewable diesel, high blend ethanol E85 or ethanol diesel ED95). The dominant grade would be, for example, E20/25 petrol*" (see also Section 5.26.3.1.7).

Ultimately, the FI NIR mentions that the trend in the availability of, E85 and ED95 fuel will depend on the demand. It also states that the network can grow quickly and in response to market demand at any given time, reaching, if necessary, several hundred stations.

[16] However, from the information provided in the FI NIR it is not clear which is the total number of refuelling stations providing at least one type of biofuels in 2018.

Considering the publicly accessible E85 refuelling infrastructure, the 2018 ***attainment*** of the future targets is 7.78% for 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Finland from 2016 until 2018 for the deployment of publicly accessible biofuels (E85) refuelling infrastructure is 2.35% of the overall planned deployment during the period 2016-2030[17].

Ratio

Based on the Finnish NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair E85/road. It is worth reminding that the number of vehicles used to calculate these ratios might be underestimated, due to the uncertain number of E85 converted vehicles in the official statistics.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Other AF (E85)	road	36.50*		29.51			

* Value computed with 2016 AFI number from the FI NPF

5.26.3.1.6 LPG

Vehicles

Information is not available in the Finnish NIR.

Infrastructure

Information is not available in the Finnish NIR.

5.26.3.1.7 Synthetic and paraffinic fuels

Vehicles

The FI NIR indicates that the use of renewable diesel, by bus operators, taxis and other transport firms as well as for non-road mobile machinery, is increasing. For instance, the NIR expected that all the vehicles operating at Finavia's regional airports would be using renewable diesel by the end of 2019.

The FI NIR objectives indicated in Section 5.26.3.1.5 also apply to vehicles running on 100% renewable diesel that do not rely on any special technology to do so.

Infrastructure

Information on the number of publicly accessible synthetic and paraffinic refuelling points in use between 2016 and 2018 is not available in the Finnish NIR. Finland recorded 20 renewable paraffinic diesel (HVO) refuelling points for heavy-duty vehicles (a map was also included in the NIR) and 34 for all vehicles in summer 2019.

The FI NIR identifies the limited network of refuelling stations as a bottleneck to greater renewable diesel use. The objective mentioned in Section 5.26.3.1.5, related to the national

[17] Calculation performed using the value of 100 E85 refuelling stations existing in 2016 as indicated in the FI NPF.

distribution infrastructure programme for alternative propulsion systems in transport also applies to 100% renewable diesel HVO100. The NIR again specifies that future HVO100 availability is conditional to market demand.

5.26.3.2 Rail transport

5.26.3.2.1 Electricity

Vehicles

Information is not available in the Finnish NIR.

Infrastructure

The FI NIR states that "*an objective of the national distribution infrastructure programme for alternative propulsion systems in transport was that rail would be nearly 100% electrified by 2050*", therefore the electrification of the state rail network will continue for 2020/2025/2030.

5.26.3.3 Waterborne transport (maritime)

5.26.3.3.1 Electricity

Vessels

The NIR mentions two electric vessels in operation since 2018: the 'Aranda' marine research vessel, capable of relying on its battery for short journeys, and a cable reel ferry operating between Nauvo and Högsar. According to the NIR, there were a few electric vessels in use in Finland in autumn 2019. The NIR expects new electric cable ferries to be deployed in the future as well as a new electric ferry to be sailing in the archipelago off Turku. In addition, the NIR reports hybrid (electric) vessels: the 'Elektra', in service between Parainen and Nauvo since mid-2017, and three new ones (fitted with batteries to be charged by diesel electric generators, whose power will be used at ports) commissioned by Finnlines and expected to be ready between 2020 and 2021.

Because there are no numerical estimates of electric vessels to be deployed in the maritime ports provided in the Finnish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

Similarly to the NPF, the Finnish NIR did not provide numerical data regarding the shore-side electricity supply points in 2018. However, the NIR reports that in autumn 2019 shore-side power was available at the ports of Helsinki, Oulu and Kemi. The Finnish NPF had reported 4 SSE supply points in 2016.

For shore-side electricity, the development plans over the next years vary from port to port. The FI NIR mentioned the objective that the largest ports should have a shore-side electricity facility by 2030. To this end, several projects have started during the implementation period and are currently continuing at the ports of Helsinki, Oulu and Kemi, but also at the ports of Turku and Långnäs. The Finnish NIR indicates technical and economic challenges with the supply of shore-side electric power, as individual cruisers need about 15 MW each.

Because there are no numerical targets for shore-side electricity supply in the maritime ports provided in the Finnish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

5.26.3.3.2 LNG

Vessels

In 2018, LNG was the fuel used by four vessels under Finnish flag. LNG consumption data on one of them (the Viking Grace) accounted for 94% of all the fuel used in 2018. The NPF had indicated 17 LNG seagoing ships in 2016.

The number of LNG-fuelled vessels is expected to increase in the next years, but no numerical data for 2020/2025/2030 were provided in the NIR. The only exception being the indication that five new vessels powered by LNG were in the order book in September 2019, although it is not certain whether all will be registered with the Finnish flag.

Because there were no numerical estimates in the Finnish NIR of LNG vessels to be deployed in the maritime ports, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Finnish NIR mentions that LNG bunkering operations are currently carried out in the TEN-T Core port of Helsinki. On the west coast of Finland, an LNG terminal is available since September 2016 in Pori, while another one was completed in June 2019 in Tornio. The FI NIR confirms the 2025 target of 6 refuelling points provided in the NPF. More specifically, it mentions that the Finnish national distribution infrastructure programme for alternative propulsion systems in transport aimed at having bunkering facilities (LNG or LBG) at all TEN-T Core Network ports (Hamina-Kotka, Helsinki, Naantali and Turku) and in the ports of Pori and Tornio by 2025.

The FI NIR states that the increase in the number of LNG-fuelled ships used for domestic and international transport will be a factor that supports the development of the LNG infrastructure in the longer term and that low oil prices might slow down the investments.

The 2018 ***attainment*** of future LNG refuelling infrastructure targets for seagoing ships is 33.33% for 2025. The ***progress*** could not be computed due to the lack of necessary data.

5.26.3.3.3 Biofuels

Finland reports the intention to increase the use of VG Marine EcoFuel, produced in Finland, by four or five times the current volume of 450 tonnes a year by the end of 2021.

Vessels

The FI NIR does not provide numerical data on the number of vessels using biofuels in 2018, but gives information indicating that at least four vessels that fly the Finnish flag can use biofuels. On two of them, the fuel consumption in 2018 included approximately 25% bio-oil, manufactured in Finland from vegetable fat and fish gut waste.

The number of biofuesl vessels is expected to increase in the next years, but no numerical data for 2020/2025/2030 were provided. The Act on the Promotion of Biofuels in Transport aims at increasing the use of biofuels on boats that use the same fuels as road transport. At the same time, the stock of boats and boat engines in Finland is replaced slowly.

5.26.3.4 Waterborne transport (inland)

5.26.3.4.1 Electricity

Information is not available in the Finnish NIR.

5.26.3.4.2 LNG

Vessels

Information is not available in the Finnish NIR.

Infrastructure

The FI NIR confirms the target of one LNG refuelling facility for inland waterways provided in the NPF for 2030. More specifically, it is stated that the potential needs for LNG/LBG of vessels navigating in the Saimaa lake deep-water routes will be covered by a mobile bunkering point or similar solution located in Mustola, near Lappeenranta, by 2030.

5.26.3.5 Air transport

The FI NIR does not give any numerical data on airplanes and infrastructure, but the objective for air transport is to reach a 40% share of renewables or of other solutions to cut emissions by 2050, and airport terminals traffic emission-free by 2050.

5.26.3.5.1 Electricity

Airplanes

Information is not available in the Finnish NIR. Finavia predicts that Finland will have pure electric passenger aircraft on domestic routes by the end of the 2030s at the earliest.

Infrastructure (for stationary airplanes)

It is not fully clear from the NIR whether electricity for stationary airplanes continues to be available at the major Finnish airports, as indicated in the NPF, and what the current situation for smaller airports is. The number of electric recharging infrastructure for stationary airplanes is expected to increase in the next years, but no numerical data for 2020/2025/2030 were provided.

Electricity is used by about 30% of non-road machinery of ground handling companies at Helsinki-Vantaa Airport, and the replacement rate for rechargeable equipment is 5-15% per year.

5.26.3.5.2 Biofuels

Finland reports an objective on blending obligation, which would allow for sustainable biofuels to achieve a 30% share in aviation fuels by 2030, but no measures have yet been put in place to achieve it.

Airplanes

Information on flights / airplanes powered by biofuels is not provided in the FI NIR.

Infrastructure

Finland did not provide data on the biofuels refuelling infrastructure for airplanes in its NIR.

5.26.4 ***Measures assessment***

As in the NPF, the Finnish NIR contains an extensive and detailed description of measures, most of them in place during the implementation period. They cover a wide variety of AFs and transport modes. The majority focuses on electricity, natural gas and biofuels as AF and on road as transport mode, however measures for waterborne maritime, rail and air are also present.

5.26.4.1 Legal measures

The Finnish NIR contains 7 legal measures (versus 12 in the NPF) to promote AF. One of them focuses exclusively on biofuels, while the rest target a combination of AFs.

An overall assessment of the legal measures is that the Finnish NIR shows an increased ambition level compared to the NPF.

5.26.4.1.1 Legislative & Regulatory

Almost all the legal measures listed in the NIR can be categorised as legislative and regulatory measures. They tend to target a combination of AFs in road transport, such as:

- Act on Transport Services (320/2017);
- Act on Consideration for the Energy and Environmental Impact of Vehicles in Public Procurement;
- Act on the Distribution of Alternative Fuels for Transport.

In addition, the Act on the Promotion of Biofuels in Transport entered into force in 2019 and set a mandatory target for 2030 of 30% biofuels share (10% share of advanced biofuels). Biogas is also being considered.

Traficom, the Finnish Transport and Communications Agency, and many other Finnish actors have established collaborations. In November 2018, the Finnish government and the automotive industry concluded a climate agreement known as the 'green deal', to be in effect until the end of 2025. Among its goals there are: increasing the registration share of new vehicles with alternative propulsion systems to at least 25% by 2025, reducing average CO_2 emissions from new light-duty vehicles by at least 4% a year as well as promoting biofuels use in heavy-duty vehicles.

The FI NIR reports as well contribution to targets and measures agreed upon at international level, as Finland has actively participated in the work of the ICAO and IMO to promote the use of alternative means of propulsion.

5.26.4.1.2 Administrative

The Finnish NIR provides information on one administrative measure regarding the contribution to EU objectives and measures, targeting a combination of AFs and transport modes.

5.26.4.2 Policy measures

The Finnish NIR contains 29 policy measures at national level, a strong increase compared to the 12 policy measures identified in the NPF. Of all the policy measures reported in the NIR, 83% have a financial nature, 55% can be characterised as targeting a combination of alternative fuels, 31% a combination of transport modes and 28% as targeting a combination of both.

Finland based their policy measures and financial incentives on the emissions level to encourage introduction of alternative fuels vehicles and other sustainable transport modes. The main focus in the Finnish NIR is on electric, biofuels and CNG/LNG vehicles, where financial instruments are introduced for different vehicle categories.

The NIR reports at least one policy measure that targets exclusively each of the AFs as defined in the Directive, with the exception of hydrogen and synthetic and paraffinic fuels. As a matter of fact, hydrogen seems to have lost (part of) its relevance in Finnish plans and the NIR reports a decrease of ambition justified with different directions of market development. Nevertheless, some subsidising possibilities for hydrogen are still possible under the 'Energy support programme' and the taxation system.

5.26.4.2.1 Measures to ensure national targets and objectives

Of all the national policy measures described in the Finnish NIR, 19 can be categorised as measures to ensure national targets and objectives.

Road transport

Among the policy measures that focus on road transport, the following can be highlighted:

- BEV purchase subsidy: granting €2,000 to private persons (applicable also to long-term leases);
- Financial aid for ethanol[18] and gas-powered vehicle conversions: €200 and €1,000 respectively;
- Scrapping premium: €2,000 for the purchase of vehicles powered by high blend ethanol, electricity or methane, topped up with an industry discount of €500. The measure was in place in 2018 and resulted in 6,677 new vehicle purchases, mostly petrol vehicles. Of the total budget of 8 million €, circa 90% was used. The NIR compares the share of total vehicle purchases AFVs held both with and without the premium in the same period: in both cases, AFVs accounted for around 6% of the total vehicle purchases. However, the share of gas-powered vehicles was much higher with the premium (4.4% compared to ca. 1% without the premium).

[18] As the NIR states, the conversion of old vehicles into ethanol-powered flex-fuel cars is motivated by the lack of new model availability, the slow rate of replacement of the vehicle stock and its age.

- Differential fuel and vehicle registration taxation: four measures aim at taxation of the road vehicles, either privately owned or company cars;
- Information measures: All cars registered in Finland after 2001/2002 have an energy label developed for all new and used vehicles for which there is type approval information on emissions.

It seems that the BEV purchase subsidy and conversion aid have together an annual estimated budget of 6 million € over 2018-22, of which only 15.16% of the 2018-2019 budget was taken up.

Eight policy measures in the Finnish NIR are financial incentives to support the deployment of electric recharging infrastructure.

Waterborne transport

The FI NIR reports the plan to pursue the implementation of the LNG operational programme prepared in 2016, which consists of: i) addressing issues for the refuelling of ships with gas in Finland; ii) financial incentives for the construction of LNG infrastructure and the procurement of LNG-powered ships; iii) active role of Finland at international level.

The number of LNG-fuelled vessels in Finland is supposed to increase in the next few years, due to more stringent emission controls. Liquefied natural gas is now an attractive option to help achieve the emissions limits for coming years, as availability of other alternative fuels is not sufficient to meet the needs of maritime transport. Finland notices recent international developments in the LNG distribution infrastructure, which supports the transition to LNG vessels.

The Finnish NIR speculates that the use of shore-side electricity supply could be promoted through lower taxation on shore-side electricity in accordance with Article 19 of Council Directive 2003/96/EC, which would result in its wider use.

Air transport

The Finnish NIR also presents policy measures on promotion of the use of biofuels in air transport and on promotion of alternative propulsion systems at ports and airports. The main goal is to explore and promptly adopt various financing models and/or other approaches to guarantee the availability of biofuels at Helsinki-Vantaa Airport. The FI NIR explains that the various actors have discussed possible models in 2016-2019, but no actual measures have been put in place yet. Progress is expected in the coming years and the target is to reach a 30% share for sustainable biofuels in air transport by 2030, by means of blending obligation.

5.26.4.2.2 Measures that can promote AFI in public transport services

Many of the policy measures described in the Finnish NIR, can be considered also as measures that can promote AFI in public transport services. These measures are such that they can impact also public transport on road, rail, air and waterborne. All these measures address a wide spectrum of uses (different alternative fuel/mode of transport combinations).

The measure addressing rail in the Finnish NIR consists of financial incentives to achieve the goal of 100% rail electrification. The state provided financial assistance for the following urban rail projects:

- Western extension of the Helsinki metro, phase 1 (entire project 1,186 million €, state contribution 200 million €);
- Western extension of the Helsinki metro, phase 2 (entire project 801 million €, state contribution 240 million €);
- Jokeri light rail (entire project 275 million €, state contribution 84 million €);
- Tampere tramway (entire project 245 million €, state contribution 30%)

For the future, the government of Finland plans an increase in rail investments, although it is unclear to what extent this covers alternative fuels.

5.26.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

A measure for private recharging points reported in the Finnish NIR regards a grant for building recharging infrastructure in housing cooperatives, with a budget of 1.5 million € per annum for 2018-2021. The grant, which is available also for acquiring recharging equipment, is for 35% of actual costs, with a ceiling of €90,000. It requires the provision of at least five recharging points. It has been proposed that the budget for this grant is increased by 4 million € per annum as from 2020.

5.26.4.3 Deployment and manufacturing support

5.26.4.3.1 AFI deployment

The Finnish NIR contains seven AFI deployment support measures, which represents an increase compared to the three measures identified in the NPF. While all of them include budget information, four of them focus on electricity and the rest target a combination of alternative fuels.

In addition to the urban rail projects highlighted in Section 5.26.4.2.2 (thus dealing with passenger transport), the following development projects were in progress or have just been completed in Finland in 2016-2019, including electrification projects:

- The Seinäjoki-Oulu upgrade project (entire project 674 million €)
- The western rail track at Pasila (49 million €)
- The Riihimäki triangular junction (12 million €)
- Increased capacity between Helsinki and Riihimäki (150 million €)
- Improvements to the Helsinki rail yard (55 million €)
- The Luumäki-Imatra project (189 million €)
- The Pori-Mäntyluoto electrification project (7 million €)
- The electrification of the line at Uusikaupunki (21 million €)
- The Pännäinen-Pietarsaari electrification project (4 million €)

Besides electricity for rail, electricity for road features among the AFI deployment measures indicated in the NIR. Concerning publicly accessible recharging infrastructure, the NIR reports 4.8 million € in aid over 2017-2019, with an aid rate of 35% for fast recharging and 30% for normal recharging points, granted only for smart charging systems. With regards to private AFI deployment, the policy measure mentioned in Section 5.26.4.2.3 resulted in 1,200 recharging points in 75 housing cooperatives in 2018, at an expense of 0.7 million €.

TEN-T grants are reported to be used where possible, in building the distribution network in Finland. In 2016-2019 multiple LNG/CNG large scale projects have been implemented in Finland and have received TEN-T financial support in 2016-2019 of almost 33 million €. In comparison to the NPF, the budget is lower (30 million € vs. 90 million € in NPF), but the projects seem to continuously run and this decrease is probably due to the market saturation.

In addition to the aforementioned budgets, the Finnish NIR reports an estimated budget of 41.5 million € for AFI deployment for the period 2018-2021. This includes infrastructure support programme for electric transport and the use of biogas in transport, and the aid for the construction of recharging points in apartment buildings.

5.26.4.3.2 Support of manufacturing plants for AF technologies

The Finnish NIR indicates slightly over 30 million € of aid between 2017 and 2019 to support the construction of a biogas production plant and/or the production of biogas.

5.26.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Finnish NIR.

5.26.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.26.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, eleven clusters of measures have been identified, for as many pairs AF/transport mode, of which seven were assessable. The electricity/road, CNG/road, LNG/water (both maritime and inland) and electricity/rail pairs are the ones having a high score; the LNG/road and biofuels/road pairs get a medium score. All the others pairs score low or are not assessable. Five of the seven assessable clusters identified can be considered to be comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the lack of future targets and estimates for several pairs does not facilitate the task of putting this assessment into perspective. Based on the impact seen during the implementation period, for the future it can be said that the measures for the pairs electricity/road, CNG/road and LNG/water have a high impact. Electricity/rail, LNG/road and biofuels/road result to have a medium impact. Hydrogen/road has a low impact. Finally, electricity/water, electricity/air, biofuels/water and biofuels/air could not be assessed as limited information and no allocation were given in relation to the ‘Energy support programme’. Moreover, concerning this particular measure, aimed at “*(exploring) the possibility of promoting the use of alternative propulsion systems at Finnish ports and airports*”, the Finnish NIR and NFP explain that only the most promising options could be adopted by the beginning of the 2020s at the latest.

Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all pairs.

Table 5.26.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	H	C		**H**		+
CNG	Road	H	C		**H**		+
LNG	Road	M	C		**M**		+
	Water (M & I)*	H	C		**H**		+
Electricity	Water (M & I)*	X					
	Air	X					
	Rail	H	N		**M**		+
H2	Road	L	N		**L**		+
Biofuel**	Road	M	C		**M**		+
	Water (M & I)*	X					
	Air	X					

Legend: Score: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

*For some of the measures, it is unclear which ones correspond to maritime transport, which to inland and which cover both.
**For road transport, this includes renewable diesel.

5.26.4.5 Research, Technological Development & Demonstration

The Finnish NIR lists nine RTD&D research and pilot projects relating to alternative propulsion systems for transport carried out between 2016 and 2019: three addressing the field of biofuels, two on emissions measurements and financial mechanisms, and three on electric vehicles. In addition, an Action Plan for the Future of Mobility in Europe Mobility4EU, as well as the involvement in a project initiated by the European Commission to explore best practices for providing consumers with price comparison information on different propulsion systems were mentioned. The NIR does not provide specific details about each of these projects and this does not allow to either make direct comparisons with the projects listed in the NPF or to further analyse them. According to the information given in NIR, the majority of these projects focus on electricity and biofuels, to increase their cost-effectiveness. The indicated budget for RTD&D projects reported in the NIR amounts to 3.9 million € for the period 2016-2020. It includes both national funds and EU financial support to RTD&D activities on alternative fuels.

5.26.5 *Additional information on alternative fuels infrastructure developments*

The FI NIR provides information on the fuel use in road transport only with reference to 2017 (see Table 5.26.5-1). No other past data, nor future expectations have been shared.

Concerning rail transport, the NIR reports that electric traction systems account for 95% of passenger transport and 78.3% of freight transport.

The FI NIR states that the main fuel used in aviation in Finland is kerosene. Total sales of kerosene in 2018 reached around 77,000 tonnes. More than 80% of kerosene was used in international transport.

Table 5.26.5-1 Changes in fuel use in transport sector (2016-2030)

MODE OF TRANSPORT	FUEL	Fuels use [%]			Estimated fuels use [%]		
		2016	2017	2018	2020	2025	2030
Road	Gasoline		32.20%				
	Diesel		57.10%				
	Electricity		0.50%				
	CNG		0.20%				
	LNG		0.00%				
	Hydrogen		0.00%				
	LPG		0.00%				
	Biofuels		10.10%				
	Total Road		**100.10%**				

5.26.6 *Summary of the assessment*

Tabular overview

Table 5.26.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	E85/ road
AF Vehicles / Vessels		Past situation (2016)	3,472	2,184	8*	17*	3,650
		Situation (2018)	15,807	6,307	25**	4	4,132
		Estimate (2030)	382,790	52,788	NA	NA	NA
		Future share (2030) [%]	9.96%	1.37%			
		Estimate attainment (2018 vs 2030) [%]	4.13%	11.95%			
		Progress (2018)	adequate	adequate			
Publicly accessible AF Infrastructure		Past situation (2016)	684	24	2*	1*	100*
		Situation (2018)	2,399	40	6**	2	140
		Target (2030)	25,000*	NA	NA	NA	1,800
		Target attainment (2018 vs 2030) [%]	9.6%*				7.78%
		Progress (2018)	adequate	fast			2.35%
Sufficiency Index		2016	5.08	91.00			36.50*
		2018	6.59	157.68			29.51
		2020					
		2025		460.67*			
		2030	15.31*				
Measures	**Legal measures**	Ambition (NIR vs NPF)	+	+	+	+	+
	Policy measures + Deployment & manufacturing support	Score	H	H	M	H	M
		Comprehensiveness	C	C	C	C	C
		Impact	H	H	M	H	M
		Ambition (NIR vs NPF)	+	+	+	+	+
	RTD&D	Ambition (NIR vs NPF)	+				+

Legend:

(grey)	not applicable
(white)	the value could not be computed
NA	no value/information provided/available in the NIR

* Value taken or calculated from FI NPF. ** Value taken from EAFO (absent in NIR).

The NIR describes Finland's efforts to increase the use of alternative fuels in transport, including waterborne transport. For instance, the information provided in the Finnish NIR is that Finland is committed to an ambitious (climate) target under the IMO's provisional Greenhouse Gas Strategy for reducing emissions from shipping, and is aiming at similar emission cuts both in international navigation and for maritime transport in Finnish waters. An objective for boating activities is that they should become virtually emission-free in Finland by 2050, and all new boats should be able to be used with an alternative propulsion system by 2030.

In principle, the Finnish NIR covers the whole AFID period (2016-2030), but the quantitative analysis is not always possible. It almost fully addresses the requirements of Annex I of the Directive. In particular, the FI NIR offers quantitative objectives for electric vehicles and infrastructure, for E85 infrastructure and for CNG vehicles. The FI NIR does not provide information on the methodology applied to take account of the charging efficiency of high power recharging points and does not provide considerations on any particular needs during the initial phase of AFI deployment.

The main outcomes of the technical assessment of the Finnish NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – With 15,807 electric vehicles and 2,399 publicly accessible recharging points in 2018, Finland is progressing adequately towards reaching both the envisaged EV estimate and AFI target for 2030. The targeted numbers of publicly accessible recharging points in 2020 and 2030 remain the same as in the NPF, but since the number of electric vehicles in Finland has grown more rapidly than expected, this might need to be revised. The infrastructure target for 2020 has been reached already in 2018. Electric HCVs constitute the smallest share in the Finnish EV market (two in 2018), but are foreseen to increase up to 2,046 by 2030. Also the number given for buses and coaches is expected to increase to 1,000 in 2030. The targeted number of electric vehicles in 2025 and 2030 is more ambitious in the NIR than in the NPF (+51.64% for 2025 and +45.55% for 2030). As for the sufficiency index, it is currently adequate, but according to the available data it might become inadequate in 2030.
- **CNG** – According to the Finnish NIR, the number of CNG vehicles will be growing from 6,307 reported for 2018 up to 52,788 in 2030. The number of HDVs reported in 2018 is of 133 HCVs and 47 buses and coaches. The expected number of HCVs and buses and coaches in 2030 is respectively 1,719 and 147. The estimated number of LCVs in 2030 is 7,177. The 2018 progress for CNG vehicles is adequate. Regarding CNG infrastructure, 40 publicly accessible refuelling points have been recorded in 2018 and no targets for 2025 and 2030 are given. The 2020 target provided in the NIR (50 refuelling points) is 9.09% lower than in the NPF. The 2018 state of play corresponds to a fast progress towards reaching the envisaged targets, while the sufficiency index is always below the reference value of 600.
- **LNG** – The FI NIR only briefly mentions long-distance lorries using LNG and LBG, but no quantitative information is provided on LNG vehicles market. Data on 25 LNG vehicles and 6 publicly accessible refuelling points in 2018 come from EAFO. For Finland the objective is to have a network of LNG refuelling stations nationwide for heavy-duty vehicles on the highway by 2030. The NPF had reported a target of 9 LNG stations in 2020 and 11 in 2025, but this has not been confirmed in the FI NIR.
- **Hydrogen** – The Finnish NIR does not include hydrogen infrastructure provisions. Despite a target in the NPF to have 21 hydrogen refuelling stations in the main urban centres by 2030, the number of hydrogen refuelling stations in Finland dropped from two in 2016, to zero in 2019. In 2018, there was just one hydrogen passenger car on the road in Finland and this number did not change between 2016 and 2018. The FI NIR states that it is unlikely that the network of hydrogen stations will grow in line with the targets set in 2016. Anyway, financial support for hydrogen vehicles, infrastructure and other hydrogen projects is foreseen within the 'Energy support programme', as well as within the taxation system.
- **Biofuels** – The fastest growing alternative fuels in Finland are biofuels. Liquid biofuels (including high blend ethanol E85 or ethanol diesel ED95) are planned to account for 30% of the total road fuels in 2030 (the share was 10% in 2018), the objective being laid down

in legislation[19]. The NIR indicates that new flex-fuel vehicles (E85), no longer being commercially available in Finland, resulted in zero registrations in 2019. The country instead relies on conversions of conventional vehicles. Finland recorded 140 E85 refuelling stations in 2018. While for 2020 and 2025, both the NPF and the NIR indicate no targets, for 2030 the FI NIR has a new target of 1,800 refuelling points offering biofuels (and synthetic fuels, see next), which constitutes an increase of 620% compared to the NPF target of 250 refuelling points.

- **LPG** – LPG is not taken into consideration in the Finnish NIR.
- **Synthetic and paraffinic fuels** – Finland recorded 20 renewable paraffinic diesel (HVO) refuelling points for heavy-duty vehicles and 34 for all vehicles in mid-2019. In the infrastructure targets mentioned above for liquid biofuels (1,800 in 2030), the NIR also includes the availability of 100% renewable diesel, similarly to E85 and ED95.

Rail transport

- **Electricity** – One objective of the Finnish national distribution infrastructure programme for alternative propulsion systems in transport is that rail should be nearly 100% electrified by 2050.

Waterborne transport (maritime)

- **Electricity** – Finland did not provide numerical objectives in their NIR, instead the situation up to 2019 was described. Traficom's register of boats reports 184 vessels[20] in Finland with an electric motor, which accounts for 0.09% of all boats in September 2019. According to the FI NIR, development plans for shore-side electric supply over the next years vary from port to port, and no numerical data has been provided. The Finnish NIR indicates challenges with the supply of shore-side electricity, as individual cruisers need up to 15 MW for large vessels.
- **LNG** – In 2018, LNG was the fuel used by four vessels under Finnish flag. The NPF had indicated 17 LNG seagoing ships in 2016. Sixteen vessels with a gas motor were reported for September 2019 in Finland. Although 2025 and 2030 estimates are not provided, the NIR expects the number of LNG-fuelled vessels to increase in the next years. Bunkering operations are reported in the ports of Helsinki and Pori. The FI NIR confirms the 2025 target of 6 refuelling points provided in the NPF. In its NIR, Finland states that the increase of LNG-fuelled ships used for domestic and international transport will support the development of the LNG infrastructure and that low oil prices might slow down the investments.
- **Biofuels** – Biofuels accounted for around 10% of MDO (marine diesel oil) or MGO (marine gas oil) fuels in 2018. The FI NIR does not provide numerical estimates for the future, but informs about four vessels flying under Finnish flag using biofuels. Bio-oil manufactured in Finland from vegetable fat and fish gut waste is explicitly mentioned here. Finland reports the intention to increase the ship use of VG Marine EcoFuel, produced in Finland, by four or five times the current volume of 450 tonnes a year by the end of 2021. The Act on the Promotion of Biofuels in Transport implies that the use of biofuels will increase on boats that use the same fuels as road transport.

[19] The rest is planned to be achieved through the increased use of (hydrogen), electricity and gas.
[20] Register includes watercraft over 5.5 metres long or with motors in excess of 15kW.

Air transport

The FI NIR does not give any numerical data on airplanes and infrastructure, but the objective for air transport is to reach a 40% share of renewables or of other solutions to cut emissions by 2050, and airport terminals traffic emission-free by 2050.

- **Electricity** – Finavia predicts that Finland will have pure electric passenger aircraft on domestic routes by the end of the 2030s at the earliest. The FI NIR speculates that it is more probable that hybrid aircraft (combustion engine plus electric power) will come onto the market first. There are at present dynamic efforts to develop hybrid and electric aircraft by start-ups and the world's largest aircraft manufacturers. The number of electricity recharging infrastructure for stationary airplanes is expected to increase in the next years, but no numerical data for 2020/2025/2030 were provided.
- **Biofuels** – The NIR provides very limited information on biofuels use in air transport. The objective is that the blending obligation would allow for sustainable biofuels to reach a 30% share of aviation fuels by 2030. No measures have yet been put in place to achieve the objective.

As in the NPF, the Finnish NIR contains an extensive and detailed description of **measures**. They cover a wide variety of AFs and transport modes.
Considering all the legal measures, they show an overall increase in ambition compared to the NPF and appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR.
With reference to the Policy and Deployment & Manufacturing measures, although the lack of future targets and estimates for several pairs does not facilitate the task of putting this assessment into perspective, the applied assessment methodology provides very positive scores, which are based on the results obtained during the implementation period. The measures for the pairs electricity/road, CNG/road and LNG/water (both maritime and inland) have a high impact. Electricity/rail, LNG/road and biofuels/road pairs result to have a medium impact. In addition, shore-side electricity supply infrastructure for ships was addressed in the NIR and LNG refuelling infrastructure constitutes a strong point in both the Finnish NPF and NIR. Concerning rail transport, the NIR indicates that 3.7 billion € were spent in Finland on rail development projects, including electrification, in 2016-2019 and reports on planned further increase in rail investments. The focus on biofuels development for aviation, road and maritime transport is strong in Finland and measures continue to support further development. In particular, a biofuels quota obligation is being planned for air transport. The level of ambition for all support measures has increased from the NPF to the NIR. Only for hydrogen there is lower ambition in the NIR compared to the NPF, explained as the result of an actual market request lower than foreseen when designing the NPF. Nonetheless, financial support for hydrogen is still possible, even if the market does not seem to follow yet. Noteworthy is the successful implementation of the measures supporting ambitious climate targets and provision of sufficient financial means to implement the Directive.
As for RTD&D measures, they are focused principally on biofuels and electricity.

5.26.7 *Final remarks*

The Finnish NIR provides a comprehensive report on the efforts made to implement the Directive, which is largely in line with the provisions of Annex I to the Directive. However, no information is provided on targets for recharging points in 2025, and for CNG and LNG refuelling points for vehicles for 2030. Furthermore, no estimates are provided for LNG vehicles and vessels by 2020, 2025 and 2030. Nevertheless, the NIR reports that there is a small fleet of LNG vessels in Finland and their number is expected to increase in the next years. Biofuels and electricity will play a major role in the decarbonisation of transport in Finland. The Finnish NIR contains an extensive and detailed description of measures covering all fuels and transport modes.

As regards electricity, the NIR estimates that about 380,000 electric vehicles could be on the roads by 2030, representing about 10% of the future fleet. Taking into account the current situation and expected trends, this level of ambition does not appear to be fully compatible with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. While current infrastructure deployment is in line with the current vehicle uptake, Finland should provide information on estimated targets for 2025 and 2030 that will be in line with the expected vehicle uptake. No information on charging efficiency is provided. In 2019, shore-side electricity supply was available in three ports and projects are ongoing in the remaining two ports of the TEN-T Core Network. In addition, several electric powered vessels are already in operation, but further information on fleet development would be helpful. Finland should provide clarifications on the installation of electricity supply to stationary aircraft in its airports. The NIR predicts to have some electric passenger aircraft by 2030. No information is provided on the current share of electrified rail network. However, Finland aims to electrify nearly 100% of its railways by 2050.

Concerning hydrogen for road transport, the NIR does not include targets for the number of future hydrogen refuelling stations. While some financial support for FCHVs and infrastructure is foreseen, further effort is needed to address the uptake of FCHVs and infrastructure in Finland. It would be relevant that Finland provides more information on how to ensure EU-wide connectivity for HCEV.

Regarding natural gas, according to the Finnish estimates, CNG vehicles will represent about 1.5% of the vehicle fleet by 2030. No targets are provided in the NIR for CNG refuelling points in 2025 and 2030, while the NPF foresaw 55 refuelling points for 2025. The NPF had presented a target of 11 LNG refuelling points by 2025. This seems to be sufficient considering the length of the Finnish TEN-T Core Network, provided that the refuelling stations are distributed widely along the network. The NIR does not provide any information on the current number of LNG vehicles or any future estimates. LNG bunkering operations are currently carried out in the TEN-T Core port of Helsinki and it is planned that six ports (there are five ports in the TEN-T Core Network) will supply LNG for vessels by 2025. Although future estimates are not provided, the NIR expects the number of LNG-fuelled vessels to increase in the next years compared to the 16 existing in 2019.

No information is provided on LPG vehicles or infrastructure.

While the ambition for zero emission fuels and natural gas are relatively low, Finland’s transport decarbonisation strategy focusses on biofuels and to a lesser extent on synthetic fuels.

Legislation is in place that foresees that liquid biofuels (including high blend ethanol E85 or ethanol diesel ED95) will account for 30% of the total road fuels in 2030. Finland recorded 140 E85 refuelling stations in 2018 and plans to have 1,800 refuelling points offering biofuels and synthetic fuels. In order to create demand for such fuels, Finland provides financial incentives to retrofit existing vehicles for the use of high biofuel blends. In waterborne transport, biofuels accounted for around 10% of MDO (marine diesel oil) or MGO (marine gas oil) fuels in 2018. Finland reports the intention to increase the ship use of VG Marine EcoFuel, produced in Finland, by four or five times the current volume of 450 tonnes a year by the end of 2021. As for the use of renewable fuels in aviation, Finland sets itself the very ambitious target to have a biofuel blending obligation of 30% in aviation fuels by 2030.

5.26.8 *ANNEX - Description of the Member State*

On a surface area of 338,400 km², Finland has a population of 5.513 million people in 2018, which makes up for a population density of 16 inhabitants/km².

Number of main urban agglomerations

- 9 urban agglomerations > 50,000 inhabitants

In 2018, Finland achieves a per capita gross domestic product at market prices of €42,490, which represents a per capita gross domestic product in purchasing power standards of 111 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Finland is 1,071 km. The total road network length is 26,952 km, of which 926 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Finland: 5% (348 km) of the Scandinavian – Mediterranean Corridor.

Through the TEN-T Road Corridors, Finland is connected with the following Member States:
- Sweden (through the Scandinavian – Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Finland accounts for 4,728,980 registered road vehicles of which 3,470,507 are categorized as passenger cars, 465,024 as light goods vehicles, 171,182 as heavy goods vehicles and 18,467 as buses and coaches. The motorisation rate is 629 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 5 maritime ports in the TEN-T Core Network (Hamina, Helsinki, Kotka, Naantali, Turku)
- 12 maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 2 airports in the TEN-T Core Network (Helsinki-Vantaa, Turku)
- 18 airports in the TEN-T Comprehensive Network

5.27 Sweden (SE)

5.27.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the Swedish NPF the Commission concluded:

The Swedish NPF addresses only very few of the requirements of Article 3. According to the Swedish NPF, climate change is 'one of the top priority issues for the government'. The expression 'fossil-free' is emphasised throughout the NPF. Sweden clusters national policy objectives of interest to the Directive into 6 groups: climate, energy, transport, regional, industry and consumer. Numerical targets are shown only for the first two. The Swedish NPF contains neither future estimates for alternative fuels vehicles nor any targets for alternative fuels recharging or refuelling infrastructure. This violates a basic requirement of the Directive. It can pose a serious risk to cross-border continuity and a functioning internal market for alternative fuels vehicles.

Concerning future estimates of electric vehicle stock, the Swedish NPF is rather vague. The lack of clear targets for future electric vehicle market deployment jeopardises the assessment and may represent an obstacle to policy efforts towards electro-mobility. It will be important to establish appropriate infrastructure targets in line with the market developments.

The Swedish NPF indicates regional discrepancies with regards to the share of natural gas use. No natural gas refuelling points can be found in large inland areas in Northern Sweden (see Figures 7-8 of the NPF). CNG refuelling infrastructure halfway the Skellefteå - Härnösand route (around southern Umeå) as well as halfway the Sundsvall - Gävle route (around Hudiksvall) would appear sufficient to meet the requirement of one refuelling point at least every 150 km.

The use of alternative fuels for public transport activity is concisely addressed. Rail is briefly mentioned. Additional details would be desirable.

The Swedish NPF highlights the role of biofuels in the country's transport sector and the fact that Sweden has already met the sectoral 2020 target set by the Renewable Energy Directive. The Swedish NPF stresses that no special infrastructure is required for biofuels and regards this as a cost-effective solution for road vehicles. At the same time, the NPF indicates that new flex-fuel car registrations have decreased dramatically in recent years (0.4% share in 2015).

The Swedish NPF contains a relatively comprehensive portfolio of measures. Overall, Sweden appears to be implementing a solid policy package, beneficial to the deployment of alternative fuels vehicles, also visible in the current high shares of newly registered EV; but, as the Swedish NPF does not contain future quantitative targets for AFI, it is difficult to judge how the support measures can support reaching the objectives.

Further elaboration on the possibility of Member State cooperation to establish a harmonised fairway and port recharging system in the Baltic Sea Area would be advantageous.

Information on AFI targets related to inland waterways, airports and private electro-mobility is inadequate. Information on these is essential in view of the requirements stipulated in the Directive.

5.27.2 *Overview of requirements' fulfilment from Annex I of the Directive*

Table 5.27.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, Water / All		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road, Water / All		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	Yes
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, Combination / Electricity, Combination		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.	Combination / CNG		Yes
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	Road, Water, Air / All		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity, CNG, Hydrogen		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road / Electricity, CNG, Hydrogen		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	Road, Water / Electricity, CNG, LNG, Hydrogen, E85, HVO		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	Yes
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road, Rail / Electricity, CNG, Hydrogen, E85, HVO		Yes

The checklist shows that almost all the requirements of Annex I from the Directive are covered in the Swedish NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is partially covered for all modes; CNG, hydrogen and HVO are partially covered for road transport; LNG for road and maritime transport; biofuels are partially covered for road and air transport; all the other combinations are either absent or not applicable.

The Swedish NIR reports 67 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify six AF/transport mode clusters of measures, all assessable.

5.27.3 *Quantitative assessment: Vehicles and infrastructure*

It is important to note, when interpreting the values shown in Table 5.27.3-1, that the original Swedish NPF notified to the Commission did not specify relevant AFI targets and AFV estimates. The government of Sweden later provided this information officially to the Commission (document 'Information supplementing the Swedish policy framework for alternative fuels infrastructure in accordance with Directive 2014/94/EU' (Annex to minutes II 20 of government meeting of 30 August 2018, N2018/04594/MRT)). This fact is acknowledged in the Swedish NIR, which also indicates that those AFI targets and AFV estimates differ from the ones provided in the NIR. For the purpose of this assessment, the relevant AFI targets and AFV estimates communicated by the Swedish government in its NIR and in the document supplementary to its NPF will be considered and the latter will be referred to as "NPF".

Table 5.27.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road*	NIR	68,728	6,700	142,211	9,000	370,617	NA	644,148	NA
	Change NIR vs NPF [%]			-10.95%	0.00%				
	Attainment [%]			48.33%	74.44%	18.54%		10.67%	
CNG / road	NIR	42,463	185	42,351	230	54,268	≥ 230	76,898	NA
	Change NIR vs NPF [%]			-10.16%	0.00%	15.12%	0.00%		
	Attainment [%]			100.26%	80.43%	78.25%		55.22%	
LNG / road	NIR	NA	6	NA	22	NA	≥ 22	NA	NA
	Change NIR vs NPF [%]				0.00%		0.00%		
	Attainment [%]				27.27%				
LNG / water (maritime)	NIR	NA	11	NA	NA	NA	17	NA	17
	Change NIR vs NPF [%]						0.00%		0.00%
	Attainment [%]						64.71%		64.71%
LNG / water (inland)	NIR	NA	0	NA	NA	NA	0	NA	0
	Change NIR vs NPF [%]								
	Attainment [%]								
H2 / road	NIR	42	6	≥ 36	13	≥ 36	≥ 13	≥ 36	NA
	Change NIR vs NPF [%]			0.00%	0.00%	0.00%	0.00%		
	Attainment [%]				46.15%				

Legend:		
	(grey)	not applicable
	(blank)	the value could not be computed
	NA	no value/information provided/available in the NIR

*The Swedish NIR indicates that its AFV estimates are based on the ‘Reference EU’ scenario reported by Swedish Energy Agency, which takes into account instruments introduced by 1 July 2018. For electric LCVs and buses and coaches, the Swedish NIR reports the estimates only as percentage values, presumably of the total stock of respectively LCVs and buses and coaches. The same occurs with HDVs powered by CNG. Without information on the absolute numbers of these, it is not possible to apply our methodology to these vehicle types. As a result, the 2020 percentage change NIR vs NPF reflects electric passenger cars (NIR) relative to the sum of electric passenger cars and electric LCVs (NPF).

5.27.3.1 Road transport

5.27.3.1.1 Electricity

Vehicles

Sweden recorded 68,728 battery-electric and plug-in hybrid electric vehicles in use in 2018[21] (Table 5.27.3-1). Of these, 66,058 were passenger cars (one-fourth were battery-electric) and 2,670 were LCVs (of which 2,661 battery-electric). The Swedish NIR provides information on neither past electric buses and coaches (it only provides percent estimates for 2020, 2025 and 2030) nor, as in the NPF, past and future electric HCVs (the NIR considers that the use of electricity to power lorries is still relatively uncommon). Compared to the NPF, the Swedish NIR reflects a lower policy ambition – the 2020 estimate is almost 10.95% lower (with caveats concerning the heavy-duty sector, as noted) than the original estimate in the NPF. Sweden did not provide 2025 and 2030 EV estimates in the NPF, but the NIR presents estimates: by 2030, the Swedish NIR expects a stock of 644,148 electric cars (of which battery-electric account for only 17%). In addition, the Swedish NIR expects that, by 2030, the share of electric LCVs reaches 1.4% of, presumably, the future total stock of LCVs (up from 0.6% in 2020) and that the share of electric buses and coaches reaches 14% of, presumably, the future total stock of buses and coaches (up from 4% in 2020). Information is not available on electric PTW. Finally, the possibility of converting mining trucks to electric operation is being explored in an RTD&D project (see Section 5.27.4).

The 2018 ***attainment*** of future EV estimates is 48.33% for 2020 and 10.67% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by Sweden is equal to 24%.

Infrastructure

Sweden recorded 6,700 publicly accessible recharging points in 2018 (Table 5.27.3-1). The NIR target for the public AFI (electricity /road) for 2020 is 9,000, with no information provided on the share of normal (≤22kW) versus high power (>22kW) recharging points. In addition, Sweden reports a value of 20,000 private recharging points for 2020. In both cases, the NIR values for 2020 are the same as in the NPF. Sweden did not provide targets for publicly accessible electric recharging points for 2025 and 2030 in its NPF. In the NIR, these are not provided either.

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 74.44% for 2020. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by Sweden is equal to 36%.

Ratio

Based on the SE NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. The foreseen

[21] The 2017 EV values reported in the Swedish NIR match those reported in the document supplementary to the Swedish NPF.

sufficiency index deviates from the value of 10 in 2018 to almost 16 in 2020. Considering the lack of information regarding the share of normal power and high power recharging points, this can be regarded as potentially inadequate.

Sufficiency Index	2016	2017	2018	2020	2025	2030
Electricity	10.74	9.63	10.26	15.80		

Information on charging efficiency

Although the Swedish NIR devotes a section to this aspect, the information provided refers to an assumption on the usage of publicly accessible high power (>22kW) recharging infrastructure, rather than on the methodology applied to take account of the charging efficiency of high power recharging points or observed data on usage (which was the minimum requirement set by the Commission (Frequently-Asked Questions document notified to the Member States on 16 September 2019)).

5.27.3.1.2 CNG

Vehicles

The Swedish NIR indicates that natural gas is the most common alternative fuel to power LCVs, HCVs and buses (where it accounted for 18% of the bus fleet in 2018) but acknowledges that data disaggregated by type of fuel (either CNG or LNG) are not available in the road traffic register. As a result, the NIR provides values only for passenger cars: Sweden recorded 42,463 CNG passenger cars in use in 2018 (Table 5.27.3-1). This represents a slight decline relative to 2016. Compared to the NPF, the Swedish NIR reflects a lower policy ambition in the near-term but higher in the mid-term, in fact the 2020 and 2025 estimates are 10.16% lower and 15.12% higher respectively than the original estimates in the NPF. Sweden did not provide 2030 CNG estimates in the NPF, but the NIR presents estimates: the CNG stock is planned to increase to 76,898 CNG passenger cars. In addition, the Swedish NIR expects that, by 2030, the share of CNG HCVs reaches 1.9% of, presumably, the future total stock of HCVs (up from 1.2% in 2020) and that the share of CNG buses and coaches reaches 15.4% of, presumably, the future total stock of buses and coaches (down from 16.6% in 2020).

The 2018 ***attainment*** of future CNG vehicles estimates is superior to 100% for 2020 and 55.22% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching the envisaged CNG vehicles estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for the CNG vehicle fleet evolution planned by Sweden is equal to 4%.

Infrastructure

The Swedish NIR indicates that 185 publicly accessible CNG refuelling points were available in 2018 (Table 5.27.3-1)[22]. The NIR does not modify the 2020 and 2025 targets of respectively 230 points and at least 230 points indicated in the NPF. Both the NPF and NIR lacked 2030 targets for publicly accessible CNG refuelling points. Concerning non-publicly accessible infrastructure, the Swedish NIR indicates that there were 60 private and municipal CNG refuelling points in 2018. The NIR also indicates that the share of biogas in natural gas use in road transport grew significantly from 55% in 2013 to 93% in 2018.

The 2018 ***attainment*** of future publicly accessible CNG refuelling infrastructure targets is constant and equal to 80.43% for 2020 and 2025. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***fast progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2025 for publicly accessible CNG refuelling infrastructure evolution planned by Sweden is equal to 3%.

Ratio

Based on the SE NIR, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road. The sufficiency index is well below the indicative value of 600 (see Section 2.1.5) for the whole 2016-2025 period.

Sufficiency Index	2016	2017	2018	2020	2025	2030
CNG	257.02	249.75	229.53	184.13	235.95	

5.27.3.1.3 LNG

Vehicles

The Swedish NIR indicates that natural gas is the most common alternative fuel to power LCVs and HCVs but provides no information on the number of heavy-duty vehicles powered by LNG, indicating that the figures for the period 2016-2018 are not available in the road traffic register. It is also unclear whether a fraction of the buses powered by natural gas (Section 5.27.3.1.2) is LNG-fuelled. The NIR acknowledges that interest in LNG-fuelled heavy-duty vehicles is increasing among manufacturers. It also mentions, in the context of an innovation cluster for liquefied biogas, the demonstration of 159 bio-LNG lorries, 10 bio-LNG coaches and one port tow vehicle in 2019.

Because there were no future LNG vehicle estimates in the Swedish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Swedish NIR indicates that six publicly accessible LNG refuelling points were available in 2018 (Table 5.27.3-1). The NIR does not modify the 2020 and 2025 targets of respectively 22 points and at least 22 points indicated in the NPF. Both the NPF and NIR lacked 2030 targets for publicly accessible LNG refuelling points. The NIR also mentions, in the context of the

[22] The Swedish NIR updates the 2017 value provided in the supplement document to the NPF from 170 to 175 points. Note also that the NIR refers to natural gas vehicles and infrastructure as CNG/CBG (compressed biogas) or LNG/LBG (liquefied biogas).

aforementioned innovation cluster for liquefied biogas, the demonstration of five (bio-)LNG refuelling points and two bunkering depots in 2019.

The 2018 ***attainment*** of future LNG road refuelling infrastructure targets is constant and equal to 27.27% for 2020 and 2025, while the ***progress*** could not be computed.

Ratio

Since there are no vehicle estimates in the SE NIR, it is not possible to calculate the sufficiency index.

5.27.3.1.4 Hydrogen

Vehicles

The Swedish NIR indicates that 42 hydrogen-powered vehicles were in use in 2018 (Table 5.27.3-1), without providing information on the type of vehicle[23]. The Swedish NIR expects a future stock of at least 36 hydrogen-powered vehicles.

Because the Swedish government expects a decrease of the hydrogen-powered vehicles fleet in the future, no ***attainment*** and ***progress*** values have been computed.

Infrastructure

The Swedish NIR indicates that six publicly accessible hydrogen refuelling points were available in 2018 (Table 5.27.3-1) and that additional ones were under construction in 2019. By 2020, both the Swedish NPF and NIR indicated a target of 13 points. The Swedish NPF had also provided a 2025 target of at least 13 points.

The 2018 ***attainment*** of future hydrogen refuelling infrastructure targets is constant and equal to 46.15% for 2020 and 2025, while the ***progress*** could not be computed.

Ratio

Based on the SE NIR, the following table shows the ratio between vehicles and infrastructure (i.e. sufficiency index) for the pair hydrogen/road (see Section 2.1.5) for the 2016-2025 period.

Sufficiency Index	2016	2017	2018	2020	2025	2030
Hydrogen	4.60	7.40	7.00	2.77	2.77	

5.27.3.1.5 Biofuels

Vehicles

The Swedish NIR recorded about 215,600 ethanol-powered passenger cars in use in 2018, making E85 still the most common alternative fuel for passenger cars. However, it also reports a declining stock of passenger cars powered by E85 in the past three years (following the trend highlighted in the NPF) and indicates that new sales in 2019 were limited by model availability (five models from one manufacturer). The NIR considers that the use of ethanol to power lorries is still relatively uncommon and indicates that 9% of the bus fleet in 2018 was powered by biodiesel. The Swedish NIR acknowledges the difficulty of indicating the number of diesel vehicles running on FAME (including B100) because those vehicles are not registered as such.

[23] The Swedish NIR updates the 2017 value provided in the supplement document to the NPF from 36 to 37 vehicles.

Finally, the NIR mentions an innovation cluster for ethanol, particularly to power HCVs (see Section 5.27.4).

Because there were no future biofuels vehicle estimates provided in the Swedish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Swedish NIR reports information on infrastructure for E85 and FAME (mainly RME). The number of E85 and RME sales points decreased between 2016 and 2018: from 1,828 to 1,723 and from 38 to 9, respectively. Further information on energy use can be found in Section 5.27.5.

Because there were no future biofuels refuelling infrastructure targets provided in the Swedish NIR, the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

The sufficiency index for E85 was 125.13 in 2018, the only year for which it could be computed with the information provided in the SE NIR.

5.27.3.1.6 LPG

Apart from mentioning that this alternative fuel is part of the Directive, the Swedish NIR does not cover LPG.

Vehicles

Information is not available in the Swedish NIR. According to EAFO, Sweden recorded 465 LPG vehicles in 2016.

Infrastructure

Information is not available in the Swedish NIR. According to EAFO, Sweden recorded 30 LPG refuelling points in 2016 and 25 in 2018.

Ratio

The following table shows the ratio between vehicles and publicly accessible LPG refuelling points (i.e. sufficiency index) for the pair LPG/road. The sufficiency index could only be computed for 2016 by using data from EAFO.

Sufficiency Index	2016	2017	2018	2020	2025	2030
LPG	15.5*					

* Values taken from EAFO

5.27.3.1.7 Synthetic and paraffinic fuels

Vehicles

As in the case of FAME (Section 5.27.3.1.5), the Swedish NIR acknowledges the difficulty of indicating the number of vehicles powered by HVO100, which can be used in approved diesel engines of buses and lorries. The NIR confirms that just a few manufacturers have approved their car models to run on pure HVO, which currently limits its use.

Infrastructure

The Swedish NIR reports that the number of HVO100 sales points grew from zero in 2016 to 162 points in 2018.

5.27.3.2 Rail transport

5.27.3.2.1 Electricity

Vehicles

The Swedish NIR indicates that the stock of railway vehicles was 2,699 at the end of 2017, of which 641 were locomotives and shunters and the rest railcars. Between 2016 and 2017, the number of railway vehicles went up by 141 units (mainly electric).

Infrastructure

The length of the Swedish railway lines was 10,874 km in 2017, of which 75% was electrified. Further information on energy use can be found in Section 5.27.5.

5.27.3.3 Waterborne transport (maritime)

5.27.3.3.1 Electricity

Vessels

The Swedish NIR mentions that several ferries powered by electricity are in operation (see also Section 5.27.3.3.3). In addition, the NIR indicates that interest in alternative fuels by shipping companies is growing and claims to be providing government support to R&D and innovation in the field of electrified vessels (see Section 5.27.4).

Infrastructure

The Swedish NIR indicates that the number of ports with access to shore-side electricity supply (defined in the NIR as 'quay-side electric connection') went up from nine in 2015 to 20 in 2017[24]. According to the NIR, there were at least 20 ports with such connections also in 2018. Unfortunately, neither the NPF nor the NIR distinguished between maritime and inland port electricity supply.

In terms of future targets, the Swedish NIR indicates that values were provided in the supplement document to the NPF. That document indicates a target of 23 ports with access to shore-side electricity in 2025 and at least 23 in 2030. Furthermore, the NIR acknowledges that no official data exists on vessel access to shore-side electricity supply and that information on shore-side electrical connections use is not available.

5.27.3.3.2 LNG

Vessels

[24] The Swedish NIR updates the 2017 value provided in the supplement document to the NPF from 16 to 20 ports.

The Swedish NIR mentions that several vessels powered by LNG are in operation and on order but provides no LNG vessel estimates. Therefore, the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The Swedish NPF indicated that the number of (maritime) ports in the TEN-T Core Network with access to LNG was two in 2017 and expected to be five in 2025 and 2030. In addition, the NPF indicated that the number of other (maritime) ports with access to LNG was five in 2017 and expected to be 12 in 2025 and 2030. The Swedish NIR indicates that the number of ports with access to LNG was 11 in 2018 (of which three in ports that are part of the TEN-T Core Network). It also states that seven ports gained access to LNG in early 2019. Information is not available for 2020.

The 2018 ***attainment*** of future LNG refuelling infrastructure targets in maritime ports is constant and equal to 64.71% in 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by Sweden from 2016 until 2018 for LNG refuelling infrastructure deployment in maritime ports is 60.00% of the overall planned deployment during the period 2016-2030.

5.27.3.3.3 Synthetic and paraffinic

Vessels

The Swedish NIR reports that a hybrid electric vessel capable of running also on synthetic diesel was commissioned by the Swedish Transport Administration's shipping company in March 2019. In addition, it can be understood from the NIR that the Stena Germanica ferry powered by methanol continues to be in operation.

Infrastructure

Information is not available in the Swedish NIR.

5.27.3.4 Waterborne transport (inland)

5.27.3.4.1 Electricity

Vessels

Information on battery-powered inland vessels in unavailable in the Swedish NIR.

Infrastructure

For shore-side electricity supply, see Section 5.27.3.3.1.

5.27.3.4.2 LNG

Vessels

Information on inland waterborne vessels powered by LNG in unavailable in the Swedish NIR.

Infrastructure

The Swedish NPF had indicated that the number of inland ports with access to LNG was zero in 2017 and was expected to be zero also in 2025 and 2030. The Swedish NIR confirms that the number of inland ports with access to LNG was zero in 2018 and provides no information for 2020.

5.27.3.5 Air transport

5.27.3.5.1 *Electricity*

Airplanes

The only information found on this in the Swedish NIR relates to government support to R&D and innovation in the field of electrified airplanes (see Section 5.27.4).

Infrastructure (for stationary airplanes)

As in the NPF, the Swedish NIR provides information on the ten airports owned by Swedavia AB and confirms that GPUs are available at all aprons in seven of them. In two others, 20% of the moorings have electrical connections. According to the NIR, the number of moorings providing electricity supply for stationary aircraft has risen and demand from airlines for such connections is high.

5.27.3.5.2 *Biofuels*

Airplanes

The only piece of information found in the Swedish NIR relates to a programme by an airline targeting greater use of bio-jet fuel.

Infrastructure

The Swedish NIR reports that one of the world's first initiatives to showcase bio-jet fuel use in existing refuelling infrastructure took place in Karlstad airport in 2014. The NIR also mentions a central refuelling point in Arlanda airport. However, it also indicates that the amount of bio-jet fuel supplied in Sweden is very low and remains unreported in the official statistics.

5.27.4 ***Measures assessment***

As in the NPF, the Swedish NIR contains a rather comprehensive portfolio of measures. They tend to target either a combination of alternative fuels, or of transport modes or both.

5.27.4.1 Legal measures

The Swedish NIR contains 16 legal measures. This represents a significant increase compared to the seven legal measures identified in the NPF. All presented measures are in place, with the exception of one related to the Energy Performance of Buildings Directive (2018/844/EU). While three legal measures target specifically electricity, 63% of the legal measures target a combination of alternative fuels and transport modes.

Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR. The level of ambition of the legal measures has increased in the NIR, compared to the NPF.

5.27.4.1.1 Legislative & Regulatory

Of all the legal measures described in the Swedish NIR, six can be categorised as legislative and regulatory measures (most of them targeting road transport) and include the following ones:

- Norms & requirements: Act (2016:915) and Ordinance (2016:917) on requirements for installations for alternative fuels.
- National targets: Pumps Act (2005:1248) entailing the obligation for refuelling stations and sales outlets to supply renewable fuels.

5.27.4.1.2 Administrative

Of all the legal measures described in the Swedish NIR, ten can be categorised as administrative measures. The following new ones can be highlighted:

- AFV classification on environmental performance: fairway and port charges disaggregated by environmental class. The Swedish NPF had indicated the intention to introduce in 2018 a more environmentally ambitious charging model. The Swedish NIR confirms that the new system was introduced on 1 January 2018. The fairway charge is differentiated into four environmental classes. Environmentally differentiated port levy charges are also in use in around 20 ports. According to the NIR, the system incentivises vessel performance and the use of electricity, LNG and methanol.
- Another measure targeting waterborne transport concerns national guidelines for liquid methane bunkering at ports, which have since 2018 clarified the requirements for (bio)LNG.

Other measures concern CEF applications, a national freight strategy and coordination assignments at regional level. Finally, the number of actors involved in the 'Fossil-Free Sweden' initiative grew from more than 170 reported in the NPF to over 400 in the NIR. In this context, industry roadmaps on automotive, aviation, haulage and shipping have been or will be presented.

5.27.4.2 Policy measures

The Swedish NIR contains 18 policy measures, compared to 14 policy measures identified in the NPF. Of all the policy measures, 67% can be characterised as targeting a combination of alternative fuels (most of them are road-related measures), 17% a combination of transport modes and 11% as targeting a combination of both. The majority of these measures have a financial nature.

5.27.4.2.1 Measures to ensure national targets and objectives

Of all the policy measures described in the Swedish NIR, twelve can be categorised as measures to ensure national targets and objectives. With one exception, these measures featured in the NPF. However, for some of them the level of ambition has increased. This is prominently the case of the bonus-malus/feebate system, which covers new passenger cars, LCVs and light buses. The budget allocation has increased from 1.24 billion SEK in 2019 to 1.63 billion SEK in 2020. As a consequence of implementing the bonus-malus system, two measures (vehicle tax exemption for green cars and super green car premium) were abolished.

Other policy measures to ensure national targets and objectives include CO_2 and energy tax exemptions for high-blend sustainable biofuels and aid for the procurement of vehicles (including heavy lorries) that can run on alternative fuels. For the latter, 63.8 million SEK were granted over 2016-2018 for 495 vehicles (with around 400 of them powered by bio-LNG). It is, however, unclear what proportion of this budget was for heavy commercial vehicles.

5.27.4.2.2 Measures that can promote AFI in public transport services

Of all the policy measures described in the Swedish NIR, four can be categorised as measures that can promote AFI in public transport services (of which three were mentioned in the NPF). They deal with public procurement and lower vehicle taxation for AFVs, aid for municipalities and country councils for measures that promote public transport solutions via the so-called 'urban environment agreements' as well as an electric bus premium (applicable also to fuel cell and trolley buses) endowed with 750 million SEK for the period 2016-2023.

5.27.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

While no measures promoting the deployment of private electro-mobility infrastructure were identified in the NPF, two were found in the NIR. Both of them focus on electricity for road: the so-called 'BeBo' and 'Belok' networks to promote recharging infrastructure deployment in apartment and commercial buildings as well as aid for home recharging for private individuals. The latter entails aid to cover 50% of the acquisition and installation cost of a charging box, with a limit to SEK 10,000 per property. A status report released in April 2019 indicates that 3,300 people have received aid.

5.27.4.3 Deployment and manufacturing support

5.27.4.3.1 AFI deployment

The Swedish NIR reports three AFI deployment measures, of which two are related to the Climate Leap initiative and one is new: investment aid for recharging stations used by companies and other organisations, which is provided through a grant that covers up to 50% of the costs, with a maximum of SEK 15,000 per recharging point. Concerning the Climate Leap and according to the NIR, aid amounted to 276.1 million SEK for the period 2016-2018 and had been granted for over 30,000 recharging points by the end of 2018. It is unclear how this figure relates to the AFI targets provided in the NIR. In addition, 533.9 million SEK of Climate Leap aid was given for biofuels/liquefied biogas (mainly publicly accessible) refuelling points between 2016 and 2018.

5.27.4.3.2 Support of manufacturing plants for AF technologies

The Swedish NIR lists four measures to support manufacturing plants for AF technologies, all of them targeting mainly biogas production. In total, 1,209 million SEK have been earmarked for manufacturing support for the period 2014-2023, of which over 250 million SEK for two projects focusing on production of biofuels from waste products from forestry.

5.27.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the Swedish NIR.

5.27.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.27.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, clusters of measures on electricity, CNG, hydrogen and biofuels for road transport as well as LNG for road and waterborne transport could be identified in the Swedish NIR. The electricity/road cluster is the only having a high score; the other clusters receive a medium score. Half of the clusters (on electricity, CNG and biofuels) can be considered comprehensive. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact, those for the pairs CNG/road and biofuels/road have a medium impact while all the other measures have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased for all the identified clusters.

Table 5.27.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness	Impact	Ambition (NIR vs NPF)
Electricity	Road	H	C	**H**	+
CNG	Road	M	C	**M**	+
LNG	Road	M	N	**L**	+
	Water (Maritime & Inland)*	M	N	**L**	+
H2	Road	M	N	**L**	+
Biofuels	Road	M	C	**M**	+

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

*It is unclear which measures correspond to maritime transport, which to inland and which cover both.

5.27.4.5 Research, Technological Development & Demonstration

The Swedish NIR lists 26 RTD&D projects. Because the number and a detailed description of them were not available in the NPF, it is not possible to make a proper comparison of the amount and nature of the projects reported in the NPF and NIR. Nonetheless and based on the corresponding start and stop years reported in the NIR, it can be deduced that a substantial proportion of the projects can be considered new. The majority of the funding is national, with instances of co-funding with industry.

As the Swedish NIR indicates, many of the RTD&D projects cannot be attributed to a single alternative fuel or transport mode, and are thus reported as a combination thereof. Specifically, 38% of the RTD&D projects can be characterised as targeting a combination of alternative fuels and 62% target a single alternative fuel; 65% focus on a combination of transport modes and 35% on a specific one; overall, 27% of the RTD&D projects target a combination of both alternative fuels and transport modes. Regarding transport modes, road, water and air transport are individually represented. For those projects that focus on a single fuel, electricity and biofuels can be highlighted. Two RTD&D projects worth mentioning are the Northvolt Pilot Production Line for lithium-ion battery cell manufacturing (up to 146 million SEK of aid) and the ‘Electrified roads’. Following the tests initiated in 2016 and an evaluation in 2018, the Swedish authorities decided to support with 175 million SEK the construction of two stretches of electrified roads with the expectation that they will become operational during 2019-2022: one demonstrating conductive ground rail and one inductive technologies. Concerning biofuels, two innovation clusters (one demonstrating ED95 for road freight and one for sustainable biofuels for aviation) were being established and biofuels production from lignocellulosic or residual products funded with 180 million SEK for the period 2017-2021. A project on lignin, which can be refined into HVO, is also listed. Hydrogen or fuel cell technology is not explicitly mentioned in the section of the NIR that covers RTD&D.

The NIR acknowledges that, in some cases, annual budget values (shown in the corresponding tables of the NIR only for the period 2016-2019) could not be reported, so total budget figures are provided in their place (this is the case of e.g. SamspEL and TripleF projects). For some projects, the total budget does not match the sum of the corresponding annual budgets, so that it can be presumed that the difference is due to the budget being used before 2016 or after 2019. Overall, for the period 2016-2030[25], it is calculated that the total estimated budget for RTD&D projects reported in the NIR amounts to around 4.4 billion SEK (ca. 425 million €).

5.27.5 *Additional information on alternative fuels infrastructure developments*

Based on input from the Swedish Energy Agency, the Swedish NIR provides information on past (1990-2016) energy use, by type of fuel, for domestic transport and four scenarios for the period 2017-2050[26].

The Swedish NIR indicates that no official statistics on electricity use in road transport are available. Based on the information provided in the NIR, HVO100 and E85 accounted for respectively 4.6% and ca. 1% of road transport fuel consumption in 2018. In the same year, 1.65 TWh of road fuel gas were used.

For rail transport, the NIR provides the split between diesel and electricity use, disaggregated into tram, underground and rail (passenger, freight) operations. Overall, the share of electricity use in the Swedish railways remained stable at 94% over the period 2016-2018.

[25] Budget information pre-dating 2016 is also available in the NIR for some projects.
[26] With the information provided in the NIR, it is not possible to compile the corresponding table of the Excel template provided to Member States. Further details can be found in sections 8.2.1 and 8.3 of the Swedish NIR.

5.27.6 *Summary of the assessment*

Tabular overview

Table 5.27.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode: Electricity / road	CNG / road	LNG / road	LNG / water (maritime)	LNG / water (inland)	Hydrogen / road	E85 / Road
AF Vehicles / Vessels		Past situation (2016)	27,935	43,693	NA	NA	NA	23	235,000*
		Situation (2018)	68,728	42,463	NA	NA	NA	42	215,600
		Estimate (2030)	644,148	76,898	NA	NA	NA	≥ 36	NA
		Future share (2030) [%]	9.96%	1.19%				> 0%	
		Estimate attainment (2018 vs 2030) [%]	10.67%	55.22%					
		Progress (2018)	adequate	slow					
Publicly accessible AF Infrastructure		Past situation (2016)	2,600	170	6	2	0	5	1,828
		Situation (2018)	6,700	185	6	11	0	6	1,723
		Target (2030)	NA	NA	NA	17	0	NA	NA
		Target attainment (2018 vs 2030) [%]				64.71%			
		Progress (2018)	fast	fast		60.00%			
Sufficiency Index		2016	10.74	257.02				4.60	
		2018	10.26	229.53				7.00	125.13
		2020	15.80	184.13				2.77	
		2025		235.95				2.77	
		2030							
Measures**	Legal measures	Ambition (IR vs NPF)	+	+	+	+		=	+
	Policy measures + Deployment & manufacturing support	Score	H	M	M	M		M	M
		Comprehensiveness	C	C	N	N		N	C
		Impact	H	M	L	L		L	M
		Ambition (IR vs NPF)	+	+	+	+		+	+
	RTD&D	Ambition (IR vs NPF)	+	+	+	+		=	+

Legend:		
		not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* Value taken or calculated from SE NPF; **It is not possible to disentangle the inland from the maritime-related measures.

The Swedish NIR reiterates its ambition “to become one of the first fossil-free developed nations in the world” and seeks to achieve zero net GHG emissions by 2045 and negative emissions thereafter. At the same time, the NIR acknowledges that, despite the increasing renewable energy use in transport, “Sweden’s emissions are falling too slowly to be in line with climate policy targets”. Concerning the passenger car fleet, the Swedish NIR highlights that a switch from conventional to alternative technologies powered by alternative fuels is taking place.

The Swedish NIR does not cover the whole AFID period (2016-2030). Compared to the Swedish NPF that had addressed only very few of the requirements of Article 3 of the Directive, the NIR almost fully addresses the requirements of Annex I of the Directive, with the exception of information on any particular needs during the initial phase of AFI deployment. Moreover, Sweden should provide data (rather than assumed values) on the usage of high power recharging infrastructure, as per the Commission’s Frequently-Asked Questions document notified to the Member States on 16 September 2019.

The main outcomes of the technical assessment of the Swedish NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – In 2018, Sweden recorded 68,728 light-duty EVs and 6,700 publicly accessible recharging points. No details were provided on heavy-duty vehicles. With reference to the objectives of the SE NPF as updated by the NIR, Sweden's progress is fast in terms of infrastructure and adequate in terms of EV deployment. The NIR lowers the level of ambition on the number of EVs for 2020 compared to the NPF. The calculated Swedish sufficiency index is becoming potentially inadequate in 2020. The NIR does not provide recharging points targets for 2025 and 2030.
- **CNG** – The SE NIR provides values only for passenger cars: Sweden recorded 42,463 CNG passenger cars in use in 2018. The NIR also shows a substantial growth in the share of biogas use relative to natural gas use in road transport over the period 2013-2018, but records a declining stock of CNG passenger cars and conveys a future declining share of buses powered by natural gas. With regards to CNG road vehicle deployment, Sweden is progressing slowly and the level of ambition is lower for 2020 but higher for 2025, compared to the NPF. Around 75% of the CNG refuelling points in use in Sweden in 2018 was publicly accessible. It is worth mentioning that 93% of road fuel gas used in Sweden in 2018 was biogas. The progress of infrastructure deployment is fast.
- **LNG** – The NIR provides insufficient information on LNG vehicles. One of the limitations faced when analysing the stock of CNG versus LNG vehicles is the impossibility of a clear disaggregation in Sweden's road traffic register. The NIR states that this hurdle is to be removed in December 2019. So, this should no longer be a limitation in future NIR assessments.
- **Hydrogen** – In 2018, 42 hydrogen-powered vehicles were circulating on Swedish roads, supported by six publicly accessible hydrogen refuelling points. Further deployment of refuelling infrastructure can be expected in the future.
- **Biofuels** – FAME100 remains one of the most common alternative fuels used for Sweden's road transport. However, the number of RME sales points significantly decreased between 2016 and 2018.
- **LPG** – No assessment on LPG can be made using the information provided in the Swedish NIR. According to EAFO, there were 25 LPG refuelling points in 2018.
- **Synthetic and paraffinic** – The NIR indicates that HVO100 refuelling infrastructure for road transport became available in recent years.

Rail transport

- **Electricity** – The length of the Swedish railway lines was 10,874 km in 2017, of which 75% was electrified, with an average share of electricity use above 90%. Further rail electrification does not seem to play an important role in the NIR.

Waterborne transport (maritime)

- **Electricity** – It is expected that electricity supply will be available in 23 Swedish ports by 2025, compared to 20 in recent years. Future NIR assessments would benefit from a clear distinction between maritime and inland port electricity supply.
- **LNG** – The NIR restates the target of having all maritime ports in the TEN-T Core Network with LNG supply by 2025.
- **Synthetic and paraffinic** – The NIR indicates that a few vessels powered by synthetic diesel and methanol are in use.

Waterborne transport (inland)

- **Electricity** – A proper understanding on the use of electricity for inland waterborne transport cannot be derived from the information provided in the NIR. Future NIR assessments would benefit from a clear distinction between maritime and inland port electricity supply.
- **LNG** – Based on the figures provided by Sweden, it seems that LNG availability in inland ports will remain inexistent until 2030, which jeopardises uptake of inland vessels powered by LNG.

Air transport

- **Biofuels** – Bio-jet fuel for aviation is available in Sweden but currently supplied in small quantities. The NIR mentions a study, presented on 4 March 2019, containing a series of proposals to promote sustainable biofuels in aviation. It also indicates that investments in this area have been made.

With regards to the **measures**, similarly to the NPF, the Swedish NIR reports a rather solid package, consisting in 67 measures. A significant number of them targets a combination of alternative fuels and/or transport modes. There were two potentially effective measures in road and waterborne transport that were envisaged in the NPF and have become a reality in the NIR: the bonus-malus system for light-duty road vehicles and an upgraded version of differentiated port and fairway charges for vessels.

With regards to the Policy and Deployment & Manufacturing measures, six clusters on electricity, CNG, hydrogen and biofuels for road transport as well as LNG for road and waterborne transport could be identified in the Swedish NIR. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact, those for the pairs CNG/road and biofuels/road have a medium impact while all the other measures have a low impact. Compared to the NPF, the level of ambition has increased for all the identified clusters.

The Swedish NIR lists 26 RTD&D projects where all transport modes and alternative fuels are represented.

5.27.7 *Final remarks*

The Swedish NIR provides a comprehensive report on the efforts made to implement the Directive, which is largely in line with the provisions of Annex I to the Directive. However, no information is provided on targets for recharging points by 2025 and 2030 and for CNG and LNG refuelling points for vehicles in 2030. Nor are estimates provided for LNG vehicles and vessels by 2020, 2025 and 2030. The Swedish NIR contains a rather comprehensive portfolio of measures. They tend to target either a combination of alternative fuels, or of transport modes or both. In general, the Swedish NIR states the ambition to promote the large-scale electrification of road and rail transport, airports and ports.

As regards electricity, the NIR estimates that about 645,000 electric vehicles could be on the roads by 2030, representing about 10% of the future fleet by that time. Taking into account the current situation, fleet and existing trends, this level of ambition does not appear to be fully compatible with the pace of deployment of electric vehicles considered necessary for a full transition to carbon neutrality by 2050. The current infrastructure deployment is lower than the current vehicle uptake. Sweden should provide information on targets for 2025 and 2030 with a view to the expected vehicle uptake. Limited information on charging efficiency is provided. In 2017, shore-side electricity supply was available in 20 ports. This number should increase to 23 ports by 2025. However, no differentiation is made for maritime and inland ports. In addition, several electrically powered ferries are already in operation. Electricity supply to stationary airplanes is largely installed at Sweden's airports and 75% of Sweden's railways lines are already electrified.

Concerning hydrogen for road transport, the target is to have at least 13 hydrogen refuelling points available from 2025 onwards, which is an ambitious target that will need to be matched by adequate vehicle uptake.

According to Sweden's estimates, CNG vehicles will represent about 2% the vehicle fleet by 2030. The NIR presents a target to have at least 22 LNG refuelling points available from 2020. This seems sufficient considering the length of the Swedish TEN-T Core Network, provided that the refuelling points are equally distributed along the network. The NIR does not provide any information on the current number of LNG vehicles or any future estimates. Eleven maritime ports, three of which are part of the TEN-T Core Network, supplied LNG to vessels already in 2018. However, there is no estimate on LNG infrastructure in inland ports. Sweden should also provide estimates of the number of LNG vessels in its fleet by 2020, 2025 and 2030.

The Swedish NIR does not cover LPG.

Regarding biomethane, the number of vehicles running with biomethane represent a large share of the natural gas fleet. Concerning the use of E85 in vehicles, the NIR shows that by 2018 there was already a large fleet of 215,600 E85 vehicles and a significant number of refuelling points in Sweden. However, the use of E85 in flex-fuel vehicles seems to decrease due to the lack of vehicle models. ED95 use in heavy-duty vehicles is today an emerging market. As for the use of renewable fuels in aviation, very limited quantities of bio-jet are currently supplied to airplane fleets. Sweden should provide more information in future reporting on efforts to promote the use of renewable fuels in transport, and particularly in aviation.

5.27.8 *ANNEX - Description of the Member State*

On a surface area of 450,300 km², Sweden has a population of 10.120 million people in 2018, which makes up for a population density of 22 inhabitants/km².

Number of main urban agglomerations

- 13 urban agglomerations > 50,000 inhabitants

In 2018, Sweden achieves a per capita gross domestic product at market prices of €46,310, which represents a per capita gross domestic product in purchasing power standards of 121 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in Sweden is 3,034 km. The total road network length is 172,891 km, of which 2,132 km are motorways.

The following lengths of the TEN-T Road Corridors are present in Sweden: 16% (1,039 km) of the Scandinavian - Mediterranean Corridor.

Through the TEN-T Road Corridors, Sweden is connected with the following Member States:
- Denmark (through the Scandinavian – Mediterranean Corridor),
- Finland (through the Scandinavian – Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, Sweden accounts for 6,145,560 registered road vehicles of which 4,869,979 are categorized as passenger cars, 570,252 as light goods vehicles, 79,652 as heavy goods vehicles and 14,377 as buses and coaches. The motorisation rate is 481 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 5 maritime ports in the TEN-T Core Network (Göteborg, Luleå, Malmö, Stockholm, Trelleborg)
- 20 maritime ports in the TEN-T Comprehensive Network
- 2 inland ports in the TEN-T Core Network (Göteborg, Stockholm)
- 2 inland ports in the TEN-T Comprehensive Network

The inland waterways TEN-T Core Network in Sweden is 667 km long.

Number of airports in the TEN-T Core Network

- 3 airports in the TEN-T Core Network (Göteborg-Landvetter, Malmö-Sturup, Stockholm-Arlanda)
- 23 airports in the TEN-T Comprehensive Network

5.28 United Kingdom (UK) [27]

5.28.1 *Main messages from the Commission assessment of the NPF*

In its original assessment of the UK NPF the Commission concluded:

The UK NPF addresses all of the requirements of Article 3. It is well structured, contains a description of the current state and some future estimates for alternative fuels vehicles in the transport sector and establishes targets required by Article 3 of the Directive.

The UK NPF puts a lot of emphasis on the development of a market for electric vehicles. It contains relatively high estimates for the future deployment of EV with an estimated roughly 1.1% electric vehicles on the road in 2020. Today, the spatial distribution of recharging points seems to appropriately cover the needs of electric vehicles in terms of distance requirements in the UK. For the future, the targeted ratio of less than one public recharging point per 30 electric vehicles estimated for 2020 could evolve to become a barrier for the further market deployment of electric vehicles. It will be important to carefully monitor this development and correct infrastructure targets in line with the market developments. Regarding electricity supply for stationary airplanes, the UK government considers that the airport owners and operators are the best placed to assess the needs and cost/benefits, including environmental, for electricity supply for stationary airplanes. The NPF mentions shore-side electricity is not considered to be currently a commercially attractive proposition. Consequently, it does not provide any target for shore-side electricity and leaves it to the port operators and their customers to implement it on a purely commercial basis.

The UK currently features seven publicly accessible CNG refuelling points and plans to increase this number by 2020 to 8-13. The current number of publicly accessible LNG refuelling points is 11 and the 2025 target is set to 20-48, suggesting that the maximum distance requirement of at least one refuelling point every 400 km for LNG refuelling points along the TEN-T Core Network could be fulfilled on the UK territory by that year.

In view of the lack of distinction in the NPF between LPG, CNG and LNG vehicles, it is difficult to understand the current market status for those fuels. Future CNG or LNG vehicle estimates are missing in the NPF. This makes an assessment of the future situation impossible.

There is a lack of information on the future targeted spatial distribution for recharging points and CNG and LNG refuelling points in the UK NPF, along the TEN-T Core Network as well as within agglomerations/densely populated areas (urban nodes).

The UK currently offers LNG refuelling in 2 (out of 15) maritime ports in the TEN-T Core Network and 2-3 additional facilities are considered before 2025 allowing for the circulation of LNG vessels as required in the Directive.

The UK NPF displays a commitment towards developing an early market for hydrogen in 2025 timeframe, targeting the availability of 65 publicly accessible refuelling points.

The UK NPF contains a quite comprehensive list of measures; the great majority of them are in force and foreseen to stay, only few being obsolete. Some of them, especially the ones targeting to improve the economics of alternative fuels, can be considered having a medium or high impact on market actor's decisions, especially for electricity for road transport as well as private recharging infrastructure and public transport. Most of the measures are addressing financing and early market barriers, being essential in the market development. Even though the budget is provided for the majority of the measures, in some cases it is not clearly defined

[27] The UK had the obligation to submit its NIR to the Commission since it was still a Member State of the Union at the date of submission established in the Directive. Therefore, the Commission was obliged to assess the UK NIR.

which part of this is still available for future years, which makes their assessment difficult. The UK also supports research, development, and demonstration activities in the field of alternative fuels and propulsion systems.

The UK supports companies realizing public transport services and public institutions in acquiring low emitting vehicles for their fleets. The measures cover direct incentives for purchasing new electric buses (covering for zero-emission vehicles from 75% to 90% of the additional costs compared to conventional vehicles) and taxis, but also grant schemes for retrofitting old vehicles (mainly buses).

The consideration of the interests of regional and local authorities and stakeholders engaged in alternative fuels is evident throughout the text of the NPF.

The UK did not present any evidence of coordinating its plans on alternative fuels infrastructure with other countries, especially neighbouring member states.

5.28.2 ***Overview of requirements' fulfilment from Annex I of the Directive***

Table 5.28.2-1 Checklist Table

Part of the Directive 2014/94/EU	Requirement	Mode of transport / Alternative Fuel (provided in the NIR)		Yes / No
ANNEX I: 1. Legal measures	Information on legal measures, which may consist of legislative, regulatory or administrative measures to support the build-up of alternative fuels infrastructure, such as building permits, parking lot permits, certification of the environmental performance of businesses and fuel stations concessions.	Road, Water / Combination		Yes
ANNEX I: 2. Policy measures supporting the implementation of the national policy framework	Information on those measures shall include the following elements: • direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure, • availability of tax incentives to promote means of transport using alternative fuels and the relevant infrastructure, • use of public procurement in support of alternative fuels, including joint procurement, • demand-side non-financial incentives, for example preferential access to restricted areas, parking policy and dedicated lanes, • technical and administrative procedures and legislation with regard to the authorisation of alternative fuels supply, in order to facilitate the authorisation process.	Road / Combination		Yes
	• consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network	Air	Biofuels	No
ANNEX I: 3. Deployment and manufacturing support	• Annual public budget allocated for alternative fuels infrastructure deployment, broken down by alternative fuel and by transport mode (road, rail, water and air).	Road, Rail / Electricity, Hydrogen		Yes
	• Annual public budget allocated to support manufacturing plants for alternative fuels technologies, broken down by alternative fuel and by transport mode.			No
	• Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures.			No
ANNEX I: 4. Research, technological development and demonstration	• Annual public budget allocated to support alternative fuels RTD&D, broken down by fuel and by transport mode.	All / All		Yes
ANNEX I: 5. Targets and objectives	• Estimation of the number of alternative fuel vehicles expected by 2020, 2025 and 2030	Road / Electricity		Yes
	• Level of achievement of the national objectives for the deployment of alternative fuels in the different transport modes (road, rail, water and air)	Road, Rail / Electricity, Hydrogen		Yes
	• Level of achievement of the national targets, year by year, for the deployment of alternative fuels infrastructure in the different transport modes	All / Electricity, Hydrogen, CNG, LNG, LPG		Yes
	• Information on the methodology applied to take account of the charging efficiency of high power recharging points	Road	Electricity	No
ANNEX I:6 Alternative fuels infrastructure developments	Changes in supply (additional infrastructure capacity) and demand (capacity actually used)	Road / Electricity, Hydrogen		Yes

The checklist shows the requirements of Annex I from the Directive that are covered in the UK NIR.

Regarding the combination of AF/AFV/AFI with transport mode, electricity is covered for all modes; hydrogen is covered for road, rail and water transport; LNG for road and maritime transport; biofuels, CNG and LPG for road transport. All the other combinations are either absent or not applicable.

The UK NIR contains 45 measures. Under the Policy and Deployment & Manufacturing sections it was possible to identify seven AF/transport mode clusters of measures, of which five assessable.

5.28.3 *Quantitative assessment: Vehicles and infrastructure*

The UK NIR reports data as late as July 2020. This was possible due to the fact that the NIR was submitted beyond 18 November 2019. Concerning the values reported by the NIR as "*Latest Figures*", the year of reference is not always clear.

The NIR does not always provide 2018 values. Moreover, the NIR does not always specify whether the reported data on infrastructure refers to publicly accessible or total (public + private) refuelling points. Due to these shortcomings, the progress could not be always computed. As in the NPF and for the purpose of reporting the sufficiency index in this assessment, we assume that those values refer to publicly accessible infrastructure.

The NIR indicates that "*UK vehicle registration records do not distinguish between CNG, LNG and LPG vehicles. As a result, these vehicles are included within the 'gas' category*". This lack of information is to some extent offset in our assessment by reporting data sourced from EAFO.

Table 5.28.3-1 National AFV estimates and AFI targets established in the NIR at the horizon 2020, 2025 and 2030 and their comparison with the NPF situation

Alternative fuel / Transport mode		2018		2020		2025		2030	
		AFV	AFI public	AFV	AFI public	AFV	AFI public	AFV	AFI public
Electricity / road	NIR	191,726	10,309 (121,625*	413,500	12,750 (372,850*	575,000	175,000 (1,489,000*	930,000	535,000 (4,540,000*)
	Change NIR vs NPF [%]			0.00%	0.00%				
	Attainment [%]			46.37%	80.85%	33.34%	5.89%	20.62%	1.93%
CNG / road	NIR	2,973**	2**	NA	11	NA	19	NA	19
	Change NIR vs NPF [%]				0.00%		-17.78%		
	Attainment [%]				18.18%		10.81%		10.81%
LNG / road	NIR	1,521**	13**	NA	16	NA	32	NA	32
	Change NIR vs NPF [%]				0.00%		-7.35%		
	Attainment [%]				81.25%		41.27%		41.27%
LNG / water (maritime)	NIR	NA	3	NA	NA	NA	4-5	NA	NA
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]						60-75%		
H2 / road	NIR	109	8**	NA	NA	NA	65	NA	65
	Change NIR vs NPF [%]						0.00%		
	Attainment [%]						12.31%		12.31%

Legend:

(grey)	not applicable
	the value could not be computed
NA	no value/information provided/available in the NIR

* Total number of AFI (public + private). ** Data from EAFO (absent in the UK NIR).

5.28.3.1 Road transport

5.28.3.1.1 Electricity

Vehicles

The UK recorded 191,726 electric vehicles in use in 2018[28] (Table 5.28.3-1). Of these, 182,855 were passenger cars (almost one-third were BEV), 7,992 were LCVs (mostly BEV), 367 were HCVs (only BEV) and 512 were buses and coaches (the vast majority being BEV). Whereas only 2020 estimates were provided in the NPF, those provided in the NIR are for 2025 and 2030. Thus, with this information it is not possible to determine the percentage changes in the NIR versus the NPF in accordance with our methodology (Section 2.1). The estimates provided in both the NPF and NIR range from a low to a high estimate[29]. The need to have a single value for each year for the assessment resulted in the computation and adoption of the average between the two: 413,500 EVs in 2020, 575,000 EVs in 2025 and 930,000 in 2030 (see Figure 5.28.3-1).

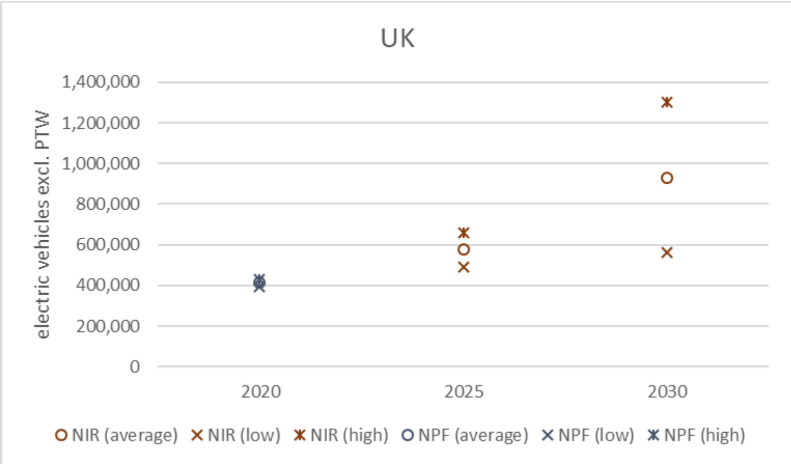

Figure 5.28.3-1 Future EV estimates in the UK NPF and NIR

The 2018 ***attainment*** of future EV estimates is 46.37% for 2020 (based on the NPF average estimate)[30] and 20.62% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching the envisaged EV estimates. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for EV fleet evolution planned by the UK is equal to 16%.

Infrastructure

The UK recorded 10,309 publicly accessible recharging points[31] in 2018 (Table 5.28.3-1), of which 1,872 had a power greater than 43 kW. In addition, the NIR provides the following information on the number of private recharging points, including both 'workplace' and

[28] In addition, the UK recorded 1,465 electric motorbikes and mopeds in 2018.

[29] The NIR disaggregates these estimates by type of EV: BEV and PHEV. For the latter, the low estimate for 2030 is below the low estimate for 2025.

[30] With reference to its "Latest Figures" the NIR states that "*the UK has already met its NPF projection for battery electric vehicles, and [...] was slightly behind in meeting its projection for Plug-In Hybrid Electric vehicles*".

[31] Table 8 of the NIR refers to 'devices' and 'sockets'. Since the title of the table indicates 'chargepoints', we assume that the values in that table reflect 'recharging points'.

'domestic/homecharge': the UK recorded 111,316 points in 2018. As in the case of AFVs, it seems that the NPF targets[32] are confirmed in the NIR, which presents targets for 2025 and 2030 for the first time. Again, these appear as a range of values with a computed average for publicly accessible infrastructure of respectively 175,000 and 535,000 points (see Figure 5.28.3-2) and of 1,314,000 and 4,005,000 private points (see Figure 5.28.3-3).

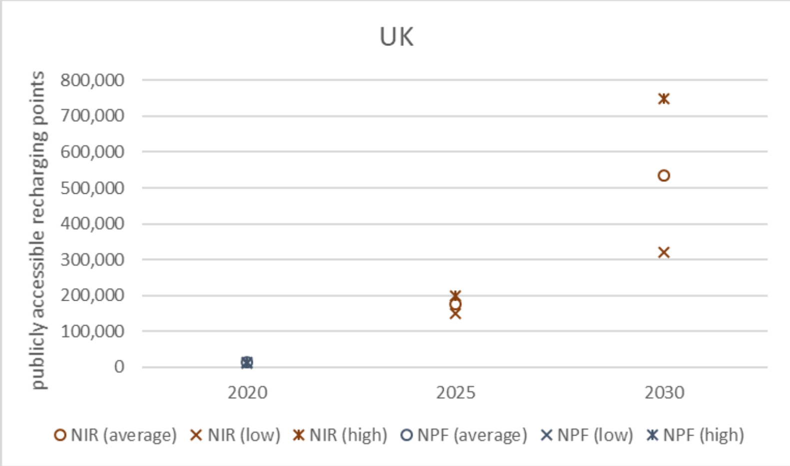

Figure 5.28.3-2 AFI targets in the UK NPF and NIR: publicly accessible electric recharging points

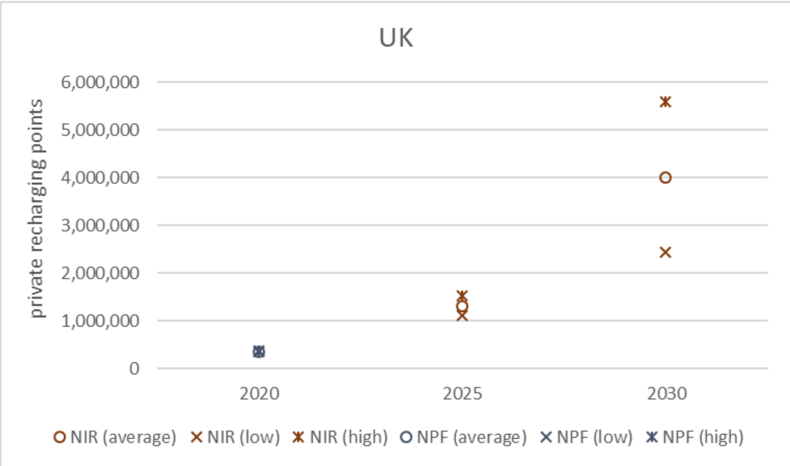

Figure 5.28.3-3 AFI targets in the UK NPF and NIR: private electric recharging points

The 2018 ***attainment*** of future publicly accessible recharging infrastructure targets is 80.85% for 2020 and 1.93% for 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to an ***adequate progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2020 for publicly accessible recharging infrastructure evolution planned by the UK is equal to 42%.

Ratio

Based on the UK NIR, the following table shows the ratio between vehicles and publicly accessible recharging points (i.e. sufficiency index) for the pair electricity/road. The sufficiency index exceeds the value of 10, except in 2025 and 2030. However, when private recharging

[32] Termed 'forecasts' in the NPF and 'projections' in the NIR.

infrastructure is taken into account, the value is well below 10 for all the years considered. This conclusion comes however with a caveat: while the underlying numbers used to calculate these values are based on average numbers, the actual future estimates and targets provided in the NPF and NIR were a range, as noted in the previous paragraphs. Thus, while the provision of recharging infrastructure could be considered as potentially adequate, attention should be paid to the actual developments in the deployment of both public and private recharging points.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	Electricity	17.87	18.95	18.60	32.43	3.29	1.74

Information on charging efficiency

Information is not available in the UK NIR.

5.28.3.1.2 CNG

Vehicles

The UK NPF acknowledged that since data disaggregated by type of fuel (CNG, LNG and LPG) are not available in the vehicle register, vehicles powered by these alternative fuels were reported as ‘gas’ vehicles. This continues to be the case in the NIR, which indicates that the UK recorded 35,125 gas-powered vehicles in 2018. Of these, 28,244 were passenger cars, whose stock declined by 21.5% between 2016 and 2018. The NIR further indicates that CNG vehicles are more prevalent in the heavy road segment, with the number of buses, coaches and trucks powered by gas growing in recent years. The sum of new registrations available on EAFO (as of March 2021) results in a value of 2,973 CNG vehicles in 2016 and 2018. Both the NPF and NIR lacked future CNG vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The UK NIR reports that 12 CNG refuelling *stations* were available in 2016, of which the NPF reported 7 were publicly accessible and 5 private. The latest figure reported in the NIR has, however, a lower value: ten *stations*. Information on refuelling points for 2018 is not reported in the NIR but a value of two publicly accessible refuelling *points* can be sourced from EAFO (Table 5.28.3-1) that had counted eight publicly accessible refuelling points in 2016. Both the NPF and the NIR reported a range of values for CNG (public + private) refuelling infrastructure (Figure 5.28.3-4). The 2025 targets provided in the NIR differ from the ones indicated in the NPF. In contrast to the NPF, the NIR contains 2030 targets, from which an average (to the closest integer) of 19 points can be computed.

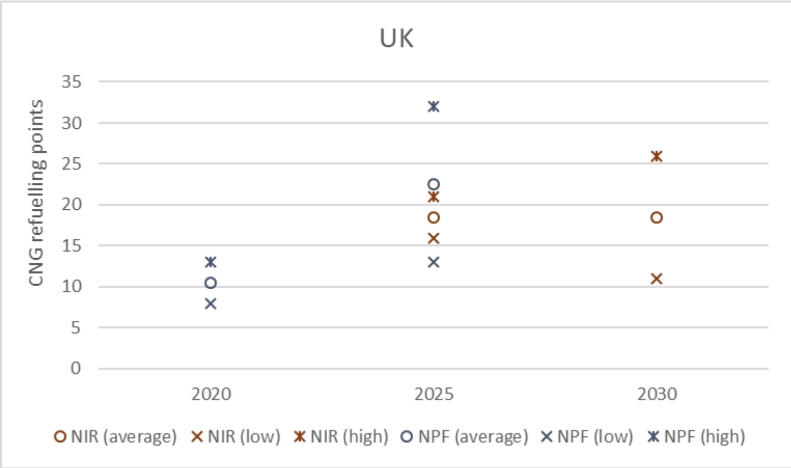

Figure 5.28.3-4 AFI targets in the UK NPF and NIR: total CNG refuelling points

NOTE: The NIR specifies that these are points on road networks. The NIR does not explicitly state whether these points are all publicly accessible.

Based on 2018 data from EAFO, the estimated ***attainment*** of future CNG refuelling infrastructure targets is equal to 18.18% for 2020 and 10.81% for 2025 and 2030. According to the assessment methodology described in Section 2.1, the 2018 situation corresponds to a ***slow progress*** towards reaching these envisaged targets. The calculated ***average annual growth rate*** corresponding to the period 2016-2030 for publicly accessible CNG refuelling infrastructure evolution planned by UK is equal to 7.72%.

Ratio

Based on EAFO data for UK, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair CNG/road for the years 2016 and 2018. The sufficiency index in 2018 was well above the indicative value of 600 (see Section 2.1.5).

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**CNG**	424.71		1486.50			

5.28.3.1.3 LNG

Vehicles

As indicated in Section 5.28.3.1.2, specific vehicle data about this alternative fuel is not available in the NIR, which indicates that LNG vehicles are more prevalent in the heavy duty segment. The sum of new registrations available on EAFO (as of March 2021) results in a value of 1,521 LNG vehicles in 2016 and 2018. Both the NPF and NIR lacked future LNG vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The UK NIR reports that 22 LNG refuelling *stations* were available in 2016, of which the NPF reported 11 were publicly accessible and 11 private. The latest figure reported in the NIR has, however, a lower value: eighteen *stations*. Information on refuelling points for 2018 is not reported in the NIR but a value of thirteen publicly accessible *points* can be sourced from EAFO (Table 5.28.3-1). Both the NPF and the NIR reported a range of values for LNG (public + private) refuelling infrastructure (Figure 5.28.3-5). The 2025 targets provided in the NIR differ from the ones indicated in the NPF. In contrast to the NPF, the NIR contains 2030 targets, from which an average of 32 points can be computed.

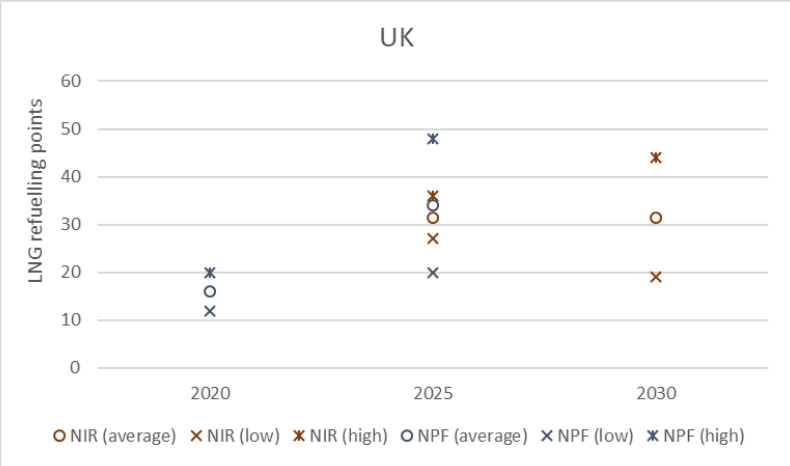

Figure 5.28.3-5 AFI targets in the UK NPF and NIR: total LNG refuelling points

NOTE: The NIR specifies that these are points on road networks. The NIR does not explicitly state whether these points are all publicly accessible.

Based on 2018 data from EAFO, the estimated ***attainment*** of future LNG refuelling infrastructure targets is equal to 81.25% for 2020 and 41.27% for 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by UK from 2016 until 2018 for the deployment of publicly accessible LNG refuelling infrastructure is 9.52% of the overall planned deployment during the period 2016-2030.

Ratio

Based on EAFO data for UK, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LNG/road for the years 2016 and 2018.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LNG	138.27		117.00			

5.28.3.1.4 Hydrogen

Vehicles

The UK recorded 109 hydrogen-powered vehicles in use in 2018 (Table 5.28.3-1). Of these, 104 were passenger cars, 3 LCVs, 1 HCV and 1 bus/coach[33]. Both the NPF and NIR lacked future hydrogen vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

[33] The sum of the values provided for each vehicle category in Table 9 of the NIR does not match the total figure (110) reported in that table. It is unclear whether the difference can be attributed to the existence of an unreported vehicle category.

The UK NIR reports that fifteen publicly accessible hydrogen refuelling *stations* were available in 2016. The latest figure reported in the NIR has, however, a lower value: fourteen *stations*. Information on refuelling points for 2018 is not reported in the NIR but a value of eight *points* can be sourced from EAFO (Table 5.28.3-1). Whereas neither the NPF nor the NIR provided a 2020 hydrogen infrastructure target, the NIR explicitly reconfirms the 2025 NPF target of 65 stations. Unlike the NPF, the UK NIR provides a 2030 target of 65 points. Though this represents no change with respect to the 2025 target, the NIR states that "*the UK will keep the situation under review*".

Based on 2018 data from EAFO, the estimated ***attainment*** of future hydrogen refuelling infrastructure targets is constant and equal to 12.31% for 2025 and 2030. According to the assessment methodology described in Section 2.1, the ***progress*** obtained by UK from 2016 until 2018 for the deployment of publicly accessible hydrogen refuelling infrastructure is -14.00% of the overall planned deployment during the period 2016-2030

Ratio

Based on the UK NIR, the following table shows the ratio between vehicles and infrastructure (i.e. sufficiency index) for the pair hydrogen/road (see Section 2.1.5) for the 2016-2018 period.

Sufficiency Index		**2016**	**2017**	**2018**	**2020**	**2025**	**2030**
Road	**H2**	2.60		13.63*			

* Based on EAFO data for infrastructure.

5.28.3.1.5 Biofuels

Information is not available in the UK NIR (see section 5.28.5).

5.28.3.1.6 LPG

Vehicles

The UK NIR reports that most of the 35,125 gas-powered vehicles recorded in 2018 run on LPG. But as highlighted in Section 5.28.3.1.2, specific vehicle data about this alternative fuel is not available. According to EAFO, there were 43,800 LPG vehicles in 2016 and 34,200 in 2018. Both the NPF and NIR lacked future LPG vehicle estimates, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Infrastructure

The UK NIR indicates that over 1,300 LPG refuelling stations were available in 2016. The latest figure reported in the NIR is approximately 1,400 stations. According to EAFO, there were 1,150 LPG refuelling stations in 2018. Both the NPF and NIR lacked future LPG refuelling points targets, therefore the 2018 ***attainment*** and ***progress*** could not be computed.

Ratio

Based on the UK NIR and EAFO, the following table shows the ratio between vehicles and publicly accessible refuelling points (i.e. sufficiency index) for the pair LPG/road.

Sufficiency Index		2016	2017	2018	2020	2025	2030
Road	LPG	33.69*		29.74**			

* AFV values taken from EAFO. ** Values taken from EAFO

5.28.3.2 Rail transport

5.28.3.2.1 Electricity

Vehicles

The UK recorded a stock of 10,254 electrified or bi/tri-mode locomotives in 2018, the majority of which were for passenger rail. Between 2016 and 2018, the number of electrified or bi/tri-mode locomotives went up by 1,111 units.

Infrastructure

The length of the open railway network in Great Britain[34] was 15,847 km in 2018-2019, of which 37.9% was electrified.

5.28.3.3 Waterborne transport (maritime)

5.28.3.3.1 Electricity

Vessels

Information is not available in the UK NIR.

Infrastructure

The UK NIR reinforces the messages communicated in the NPF, namely: there is policy in place[35], SSE facilities are not commercially attractive for UK ports (which are private entities), there are neither SSE systems deployed nor targets, and other alternative fuel options are under consideration (see Section 5.28.3.3.3). Specifically, the NIR states that "*the UK Government intends to leave the provision of SSE facilities to port operators and their customers*".

5.28.3.3.2 LNG

Vessels

Information is not available in the UK NIR.

Infrastructure

There were two LNG import terminals (Milford Haven and the Isle of Grain) and two LNG bunkering facilities (Southampton and Teesport) at the time of notification of the UK NPF. Since then, a third LNG bunkering facility has been deployed at the Port of Immingham (also part of the TEN-T Core Network). The NPF had indicated that the number of LNG bunkering

[34] The NIR acknowledges that UK data are unavailable.

[35] National Policy Statement for Ports, available at https://www.gov.uk/government/publications/national-policy-statement-for-ports.

facilities for maritime vessels was expected to be four or five in 2025. Information on the status of the planned LNG terminal off the coast of North-West England reported in the NPF cannot be found in the NIR. Instead, the latter reports on investment plans in LNG bunkering by the Stornoway Port Authority, although the expected year of entry into operation is not communicated. In addition, but subject to market demand, the NIR indicates plans for an LNG storage site for the Isle of Grain. With these caveats, the NIR targets can be interpreted as being in line with the targets expressed in the NPF.

The 2018 ***attainment*** of future LNG refuelling infrastructure targets in maritime ports ranges from 60.00% to 75.00% in 2025. Both the NPF and NIR lacked future targets for publicly accessible LNG refuelling points in maritime ports in 2030, therefore the ***progress*** could not be computed

5.28.3.3.3 Hydrogen

The UK NIR indicates that hydrogen is being considered as an alternative fuel option in the port of Orkney.

5.28.3.4 Waterborne transport (inland)

Not applicable since the UK has no inland ports along the TEN-T Core Network.

5.28.3.5 Air transport

5.28.3.5.1 *Electricity*

Airplanes

The only information found on this in the UK NIR relates to the development and demonstration, in the context of the Future Flight Challenge, of electric and autonomous aircraft services by 2024.

Infrastructure (for stationary airplanes)

The UK NIR asserts the following: "*Due to the privatised nature of the aviation industry, limited data is available on the extent to which UK airports have provision for Fixed Electric Ground Power (FEGP) or mobile Ground Power Units (GPU). A number of airports, both on the TEN-T Comprehensive Network and on the TEN-T Core Network, has chosen to invest in FEGP and GPUs. The UK Government is aware of at least 9 'Core' airports that have either already deployed FEGP or have policy in place to encourage FEGP use, along with another 7 'Comprehensive' airports*".

5.28.3.5.2 *Biofuels*

Information is not available in the UK NIR.

5.28.4 ***Measures assessment***

As in the NPF, the UK NIR contains a quite comprehensive list of measures, with electricity for road remaining the main interest, followed by hydrogen for road, and with CNG and LNG for road receiving less attention. The number of measures addressing non-road transport is rather limited.

An important measure targeting conventional fuel light-duty vehicles that has direct implications for AFVs is the end of new petrol and diesel car and van sales (related to the contents of one of the administrative measures indicated below). According to the UK NIR: "*In February 2020, the UK Prime Minister announced that the UK Government would be consulting on bringing forward the end to the sale of petrol and diesel cars and vans, from 2040 to 2035 or earlier if a faster transition appears feasible*".

5.28.4.1 Legal measures

The UK NIR contains eight legal measures, all of them in place. This represents a significant increase compared to the single legal measure (Renewable Transport Fuel Obligation (RTFO)) identified in the NPF. With one exception, the measures address a combination of AFs.

Considering all the legal measures, they appear, if fully implemented, to be fit to support the realisation of the AFV/AFI objectives as described in the NPF and revised in the NIR. The level of ambition of the legal measures has increased in the NIR, compared to the NPF.

5.28.4.1.1 Legislative & Regulatory

Of all the legal measures described in the UK NIR, six can be categorised as legislative and regulatory measures. Three of them address road transport. Examples include:

- National targets: Motor Fuel GHG Emission Reporting Regulations, setting out a 6% GHG emission reduction obligation on fuel suppliers by 2020. According to the NIR, this measure runs in parallel to the RTFO.
- Norms & requirements: Automated and Electric Vehicles Act 2018, which gives the government regulation-making powers in the areas of (i) access, standards and connection of public recharging points; (ii) provision of public recharging points at large fuel retailers; (iii) information of users of public recharging points; (iv) transmission of data relating to recharging points; and (v) smart recharging points.

5.28.4.1.2 Administrative

Of all the legal measures described in the UK NIR, two can be categorised as new administrative measures. According to the NIR, both are defined as 'AFV classification on environmental performance' measures targeting a combination of AFs for road transport. The two measures have a very distant start year, reflecting long-term objectives.

5.28.4.2 Policy measures

The UK NIR contains nineteen[36] policy measures, compared to the twelve policy measures identified in the NPF. The measures are national, with the few exceptions noted below. All the measures target solely road transport. The vast majority of these measures have a financial nature.

5.28.4.2.1 Measures to ensure national targets and objectives

[36] Excluding the 'Green bus fund', which pre-dates 2016.

Of all the policy measures described in the UK NIR, nine can be categorised as measures to ensure national targets and objectives. Two-thirds of these measures address a combination of AFs. With one exception, all the measures found in the NPF are listed also in the NIR. One measure that is no longer found in the NIR relates to Clean Air Zones / Low Emission zones.

A series of grants dedicated to specific vehicle categories (moped/motorcycles, cars, vans and trucks) continue to provide financial support for vehicles powered by electricity and hydrogen. For EVs, the grant covers 35% of the purchase price for eligible cars (20% for the other vehicle categories). In terms of budget, the most important policy measure by far is the 'Plug-in Car Grant', whose budget of 558 million £ (ca. 642 million €) over the period 2016-2019 has been followed by 403 million £ (ca. 463 million €) for the period 2020-2023. The NIR reports that the eligibility criteria for the grant was amended in 2016 as follows: (i) the maximum threshold for eligible cars was lowered to 50 grams of CO_2/km from 75 grams of CO_2/km; (ii) the minimum zero-emission range was raised to 112 km from 16 km. This had the effect of reducing the number of supported PHEVs, as the NIR admits (recall footnote 3 in Section 5.28.3.1.1). Compared to the NPF, the grant level decreased from £4,500 to £3,500 and from March 2020 to £3,000 per car, with a car price cap of £50,000. For the other vehicle categories, a combined budget of 129.5 million £ (ca. 149 million €) is reported for the period 2020-2023 (this includes also taxis; see the next section). This represents a strong increase in financial backing in comparison with the previous years.

FCEV continue to be supported also via the 'Fuel Cell Electric Vehicle Fleet Support Scheme', but with a relatively low budget.

Two of the measures addressing electricity for road apply only in Scotland, with a combined budget of 120 million £ (ca. 138 million €) over the period 2016-2020.

Not all the measures provide subsidies or favourable taxation. A joint government and industry communications campaign is also reported with its own annual budget. The aim of this measure is to inform vehicle purchasers about the advantages of ultra-low-emission vehicles.

5.28.4.2.2 Measures that can promote AFI in public transport services

Of all the policy measures described in the UK NIR, seven can be categorised as measures that can promote AFI in public transport services. Compared to the NPF, only two measures are new. One of them is the 'Ultra-Low Emission Bus Scheme', which offsets the marginal role the 'Retrofit Grant Schemes' now plays in the NIR vis-à-vis the NPF and de facto replaces the 'Low Emission Bus scheme' (which ended in 2019). The new scheme runs from 2019 to 2021 with a budget of 48 million £ (ca. 55 million €). Most of the measures address several AFs and are national, with two exceptions: one regional measure applied only in Scotland and the 'ULEV Taxi Infrastructure scheme', which is a local measure. Taxis are also supported via the 'Plug-in Taxi Grant', whose budget cannot be uniquely determined as it is bundled with other measures, as noted in the previous section.

5.28.4.2.3 Measures that can promote the deployment of private electro-mobility infrastructure

Of all the policy measures described in the UK NIR, three can be categorised as measures that can promote the deployment of private electro-mobility infrastructure. All of them were included in the NPF and each addresses a particular issue: home, workplace and business recharging infrastructure. For the 'Electric vehicle homecharge scheme', the annual spending between 2016 and 2019 was slightly lower than budgeted. Recipients can receive until 2021 up to 75% off the purchase and installation costs of the recharging point, with a £350 cap (VAT included; before April 2020, it was £500). In total, the budget reported for this measure is 61.2

million £ (ca. 70 million €) for the period 2016-2020 (slightly lower than the 65 million £ indicated in the NPF). Concerning the 'Workplace charging scheme', an estimated budget of around 22 million £ (ca. 25 million €) is reported for the period 2016-2020. This scheme also runs until 2021 and covers 75% of the purchase and installation costs. While the grant level reported in the NPF was £300 per socket, the NIR indicates that it was increased to a maximum of £500 in July 2018. The third measure refers to capital allowances for businesses acquiring recharging point equipment: 100% for the first year.

5.28.4.3 Deployment and manufacturing support

5.28.4.3.1 AFI deployment

The UK NIR reports seven (only two national) AFI deployment measures (all addressing either electricity or hydrogen), of which four were the only ones identified in the NPF. Five of the measures target road transport (one of them deals with hydrogen and the rest with electricity) and two address rail transport. The budget reported in the NIR for rail electrification was 2.4 billion £ (ca. 2.8 billion €) for the period 2016-2019. The second rail-related measure concerns operational testing of a hydrogen-powered train and has a low budget. The estimated combined budget of the road-related measures is 111 million £ (ca. 128 million €) for the period 2016-2020. The recharging needs of the local residents continue to be served with a greater budget via the On-Street Residential Charging Scheme. The Hydrogen for Transport Programme expands the refuelling network.

5.28.4.3.2 Support of manufacturing plants for AF technologies

Information is not available in the UK NIR. The closest measure related to this is the 'Advanced Biofuels Demonstration Competition' (see Section 5.28.4.5).

5.28.4.3.3 Consideration of any particular needs during the initial phase of the deployment of alternative fuels infrastructures

Information is not available in the UK NIR.

5.28.4.4 Quantitative assessment of Policy and Deployment & Manufacturing measures

Table 5.28.4-1 presents an analysis of all the Policy and Deployment & Manufacturing measures, carried out according to the assessment methodology described in Section 2.2. As it can be seen, clusters of measures on electricity, CNG, LNG, hydrogen and LPG could be identified in the UK NIR. All of them refer to road transport. Two of them can be considered comprehensive: the electricity/road cluster is the only having a high score; followed by the hydrogen/road with a medium score. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact, those for the pair hydrogen/road have a medium impact while all the other measures have a low impact. Compared to the NPF, the level of ambition of the Policy and Deployment & Manufacturing support measures has increased only for the electricity/road cluster and remains at the same level for the other clusters.

In terms of budget, some of the measures are grouped together in the NIR, rendering an estimation of the impact a hard task.

Table 5.28.4-1 Quantitative assessment of Policy and Deployment & Manufacturing support measures

AF	Transport mode	Score	Comprehensiveness		Impact		Ambition (NIR vs NPF)
Electricity	Road	H	C		**H**		+
CNG	Road	L	N		**L**		=
LNG	Road	L	N		**L**		=
	Water - maritime						
H2	Road	M	C		**M**		=
LPG	Road	L	N		**L**		=

Legend: Score and Impact: H = high; M = medium; L = low; X = not assessable. Comprehensiveness: C = comprehensive; N = Not comprehensive. Ambition level: '+' means 'higher'; '=' means 'comparable'; '-' means 'lower'.

5.28.4.5 Research, Technological Development & Demonstration

The UK NIR lists eleven[37] RTD&D projects, which represents an increase compared to the seven projects found in the NPF. Two of them (Advanced Biofuels Demonstration Competition and Future Fuels for Flight and Freight Competition), relevant for biofuels in aviation and road freight transport, have seen their budgets reduced compared to the NPF. The rest of the projects previously reported address electricity, road or combinations of AFs and transport modes. It is not possible to disentangle the individual budgets of three of these, which are reported with a joint budget of 300 million £ (ca. 345 million €) for the period 2016-2019 (the NIR indicated that the future budgets would be determined in late 2020). Overall, for the period 2016-2021, it is calculated that the total estimated budget for RTD&D projects reported in the NIR amounts to around 578 million £ (ca. 665 million €). Concerning the new projects, three of them target rail transport addressing several AFs. Water transport is specifically supported via the Maritime Innovation Fund. Another project addresses electricity and targets UK businesses. Several sources of funding are indicated, including Department for Transport, Innovate UK and the Industrial Strategy Challenge Fund.

Although the level of ambition seems to have been reduced for the measures that were already featuring in the NPF, the overall level of ambition has increased with the addition of new projects, but mainly for rail and waterborne transport. It remains to be seen the budget allocated to RTD&D post-2021.

5.28.5 *Additional information on alternative fuels infrastructure developments*

The UK NIR provides information on the evolution of renewable transport fuels production between 2013 and 2018, disaggregated into biodiesel, bioethanol and other. The NIR also indicates that the percentage of renewable transport fuels produced from waste feedstock increased from 46% to 69% during this period, with the percentage of renewable transport fuels produced from non-waste feedstock decreasing from 54% to 31%.

[37] Excluding the 'Low Carbon Vehicle Innovation Platform', which was presented to run until 2020 in the NPF but in the NIR is listed as pre-dating 2016.

5.28.6 *Summary of the assessment*

Tabular overview

Table 5.28.6-1 Overview of the NIR assessment

		Indicators	Alternative fuel / transport mode					
			Electricity / road	**CNG / road**	**LNG / road**	**LNG / water (maritime)**		**H2 / road**
AF Vehicles / Vessels		Past situation (2016)	91,321	2,973****	1,521****	NA		39
		Situation (2018)	191,726	2,973****	1,521****	NA		109
		Estimate (2030)	930,000*	NA	NA	NA		NA
		Future share (2030) [%]	2.12%					
		Estimate attainment (2018 vs 2030) [%]	20.62%					
		Progress (2018)	adequate					
Publicly accessible AF Infrastructure		Past situation (2016)	5,111	7	11	2		15
		Situation (2018)	10,309	2****	13****	3		8****
		Target (2030)	535,000*	19*	32*	NA		65***
		Target attainment (2018 vs 2030) [%]	1.93%	10.53%	40.63%			12.31%**
		Progress (2018)	adequate					
Sufficiency Index		2016	17.87	424.71**	138.27**			2.60
		2018	18.60	1486.50**	117.00**			13.63**
		2020	32.43					
		2025	3.29					
		2030	1.74					
Measures	**Legal measures**	Ambition (NIR vs NPF)	+	+	+			+
	Policy measures + Deployment & manufacturing support	Score	H	L	L			M
		Comprehensiveness	C	N	N			C
		Impact	H	L	L			M
		Ambition (NIR vs NPF)	+	=	=			=
	RTD&D	Ambition (NIR vs NPF)	=	=	=	+		=

Legend:		
	(grey)	not applicable
		the value could not be computed
	NA	no value/information provided/available in the NIR

* The NIR projects between 560,000 and 1,300,000 million EVs, between 320,000 and 750,000 publicly accessible recharging points, between 11 and 26 CNG refuelling points and between 19 and 44 LNG refuelling points in 2030.
** Partially or totally based on EAFO data.
*** The NIR refers to refuelling stations. Assumed to mean 'publicly accessible points'.
**** Value taken from EAFO (absent in both NPF and NIR).

The UK NIR highlights strategies such as the Clean Maritime Plan (2019), the Road to Zero Strategy (2018) and the National Policy Statement for Ports (2012). Concerning aviation, the NIR mentions the Jet Zero Council, the Future Flight Challenge and the voluntary agreement to join the Carbon Offsetting and reduction Scheme for International Aviation (CORSIA) from 2021. The NIR furthermore indicates that the government is holding a consultation on Aviation and Climate Change.

The UK NIR does not cover the whole AFID period (2016-2030). Compared to the UK NPF that had addressed all of the requirements of Article 3 of the Directive, the NIR addresses most of the requirements of Annex I of the Directive, with the following exceptions: (i) consideration of the need for renewable jet fuel refuelling points in airports within the TEN-T Core Network; (ii) budget to support manufacturing plants for alternative fuels technologies; and (iii) information on any particular needs during the initial phase of AFI deployment. Moreover, the UK should provide data on the usage of high power recharging infrastructure, as per the Commission's Frequently-Asked Questions document notified to the Member States on 16 September 2019.

The main outcomes of the technical assessment of the UK NIR on vehicles/vessels estimates and infrastructure targets can be summarised as follows:

Road transport

- **Electricity** – In 2018, the UK recorded 190,847 light-duty EVs, 879 heavy-duty EVs and 121,625 recharging points, of which 10,309 publicly accessible. With reference to the objectives of the UK NPF as updated by the NIR, progress is adequate, both in terms of infrastructure and of EV deployment. In contrast to the NPF, the NIR provides targets for 2025 and 2030, with a wide range of values particularly for 2030. The UK NIR reports also a fair amount of information on private recharging infrastructure. The calculated UK sufficiency index is subject to the consideration of the role this type of infrastructure will play.
- **CNG** – The UK NIR continues to report CNG vehicles as part of the wider 'gas-powered vehicle' category. Both the NPF and NIR lacked future CNG vehicle estimates. No data on refuelling points for 2017 and 2018 was provided in the NIR. The current figure reported in the NIR is 10 CNG stations. Compared to the NPF, the 2025 target is lower. In contrast to the NPF, the NIR provides a target for 2030, ranging from 11 to 26 refuelling points. Future NIR assessments would benefit from a clear distinction between CNG and other 'gas-powered' vehicles.
- **LNG** – The UK NIR continues to report LNG vehicles as part of the wider 'gas-powered vehicle' category. Both the NPF and NIR lacked future LNG vehicle estimates. No data on refuelling points for 2017 and 2018 was provided in the NIR. The current figure reported in the NIR is 18 LNG stations. Compared to the NPF, the 2025 target is lower. In contrast to the NPF, the NIR provides a target for 2030, ranging from 19 to 44 refuelling points. Future NIR assessments would benefit from a clear distinction between LNG and other 'gas-powered' vehicles.
- **Hydrogen** – In 2018, the UK recorded 109 hydrogen-powered vehicles. No data on refuelling points is available for 2017 and 2018. The current figure reported in the NIR is 14 hydrogen stations. While no future vehicle estimates are provided, the number of hydrogen stations to be expected in 2025 remains 65. The same value is for the first time reported for 2030.

- **Biofuels** – The information is very limited and basically related only to legislative and RTD&D projects.
- **LPG** – The UK NIR continues to report LPG vehicles as part of the wider 'gas-powered vehicle' category. No data on refuelling points is available for 2017 and 2018. The current figure provided in the NIR is ca. 1,400 LPG stations. The NIR indicates that the LPG vehicle market is mature but niche and stresses that the country is moving to zero-emission mobility.

Rail transport

- **Electricity** – In 2018, the UK recorded ca. 10,254 electrified or bi/tri-mode locomotives operating on 6,012 km of electrified lines in Great Britain (representing 37.9% of the open rail network). In contrast to the NPF, which lacked an assessment of the situation for rail, the NIR states that the "*Traction Decarbonisation Network Strategy*" is expected to be completed in 2020. Overhead electrification and deployment of battery-powered trains will be considered in this strategy.
- **Hydrogen** – The aforementioned strategy will take also hydrogen trains into account.

Waterborne transport (maritime)

- **Electricity** – SSE does not and is not expected to play a significant role in the near future for maritime transport in the UK because ports are managed by private entities and SSE facilities are considered not commercially attractive for UK ports.
- **LNG** – The number of LNG bunkering facilities increased from two to three between the notification of the NPF and the NIR. Although not fully explicitly, the NIR seems to endorse the NPF targets and to consider the level of LNG deployment sufficient to meet the needs of maritime transport.
- **Hydrogen** – There is a least one UK maritime port exploring this option.

Air transport

- **Electricity** – The NIR does not provide robust evidence on how many UK airports already supply electricity for stationary airplanes and how many are planning to do so.
- **Biofuels** – Beyond a couple of relevant RTD&D projects, no information could be found.

With regards to the **measures**, similarly to the NPF, the UK NIR reports a rather comprehensive package, consisting in 45 measures. While many of them address a combination of AFs, a strong focus on electrification can be noticed. Many of the measures have a financial nature and are accompanied by annual budgets. Worth mentioning are the plug-in grants for the purchase of several vehicle categories.

With regards to the Policy and Deployment & Manufacturing measures, five clusters on electricity, CNG, LNG, hydrogen and LPG for road transport could be identified in the UK NIR. In terms of expected impact of these measures to support the realisation of the AFV/AFI objectives as presented in the NPF and revised in the NIR, the measures for the pair electricity/road result to have a high impact, those for the pair hydrogen/road have a medium impact while all the other measures have a low impact. Compared to the NPF, the level of ambition has increased only for the electricity/road cluster.

The UK NIR lists eleven RTD&D projects, which represents an increase compared to the seven projects found in the NPF. Road transport is prevalent, but it is noteworthy that three RTD&D projects cover rail transport and one waterborne transport (Maritime Innovation Fund).

5.28.7 *Final remarks*

The UK NIR provides a rather comprehensive reporting on the efforts made to implement the Directive.

The NIR is to certain extent in line with the provisions of Annex I to the Directive: it misses detailed estimates for CNG and LNG vehicles and vessels for the years 2020, 2025 and 2030. Instead, the NIR provides a single figure for gaseous vehicles (CNG, LNG and LPG) in 2018. There is no information on the existing shore supply installations in the UK ports. The NIR includes a significant number of measures to promote alternative fuels in road transport and here particularly electricity and hydrogen. It lacks description of measures to promote alternative fuels in other transport modes.

The NIR estimates that approximately 930,000 electric vehicles could be on the roads by 2030. Taking into account the number of the planned public recharging points (535,000) by 2030 and the total number of private and public recharging points foreseen at the same date, the number of electric vehicles estimated by 2030 seems rather low. The NIR does not include information on the plans for shore-side electricity supply in ports. The NIR reports that at least 16 UK airports (at least nine of which would be part of the Core and seven of the Comprehensive TEN-T networks) already supply electricity for stationary airplanes. Only 37.9 % of the rail network is electrified, further efforts should be made to electrify the UK rail network.

The NIR does not provide estimates for FCEV vehicles in 2020, 2025 and 2030; the number of 65 hydrogen refuelling points for road transport planned by 2030 seems limited taking to account the length of the UK TEN-T network.

Information on past number of CNG, LNG and LPG vehicles and estimates by 2020, 2025 and 2030 should be differentiated according to the type of the fuels. The number of planned CNG refuelling points in 2020 (11) does not ensure the CNG supply for vehicles in the major UK urban agglomerations. The UK does not see a relevance of this fuel in the future as it only projects for 19 CNG refuelling points by 2030. The estimated number of LNG refuelling points (32) by 2025 and 2030 is insufficient considering the length of the UK TEN-T core network. Furthermore, only four or five maritime ports out of fifteen maritime ports of the UK TEN-T Core network will ensure the supply of LNG by 2025.

A significant network of 1,400 LPG stations exists in the UK but no estimates are provided for 2025 and 2030. Nevertheless, the current number of LPG refuelling points seems sufficient.

The NIR also indicates that the percentage of renewable transport fuel produced from waste feedstock increased from 46% to 69% between 2013 and 2018, with the percentage of renewable transport fuel produced from non-waste feedstock decreasing from 54% to 31% in the same period. The UK NIR would have benefited from information on the planned use of biofuels in aviation.

5.28.8 *ANNEX - Description of the Member State*

On a surface area of 243,800 km², the United Kingdom has a population of 66.274 million people in 2018, which makes up for a population density of 272 inhabitants/km².

Number of main urban agglomerations

- 171 urban agglomerations > 50,000 inhabitants

In 2018, the United Kingdom achieves a per capita gross domestic product at market prices of €36,480, which represents a per capita gross domestic product in purchasing power standards of 105 if expressed in relation to the EU-28 average set to equal 100.

Length of the road networks

The length of the road TEN-T Core Network in the United Kingdom is 2,872 km. The total road network length is 86,176 km, of which 3,838 km are motorways.

The following lengths of the TEN-T Road Corridors are present in United Kingdom: 35% (1,457 km) of the North Sea - Mediterranean Corridor.

Through the TEN-T Road Corridors, the United Kingdom is connected with the following Member States:
- Ireland (through the North Sea - Mediterranean Corridor),
- France (through the North Sea - Mediterranean Corridor)

Number of registered road vehicles

At the end of 2018, the United Kingdom accounts for 37,438,661 registered road vehicles of which 31,517,597 are categorized as passenger cars, 4,003,781 as light goods vehicles, 506,393 as heavy goods vehicles and 154,990 as buses and coaches. The motorisation rate is 476 passenger cars per 1,000 inhabitants.

Number of ports in the TEN-T Core Network

- 15 maritime ports in the TEN-T Core Network (Belfast, Bristol, Cardiff, Newport, Dover-Folkestone, Edinburgh (Forth, Grangemouth, Rosyth and Leith), Felixstowe, Glasgow (Clydeport, King George V dock, Hunterston and Greenock), Grimsby-Immingham, Harwich, Liverpool, London (London, London Gateway, Tilbury), Milford Haven, Southampton, Teesport)
- 28 maritime ports in the TEN-T Comprehensive Network
- No inland ports

Number of airports in the TEN-T Core Network

- 12 airports in the TEN-T Core Network (Birmingham, Bristol, Edinburgh, Glasgow, Leeds-Bradford, London-City, London-Gatwick, London-Heathrow, London-Luton, London-Stansted, Manchester, Nottingham-East Midlands)

8 airports in the TEN-T Comprehensive Network

6 ABBREVIATIONS

AC	Alternative Current
AF	Alternative Fuels
AFI	Alternative Fuels Infrastructure
AFID	Alternative Fuels Infrastructure Directive
AFV	Alternative Fuels Vehicle
B100	100% biodiesel for diesel engines
B7	Blend of 7% biodiesel and 93% diesel fuel
BEV	Battery Electric Vehicle
CBG	Compressed BioGas
CEF	Connecting Europe Facility
CNG	Compressed Natural Gas
CO_2	Carbon Dioxide
DC	Direct Current
DIONE	Fleet Impact model, (DIONE is a name not an acronym)
E10	Blend of 10% ethanol fuel and 90% gasoline by volume
E20	Blend of 20% ethanol fuel and 80% gasoline by volume
E3MLab	Energy-Economy-Environment Modelling Laboratory
E5	Blend of 5% ethanol fuel and 95% gasoline by volume
E85	Blend of 85% ethanol fuel and 15% gasoline by volume
EAFO	European Alternative Fuels Observatory
EC	European Commission
ED95	Blend of 95% ethanol and 5% ignition improver
EE	Employment Effect
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
EV	Electric Vehicle
FC	Fuel Cell
FCEV	Fuel Cell Electric Vehicle
FCH JU	Fuel Cells and Hydrogen Joint Undertaking
GHG	Greenhouse Gas
GVA	Gross Value of production Added
GVP	Gross Value of Production
H_2	Hydrogen
HCV	Heavy Commercial Vehicle
HDV	Heavy-Duty Vehicle (category including HCVs, buses and coaches)
HEV	Hybrid Electric Vehicle
HVO	Hydro-treated Vegetable Oil
ICAO	International Civil Aviation Organisation
ICE	Internal Combustion Engine
IDACS	Data collection related to recharging/refuelling points for alternative fuels and the unique identification codes related to electro-mobility actors
IMO	International Maritime Organisation
JRC	Joint Research Centre
LBG	Liquid BioGas
LCV	Light Commercial Vehicle
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas

MS Member State[38,39]

Member State denomination	Code
Belgium	BE
Bulgaria	BG
Czechia	CZ
Denmark	DK
Germany	DE
Estonia	EE
Ireland	IE
Greece	EL
Spain	ES
France	FR
Croatia	HR
Italy	IT
Cyprus	CY
Latvia	LV
Lithuania	LT
Luxembourg	LU
Hungary	HU
Malta	MT
Netherlands	NL
Austria	AT
Poland	PL
Portugal	PT
Romania	RO
Slovenia	SI
Slovakia	SK
Finland	FI
Sweden	SE
United Kingdom	UK

NACE Nomenclature statistique des activités économiques dans la Communauté européenne
NDI Normalised Difference Index
NECP National Energy and Climate Plan
NIR National Implementation Reports
NO_x Nitrogen Oxides
NPE Nationale Plattform Elektromobilität
NPF National Policy Framework
PHEV Plug-in Hybrid Electric Vehicle
PM Particulate Matter ($PM_{2.5}$ is PM with a diameter of 2.5 µm or less)
PRIMES-TREMOVE Price-Induced Market Equilibrium System – linked with transport model

[38] https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Country_codes

[39] The United Kingdom was still a Member State of the Union at the date of submission established in the Directive

PSA	Programme Support Action
PTW	Powered Two Wheeler
PWA	Population Weighted Average
REEV	Range Extended Electric Vehicles
REF	Reference Scenario
RP	Recharging Point
SME	Small and Medium Enterprise
SSE	Shore-Side Electricity
SWD	Staff Working Document
TCO	Total Cost of Ownership or Total Cost of Operation
TEN-T	Trans-European Transport Network
TM	Transport Mode
UWA	Un-Weighted Average
WtW	Well-to-Wheel

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