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Strategy for market development for the deployment of an alternative fuels infrastructure in the transport sector of the Republic of Slovenia

1 Content

1.1 Executive Summary

Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure (hereinafter: Directive (EU) 2015/1513) was published in the Official Journal of the European Union on 22 October 2014. Alternative fuels under this Directive include electricity, natural gas (CNG – compressed natural gas and LNG – liquefied natural gas), biomethane, biofuels, synthetic and paraffinic fuels and hydrogen (H2).

Article 3 of the Directive requires EU Member States to adopt a "national policy framework for the development of the market as regards alternative fuels in the transport sector, and the deployment of the relevant infrastructure" by 18 November 2016. This part of the Directive has been transposed into the Slovenian legal system by the Strategy for market development for the deployment of an alternative fuels infrastructure in the transport sector of the Republic of Slovenia (hereinafter: the Strategy).

On 29 July 2015 the Slovenian Government adopted the Transport Development Strategy for the Republic of Slovenia and the Environmental Report on a comprehensive environmental impact assessment for the Transport Development Strategy for the Republic of Slovenia (Decision No 37000-3/2015/8) (hereinafter: TDS). The measures Ro.35, M.11 and A.11 from the National Transport Development Programme were taken into account in preparing the Strategy, which require promoting the use of ecological vehicles, setting up a network of recharging stations, and complying with the requirements under the Directive.

In Slovenia in 2017 there are 228 publicly-available electric recharging points (of which 31 are high power recharging stations on the trans-European transport network TEN-T), 1 recharging station for hydrogen, 115 for liquefied petroleum gas (LPG) and 4 for compressed natural gas (CNG). No refuelling points for liquefied natural gas (LNG) are available as yet, but they are expected by the end of 2017 under two current projects. Recharging stations for 100 % bio-diesel are not available in Slovenia.

In line with the above, Slovenia complies with all its commitments under the Directive in the field of electricity on the entire trans-European TEN-T network, and by the end of the year it will also comply with requirements on LNG.

The Ministry of Infrastructure will prepare the 2018-2020 Action Plan and every year prepare a review of the implementation and the results attained in this area.

2 Introduction

Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure was published in the Official Journal of the EU on 22 October 2014. Alternative fuels under this Directive include electricity, natural gas (CNG – compressed natural gas and LNG – liquefied natural gas), biomethane, biofuels, synthetic and paraffinic fuels and hydrogen (H2).

Article 3 of the Directive requires EU Member States to adopt a "national policy framework for the development of the market as regards alternative fuels in the transport sector and the deployment of the relevant infrastructure" by 18 November 2016, which must contain:

- an assessment of the current state and future development of the market as regards alternative fuels in the transport sector, including in light of their possible simultaneous and combined use, and of the development of alternative fuels infrastructure, considering, where relevant, cross-border continuity;
- national objectives in accordance with the following Articles of the Directive:
    - Article 4(1), (3) and (5) which (inter alia) provide that Member States must ensure that a suitable number of publicly accessible recharging points for electric vehicles are deployed by 31 December 2020, and adopt measures to encourage and facilitate the deployment of recharging points that are not accessible to the public;
    - electricity supply from an operational shore-side in ports of TEN-T Core Network must be deployed as a priority by 31 December 2025.
    - Article 6(1), (2), (3), (4), (6), (7) and (8), which (inter alia) require that:
        - Member States identify maritime ports where access to refuelling points for liquefied natural gas is available and ensure that there are a sufficient number of LNG refuelling points available by 31 December 2025;
        - Member States ensure that by 31 December 2025, at least along the existing TEN-T Core Network, a suitable number of publicly accessible LPG refuelling points are deployed in order to ensure that LNG heavy-duty motor vehicles can circulate throughout the Union if there is demand, unless the costs are disproportionate to the benefits, including environmental benefits;
        - Member States ensure that a suitable distribution system for the supply of LNG is available in their territory;
        - Member States ensure that by 31 December 2020, a suitable number of publicly accessible refuelling points for compressed natural gas (CNG) are deployed for motor vehicles in urban and suburban areas; and
        - Member States ensure that by 31 December 2025, at least along the existing TEN-T Core Network, a suitable number of publicly accessible refuelling points for CNG are deployed,
    - as required and with reference to Article 5(1), Member States which have decided to include publicly available refuelling points for hydrogen in their national policy framework, ensure that by 31 December 2025 there are a sufficient number of such points to ensure the circulation of hydrogen-powered motor vehicles;
    - these national objectives are established and may be revised on the basis of an assessment of demand at the national, regional or Union-wide level, while ensuring compliance with the minimum infrastructure requirements set out in this Directive;
- measures necessary to ensure that the national objectives contained in the national policy framework are reached;
- measures that can promote the deployment of alternative fuels infrastructure in public transport services;
- designation of the urban/suburban areas, other densely populated areas and networks which will be equipped with recharging points for electric vehicles accessible to the public, in accordance with market needs;

- designation of the urban/suburban agglomerations, other densely populated areas and networks, which will be equipped with CNG refuelling points, in accordance with market needs;
- an assessment of the need to install LPG refuelling points in ports outside the TEN-T Core Network,
- consideration of the need to install an electricity supply at airports for use by stationary aircrafts.

Member States must ensure:

- that national policy frameworks take into account the needs of the different transport modes existing in their territory, including those for which limited alternatives to fossil fuels are available;
- that national policy frameworks take into account the interests of regional and local authorities, as well as those of the stakeholders concerned;
- that Member States cooperate, by means of consultations or joint policy frameworks, to ensure that the measures required to achieve the objectives of this Directive are coherent and coordinated;
- support measures for alternative fuels infrastructure and that they be implemented in compliance with the State aid rules contained in the Treaty on the Functioning of the European Union (TFEU);
- that national policy frameworks be in line with the Union's environmental and climate-protection legislation in force; and
- that Member States notify their national policy frameworks to the Commission by 18 November 2016.

The Slovenian Government also adopted the **Transport Development Strategy for the Republic of Slovenia** and the Environmental report on a comprehensive environmental impact assessment for the Transport Development Strategy of the Republic of Slovenia (Decision No 37000-3/2015/8) on 29 July 2015. The ministry responsible for the environment approved the TDS by issuing a Decision confirming acceptability (No 35409-24/2012/74). Chapter 2.9 of the TDS addresses alternative fuels. - Infrastructure for the use of alternative fuels in transport, and in measures: Ro.35 - Promoting the use of ecological vehicles and setting up a recharging stations network, M.11 - Recharging stations for alternative fuels - maritime and A.11 - Recharging stations for alternative fuels - aviation. This field is also addressed where relevant in the environmental report for the Transport Development Strategy for the Republic of Slovenia. For the purposes of these measures, the Resolution on the National Transport Development Programme in the Republic of Slovenia for the period until 2030 (Official Gazette of the RS (Uradni list RS; hereinafter: UL RS) No 75/16) also prescribed detailed activities, operators, time limits and the financial resources required.

Through the above-listed measures, the TDS as well as the National Programme require the Ministry for Infrastructure to prepare development plans in the field of alternative fuels.

The Strategy has also been prepared in order to implement Article 314(1) of the Energy Act (UL RS No 17/14 of 7. 3. 2014 and UL RS No 81/15 of 30. 10. 2015) which requires that measures on energy efficiency and the use of renewable sources of energy be promoted by the State through educational programmes, the provision of information, public awareness, energy consultation, promotion of energy reviews, preparation of regulations, financial incentives and other support programmes.

To transpose this Directive into the Slovenian legal system, the Slovenian Government established an inter-ministerial working group to prepare the Strategy for market development for the deployment of alternative fuels infrastructure in the transport sector.

Because the use of alternative fuels in Slovenia is exceptionally important in realising environmental objectives in the area of greenhouse gas emissions (GHG emissions) and pollutants, the inter-ministerial working group requested that a study be prepared to examine the current state in Slovenia and to make proposals for further action on the use of alternative fuels to reach the environmental objectives prescribed until 2020 and 2030. The objectives and measures in this Strategy proposal represent only the minimum framework which Slovenia must implement in order to realise already established environmental targets on transport.

A comprehensive environmental impact assessment will also be made with respect to the Strategy and, depending on the results, changes and supplements to the Strategy will be proposed as needed.

The Ministry of Infrastructure will prepare an annual review of the implementation and realisation of results in this field and put forward amendments to the Strategy or measures therein to the Government as necessary. On the basis of the Strategy, the Slovenian Government will adopt the 2018-2020 Action Plan.

3 Vision

Like much of the developed world, Slovenia faces challenges about how to provide high levels of accessibility and mobility, while avoiding the negative environmental effects that accompany the currently prevalent forms of mobility. Trends over the last few years and decades show an above-average growth in Slovenia for motor transport by road, against a reduction in rail and public transport. At the same time, the number of cars is growing, which increase these environmental pressures.

Transport accounts for almost a third of GHG emissions in Slovenia and is the main cause of air pollution in towns. The only sustainable solution to this challenge is to change to sustainable forms of mobility, with low carbon emissions and air pollution; in the White Book on Transport Policies of 2011, the European Union set out a target for GHG emissions in transport to be at least 60 % lower than in 1990, with a clear progression towards zero emissions. At the end of 2014, the Slovenian Operational Programme of measures to reduce GHG emissions by 2020 prescribed a long-term objective of reducing emissions in the transport sector by more than half by 2050.

Such a large reduction of GHG emissions and air pollutants can only be achieved by re-focusing the concepts of sustainable mobility. Sustainable mobility meets the needs of commuters but at a lower cost and with fewer side effects. Because motorised transport is a significant source of noise and a factor in spatial planning changes, this initiative will significantly contribute to reducing other environmental pressures and health risks, and contribute to a better quality of life, in particular, in towns.

Land transport measures that are promoted as part of a sustainable transport policy will contribute most to reducing the environmental burden of transport. Of key importance are the promotion of walking and cycling in agglomerations, and the promotion and increase of competition in public passenger transport. However, this is not enough. Regardless of obligations to implement these measures, it must be noted that Slovenia's dispersed population means that it will be very hard for public transport to take the place of passenger vehicles in many areas of Slovenia.

To reach the environmental objectives in the field of transport, Slovenia must be ambitious in introducing alternative fuels to the transport sector so that passenger-vehicle mobility will have as low a burden as possible on our environment.

The Strategy for market development for the deployment of an alternative fuels infrastructure in the transport sector of the Republic of Slovenia follows this objective. After 2025, Slovenia will prevent the first registration of passenger vehicles and light commercial vehicles in categories M1, MG1 and N1 where the CO_2 share is, according to the manufacturer declaration, higher than 100 g/km; after 2030 this threshold will be brought down to 'higher than 50 g/km'. These set objectives are already placing electric and hybrid vehicles to the forefront by 2025, and permitting the use of fossil fuel-powered vehicles that meet high standards and have a significantly lower negative environmental impact than the vehicles currently in use.

The Strategy sets Slovenia the target of introducing at least 200 000 electric vehicles by 2030, as well as an appropriate number of other vehicles powered by alternative fuels. This will enable Slovenia to fulfil its own environmental requirements. The proposal is based on a detailed analysis of the situation and potentials in this field, and analyses of possible development scenarios, and based on that work offers sets of more than 50 proposed measures to promote the deployment of infrastructure and the use of vehicles powered by alternative fuels; these are defined separately for every energy product. It is based on information on the use and exchange of vehicles in the last decade in which vehicles were typically used significantly longer than in the most recent decade (when the vehicle fleet became very quickly out of date). The Strategy includes relevant alternative sources of energy which, in addition to electricity, includes liquefied in compressed natural gas and biomethane, biofuels, synthetic and paraffinic fuels and hydrogen. Promoting the use of all these fuels will also help reach the wider

energy objectives, in particular, increasing energy efficiency and energy safety, since it will reduce dependency on importing fossil fuels.

For a more rapid shift to green mobility in the field of personal transport, the automotive industry's contribution will be key, with technical improvements in the field of electric mobility, the use of hydrogen and fuel cells, and innovations and improvements in the use of standard internal combustion engines. Technological advances will allow for the faster development and faster attainment of the set objectives.

The Strategy will significantly enhance TDS guidelines and contribute to the realisation of the sustainable transport policy vision, as it will create favourable conditions and strong incentives for low-emission mobility. Implementing the Strategy will require the Slovenian Government to play an active role, as well as the long-term participation of all other stakeholders. In addition to researchers, manufacturers and providers, local communities will have an important role in realising the Strategy but in the end success will come down to the decisions that consumers make about mobility. Our aim for the Strategy is to put in place conditions that ensure that their choices contribute not only to attaining, but even to exceeding the objectives put forth by the proposal.

4 Overview of current situation in the field of alternative fuels in transport

4.1 Situation on infrastructure and vehicles powered by alternative fuels in Slovenia

4.1.1 Electricity

Electric mobility is undergoing constant development. Battery technology is constantly improving, resulting in the greater availability of electric vehicles, while their prices are gradually falling. Even though vehicle retailers in Slovenia have been offering electric vehicles since the spring of 2015, not many consumers have made that choice yet. Slovenia is lagging behind its projections for electric mobility from the Operative Programme of measures to reduce GHG emissions by 2020 (hereinafter: OP-TGP), according to which there should be between 6000 and 7000 battery powered electric vehicles and plug-in hybrids on our roads by the end of 2016. There are currently between 1150 and 1200 such vehicles with Slovenian registration plates (September 2017). This means that retailers should be supported in significantly increasing sales of these vehicles, to set up a mass market in electric vehicles.

Slovenia is well placed with its recharging infrastructure for electric vehicles, with good relatively coverage of such infrastructure compared to electric vehicle numbers; this is particularly true for the TEN-T Core Network, the core of which enjoys comprehensive coverage. At the end of 2015 there were 26 fast-recharging points on the Slovenian road network for electric vehicles, with CCS recharging technology and Chademo power of 50 kW and AC power of 43 kW. In 2016, 5 fast-recharging stations were installed on the TEN-T Network. In addition to the reliable use of electric vehicles by Slovenian users, the network also allows for the reliable circulation of electric vehicles within the EU. Slovenia had already satisfied this criterion under Directive 2014/94/EU.

Recharging infrastructure for electric vehicles in cities and larger urban agglomerations is not evenly distributed across the whole country. There are many more recharging points in Ljubljana than in other locations. However, the project Green Celtic (Zelena Keltika), a system of electric recharging points, was installed in 2016, allowing electric vehicles to be used across the whole northern Primorska region. Recharging infrastructure will also have to be installed in other areas of Slovenia where there is no connection to this system.

Improved battery technology introduced to the Slovenian electric vehicles market in the second half of 2016, along with subsidies and low recharging costs and maintenance, is offsetting the higher purchase price. Electric vehicles are still by no means a universal choice, but people who use them for travelling to and from work and daily errands are already benefitting. Consumers need to be informed of everything that makes it easier to purchase and use electric vehicles and be convinced to make the change to electric mobility. Electric vehicles are connected with new forms of mobility, such as co-ownership of vehicles, which could contribute to reducing the number of passenger vehicles in the centres of larger towns and the use of vehicles which have a lower share of GHG emissions and pollutants. All this will help Slovenia catch up in this sector.

4.1.2 Hydrogen

Vehicles with hydrogen fuel cells are comparable to electric battery vehicles, and together they will play a key role in decarbonising transport.

The greatest obstacle to a rapid increase in the use of hydrogen in transport is the current poor availability of recharging infrastructure, the number of available vehicles, and their price. In Slovenia, the first public recharging station for hydrogen was installed at the 'Petrol' petrol station in Lesce, in September 2013 (300/350 bar). The recharging point was installed as a ‘demo project’, to develop the experience needed to install more of these facilities and to prepare the relevant laws for the spatial siting of such projects.

Hydrogen could become an increasingly important fuel in the transport sector, so it must be gradually introduced through demonstration projects, in part to satisfy the needs of the TEN-T Network.

In terms of the availability of such vehicles on the market, there is already an increased interest among providers of such technologies. In Europe, Germany is well ahead in terms of planning for the making such vehicles available on the market, as well as in deployment of recharging infrastructure. In accordance with these trends, Slovenian importers and retailers of vehicles must be incentivised to put these vehicles on the Slovenian market.

4.1.3 Gaseous fuels

The use of gaseous fuels in transport has a significant potential to reduce CO_2 emission, in particular, during the transitional period. These are liquefied petroleum gas (LPG) and natural gas in both forms of storage: compressed (CNG) and liquefied (LNG). The advantage of these energy products is the possibility of relatively quickly increasing their share, because the technology is already tested and affordable.

4.1.3.1. Liquefied Petroleum Gas (LPG)

Slovenia is one of the countries with more developed recharging infrastructure for LPG, and it covers the whole road network relatively adequately. LPG is available at 115 locations around Slovenia (as at September 2017), on the motorway network as well as within towns and rural areas. Larger settlements all have LPG recharging points. This alternative fuel makes it possible to realise short- and medium-term targets for reducing the carbon footprint from transport. This will be particularly true for the period over which the development and recharging infrastructure for other alternative fuels is still being deployed and expanded. LPG is much more important, because Slovenia is lagging behind the number of vehicles powered by alternative fuels set out in the OP-TGP projections.

LPG vehicle emissions are around 14 % lower than for petrol vehicles. This means that one thousand new LPG vehicles (or converting the same number of petrol-driven vehicles to LPG-use) would have the same effect as that achieved by 142 electric vehicles. The impact on reducing GHG emissions in transport can be shown by the fact that seven LPG vehicles have the same impact as one electric vehicle.[1]. Users of LPG vehicles can save money on the use of fuel without utilising engine technology which is unaffordable for many. Given the purchasing power of Slovenian consumers, promoting LPG-use while there is a large price differential between electric vehicles and hydrogen vehicles compared to internal combustion engine vehicles, could have a great impact in reaching the objectives of the OP-TGP. The use of LPG vehicles is one of the important alternative options in transport to reach the objectives connected to reducing CO_2 emission and pollutants from transport in the period when electric vehicles, including the deployment of suitable recharging infrastructure for electricity and other alternative fuels, will not be in adequate use.

4.1.3.2. Compressed natural gas (CNG)

In accordance with Directive 2014/94/EU, one of Slovenia's more challenging commitments in deploying infrastructure for alternative fuels, is the deployment of a network of refuelling points for compressed natural gas in urban areas by 31 December 2020. The obligation is that much more challenging because there are relatively few CNG-powered vehicles in Slovenia currently, and consequently, the availability of refuelling points is poor. There are only four refuelling points in Slovenia at the moment, two in Ljubljana, one in Maribor and one in Jesenice. The availability of vehicles powered by alternative fuels by leading providers of vehicles in Slovenia is also relatively poor, which is certainly also the result of the deficient refuelling infrastructure.

By deploying a suitable number of publicly available refuelling points for CNG in densely populated urban and suburban agglomerations and in other densely populated areas, we can expect the use of

[1] Data taken from the Study on additional measures required to increase the share of vehicles powered by alternative fuels in Slovenia.

this alternative fuel to be more common in public passenger transport, by municipal vehicles and for other municipal services. Only the Municipality of Ljubljana currently has a significant number of CNG vehicles. The rolling stock of LPP (the Ljubljana bus company) has 65 CNG-powered vehicles and CNG-powered vehicles are also used by other undertakings within the related holding company.

CO_2 emissions for CNG vehicles are about 20 to 25 % less than for petrol vehicles. With the current poor market offer of CNG vehicles, the difference in price between comparable versions of petrol and CNG vehicles is around 2 000 EUR. It must be noted that CNG is cheaper per unit of energy than other competitive energy products, which allows users to save money.

CNG is an alternative fuel which is particularly suitable for buses and commercial vehicles, which is important in establishing sustainable business models for managing recharging infrastructure. As already established, aside from public passenger transport and individual vehicles for municipal activities and other city services of the City of Ljubljana, there are very few vehicles in Slovenia running on CNG.

The prices of buses and other heavy-duty CNG vehicles are currently around 15 % higher than diesel vehicles. The cost of converting a diesel passenger vehicle to a bi-fuelled system (combination of CNG and diesel fuel) is around 2 500 EUR, and the cost of converting a HGV or bus is around 10 000 EUR.

4.1.3.3. Liquefied natural gas (LNG)

For trucks used for international road transport, LNG is currently the only real alternative to diesel fuel. LNG enables the indicative objectives of the OP-TGP to be realised as well as the objectives related to reducing air pollutant emissions from transport. Currently there is no recharging infrastructure for this type of fuel in Slovenia.

4.1.4 Biofuels

Assessments of the possibility of meeting the indicative objectives of the OP-TGP in Slovenia between 2020 and 2030 has shown that these objectives cannot be realised without the use of biofuels. Biofuels are defined in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140, p. 16) as an alternative fuel in transport and, when produced sustainably, they can contribute to reducing the total emissions of CO_2. At the same time, they are a clean source of energy for all forms of transport.

Slovenia does not have production and processing capacities for fossil fuel or biofuels production and is completely dependent on their import and on current market prices. Because the production price of biofuels is higher than that of conventional fossil fuels — true for all types of biofuels but in particular for biofuels produced from sustainably obtained raw materials or from advanced generation biofuels — realising the objectives of reducing emissions by using biofuels and to increase their use requires the deregulation of fuel prices, the inclusion of actual costs in the fuel price model for the market, or the introduction of adequate price subsidies. Without these measures, realising the objectives is neither possible or feasible.

The Directive defines biofuels that comply with Directive 2009/28/EC as the most important type of alternative fuel today. They can be a clean source of energy for all types of transport. Those produced sustainably contribute significantly to the total reduction of CO_2 emissions.

4.2 Share of current use of different fuels in transport in Slovenia

According to the information from the Register of Vehicles, there were 1 470 000 road vehicles registered in Slovenia in 2016, which is 2 % more than at the end of 2015. Of these, there were 1 425 000 motor vehicles, which is also 2 % more than at the end of 2015. There were 1 097 000 registered personal vehicles (77 % of all registered motor vehicles), which is 2 % more than at the end of 2015.

In 2016, there were almost 121 000 first-time registered road vehicles in Slovenia, which is 11 % higher than in 2015. Among vehicles registered for the first time in Slovenia in 2016, there were almost 90 000 passenger vehicles, 11 % more than in 2015. There were 28 % more first-time registered buses and 22 % more first-time registered trucks; but 5 % fewer first-time registered tractors. [2] Of the 121 000 registered road vehicles, around 87 000 underwent first-time registration in Slovenia in 2016, meaning 72 % of these new vehicles had not first been registered abroad. The share was about the same for first-time registered passenger vehicles (around 65 000).

The number of first-time registered new road vehicles increased slightly in 2016 compared to 2015. First-time registered old and new road vehicles in Slovenia increased by 9 %. The same applied to new passenger vehicles: in 2016 there were 7 % more of these vehicles registered than in 2015. At the end of 2016, 53 % of registered passenger vehicles were powered by petrol, 46 % by diesel fuel, and 1 % by liquefied petroleum gas (LPG).

The number of petrol vehicles, when compared to 2015, was 2 % down, while the number of diesel vehicles was 6 % up. The number of LGP and CNG passenger vehicles, and vehicles with a combination of these fuels, increased by 10 %. The number of hybrid passenger vehicles increased by 40 %, and electric vehicles by 59 %. Three-quarters of registered road vehicles in Slovenia in 2016 were passenger vehicles. One in nine registered passenger vehicles in Slovenia was under 3 years old in 2016 and one in three passenger vehicles was 12 years or older.

Regardless of the relatively common practice of refurbishing vehicles, in 2016 Slovenia still has many vehicles whose engines fall into the environmental classes EURO 0, EURO 1 and EURO 2.

Table 1: Number of vehicles in Slovenia by "EURO" environmental standard

	EURO 0	EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6
Environmental standard	26 690	25 813	151 671	273 095	312 908	220 351	28 198

Currently a fifth of all registered vehicles in Slovenia comply with the EURO 2 standard, in relation to exhaust gas emissions. Almost half (46 %) comply with the EURO 3 standard. These vehicles greatly pollute the air. Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles, provides that producers must ensure CO_2 emissions, which is currently set at 110 g/km must be reduced to 95 g/km by 2021. The development of standards for passenger vehicles is shown in the following table.

Table 2: Development of standards for passenger vehicles

Energy Product	Effective date	**Releases**					
DIESEL		**CO**	**THC**	**NMHC**	**NO_x**	**$HC+NO_x$**	**PM**
Euro 1	July 1992	2.72 (3.16)	-	-	-	0.97 (1.13)	0.14 (0.18)
Euro 2	January 1996	1.0	-	-	-	0.7	0.08
Euro 3	January 2000	0.66	-	-	0.50	0.56	0.05
Euro 4	January 2005	0.50	-	-	0.25	0.30	0.025
EURO 5a	September 2009	0.50	-	-	0.180	0.230	0.005
EURO 5b	September	0.50	-	-	0.180	0.230	0.005

[2] SORS

	2011						
Euro 6	September 2014	0.50	-	-	0.080	0.170	0.005
PETROL							
Euro 1	July 1992	2.72 (3.16)	-	-	-	0.97 (1.13)	-
Euro 2	January 1996	2.2	-	-	-	0.5	-
Euro 3	January 2000	2.3	0.20	-	0.15	-	-
Euro 4	January 2005	1.0	0.10	-	0.08	-	-
Euro 5	September 2009	1.0	0.10	0.068	0.060	-	0.005**
Euro 6	September 2014	1.0	0.10	0.068	0.060	-	0.005**

* Before the introduction of the Euro 5 standard, passenger vehicles with a mass of 2 500 kg or over were type-approved as light commercial vehicles N1, ** Only vehicles with direct fuel injection are used.

Information on the number of vehicles by fuel type shows there are 53 % petrol vehicles 46 % diesel vehicles. Vehicles powered by alternative fuels currently represent only a small share. This data leads to the conclusion that in Slovenia there were around 7 900 vehicles with petrol engines vehicles that were modified for use with LPG, representing a share of around 0.7 %. The number and share of such vehicles is higher, as not all conversions have been reported.

Table 3: Review of vehicles in terms of the type of fuel used (2015)

	Category	Energy Product	Number of vehicles
Passenger vehicle	M1	Petrol	578 747
Passenger vehicle	M1	Diesel	421 131
Passenger vehicle	M1	LPG/Petrol	7 885
Passenger vehicle	M1	LPG/Diesel	9
Passenger vehicle	M1	CNG/Petrol	122
Passenger vehicle	M1	electricity	279
Passenger vehicle	M1	Petrol/Ethanol	15
Passenger vehicle	M1	Diesel/Biodiesel	77
Passenger vehicle	M1	A mixture of	49
Passenger vehicle	M1	Hydrogen	6
Passenger vehicle	M1G	Petrol	9 801
Passenger vehicle	M1G	Diesel	20 108
Passenger vehicle	M1G	LPG/Petrol	482
Passenger vehicle	M1G	LPG/Diesel	4
Passenger vehicle	M1G	CNG/Petrol	2
Passenger vehicle	M1G	Diesel/Biodiesel	6
Passenger vehicle	M1G	A mixture of	3

Since 2013 the sale of diesel vehicles in Slovenia has been in slow decline, falling by 5.4 %. The reduction in their share has been replaced by increased sales of petrol vehicles (up by 5.1 %). Vehicles powered by alternative fuels or power systems only represent a small share of all vehicles.

4.3 Number of vehicles powered by alternative fuels

Table 4: Number of vehicles powered by alternative fuels

Vehicles powered by alternative fuels in Slovenia	Number of vehicles 31.12.2016
Electric vehicles	449
Plug-in hybrids	111
Electric light commercial vehicles	62
Electric heavy-duty vehicles	-
Electric buses	2
Electric motorcycles	190
Electric light and heavy four-wheeled vehicles	128
CNG: passenger vehicles	122
CNG: light commercial vehicles	73
CNG: heavy-duty vehicles	8
CNG: Buses	69
LNG: light commercial vehicles	-
LNG: heavy-duty vehicles	-
LNG: Buses	-
Hydrogen: passenger vehicles	6**
Hydrogen: light commercial vehicles	-
Hydrogen: heavy-duty vehicles	-
Hydrogen: Buses	-
LPG: passenger vehicles	8 380
LPG: light commercial vehicles	373
LPG: heavy-duty vehicles	9
LPG: Buses	-
Biofuels: passenger vehicles	83
Biofuels: light commercial vehicles	56
Biofuels: heavy-duty vehicles	2
Biofuels: Buses	1

* Vehicles with a standard internal combustion engine modified for use with hydrogen.

4.4 Existing infrastructure for alternative fuels

4.4.1 Electricity

There were 228 recharging points for electric vehicles, with a total of 553 connections in Slovenia at the end of 2016. The share of public recharging points is 60 %. Most private recharging points are also publicly accessible. Recharging points for electric vehicles include 97 recharging points with the standard power of up to 3 kW. There were 92 recharging points in Slovenia with power between 7 and 22 kW by 31 December 2016, which is 40 % of all recharging points. There were 39 high-power recharging points (greater than 43 kW), representing 17 %. Currently, the relationship between the number of recharging points and electric vehicles is around 1 to 3; there are as many passenger electric vehicles as there are connecting points for electric vehicles.

Table 5: Current number of recharging points for electric vehicles

ELECTRICITY	Recharging points:
	2016
Recharging points ≤ 3.7 kW	97
Recharging points ≤ 7.5–22 kW	92
Recharging points ≥ 43 kW	39

The average share of public recharging points is 60 %. Most private recharging points are low power points (≤ 3.7 kW).

4.4.2 Hydrogen

The only recharging point for hydrogen in Slovenia is in Lesce. It operates with a recharging power of 350 bar, which is suitable for refuelling buses. To reach full capacity for recharging passenger vehicles, the refuelling point should operate at 700 bar.

Table 6: Number of recharging points for hydrogen

HYDROGEN	Refuelling points for hydrogen	
	2016 (350 bar)	2016 (700 bar)
Number of refuelling points	1	-

4.4.3 LPG

The refuelling infrastructure for LPG is relatively equally distributed in Slovenia. It allows vehicles powered by this alternative fuel to be used across all of Slovenia. They are mostly found at petrol stations.

Table 7: Number of LPG refuelling points

LPG	LPG refuelling points
Number of refuelling points	115

At the end of 2016, there were four refuelling points for compressed natural gas at three locations in Slovenia. Refuelling points operate in Jesenice, Ljubljana (2 refuelling points) and Maribor. The two refuelling points in Ljubljana are primarily intended for CNG public passenger transport.

Table 8: Number of CNG refuelling points

Natural gas	Number of CNG refuelling points
	2016
CNG refuelling points:	4

4.4.4 LNG

Slovenia currently has no operating LNG refuelling point. There is consequently also no demand for this fuel, since there are no vehicles powered by this fuel.

4.4.5 Biofuels

In Slovenia there are currently no public refuelling points for the supply of pure or majority-share biofuel such as B100 (100 % biodiesel) or E85. Small quantities of pure biodiesel are on sale through wholesale chains and most of the biofuel currently on the market is a mixture of fossil fuels, mixed in quantities permitted by current standards for diesel and petrol. Gaseous biofuel can be mixed into gaseous fuel of fossil origin and supplied to consumers via existing infrastructure.

5 Objectives for the development of alternative fuels in transport in Slovenia

5.1 Baselines for setting objectives

Defining the objectives for the development of alternative fuels in transport in Slovenia, took into account objectives that were compliant with commitments Slovenia has undertaken arising from Directive 2014/94/EU, OP-TGP until 2020 and 2030, and air pollutant targets. The Transport Development Strategy (TDS) and the latest European strategy on low-emission mobility have also been taken into account.

The scenario for meeting the indicative objectives of the OP-TGP was selected by coordinating three initial scenarios:

- zero (what happens if we do not take action in this field);
- basic (what can realistically be achieved in this area in Slovenia); and
- intensive (what we would need to do to achieve the objectives in the field of TGP according to the EC proposal on the Slovenian Energy Concept).

The scenario selected was a supplemented basic scenario, which was defined as the **optimal scenario** and enabled the realisation of the indicative objectives from the OP-TGP and reductions in the emissions of air pollutants, on the basis of current developments in this area and potential realisation, taking into account real opportunities of economic entities in this area and expected market development. The optimal scenario foresees the use of all alternative fuels to reduce emissions, in accordance with the indicative objectives in the OP-TGP.

Table 9: OP-TGP objectives

	Indicative objectives on reducing GHG compared to 2005	
	In 2020:	In 2030:
Transport	+ 27 %	+18 %

	Pollutant reduction commitments compared to 2005				
	SO_2	NOx	NMVOC	NH_3	$PM_{2.5}$
For any year from 2020 to 2029	63 %	39 %	23 %	1 %	25 %
For any year from 2030	92 %	65 %	53 %	15 %	60 %

5.2 Model used

The plan on the possible development for alternative fuel use in transport was evaluated using the MESAP REES-SLO 2 model to assess environmental impact of GHG emissions and air pollutants. The model was applied consistently to different strategic analyses in Slovenia, and for preparing the basis for the OP-TGP. The model was also used to prepare long-term energy balance sheets and as the basis for the action plans on energy efficiency and renewable sources of energy. The plan and the proposal for the development of infrastructure for alternative fuels and the increase in the share of low- or zero-carbon vehicles complies with these strategic documents.

The model has three modules: the **first** module simulates events in the vehicle fleet. A separate model is made for every type of vehicle, where the vehicle fleet structure changes according to the

breakdown of vehicles undergoing first registration. The number of first-time registered vehicles is determined for each year as the difference between the total number of vehicles by type (the exogenous variable) and the number of vehicles remaining after applying the vehicle lifespan curve. The first registration of vehicles includes new vehicles as well as imported used vehicles. For this reason, the distribution of vehicles at the time of their first registration is defined by the curve distributing the share of vehicles by age.

The **second** module simulates the need for different types of transport to address passenger transport and goods transport needs. The traffic volume of passengers and goods are exogenous variables, while coverage of different types of transport need is forecast by the model, the results of which are 'total driven kilometres' by vehicle type. The **third** module is based on the structure of vehicle used which are the results of the first module which is used to calculate fuel used for performing transport needs in terms of kilometres driven. This last module will also increase the share of biofuels and the impact of purchasing fuel for foreign vehicles in Slovenia. The model covers years for which statistical data is available calibrated against the energy balance sheet for the transport sector, produced by the Statistical Office of the Republic of Slovenia. The energy balance sheet for the transport sector is based on quantities of fuel sold in Slovenia. This means the traffic volume model includes foreign vehicles, which can then be taken into account in Slovenian fuel sales.

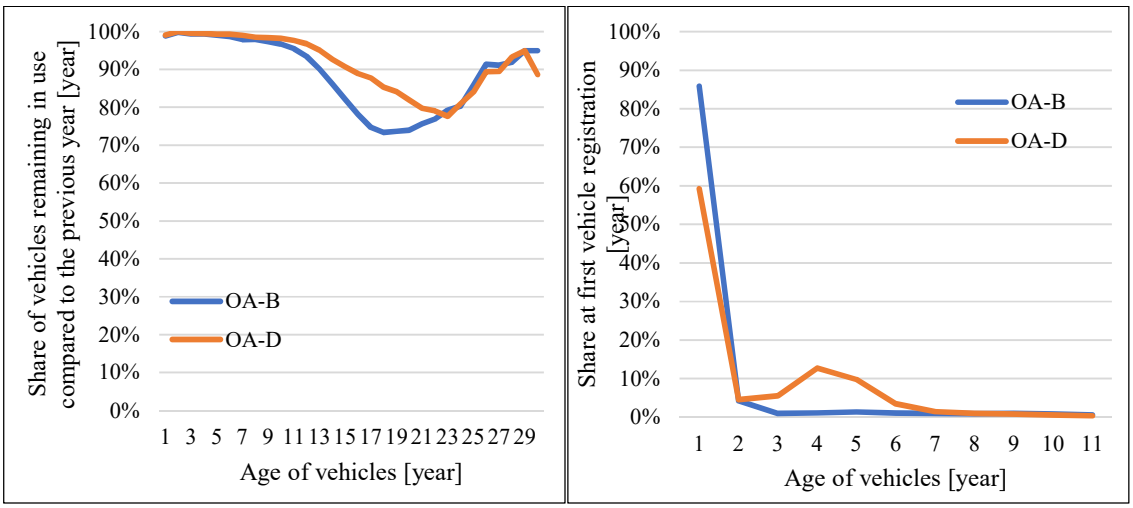

Figure 1: Vehicle share by age at first registration for passenger vehicles (PV/OA) powered by petrol (P/B) and diesel (D) – right; example of the vehicle lifespan curve for passenger vehicles powered by petrol and diesel – right

For calculating and creating the scenario, a currently valid methodology was applied, which is based on the sold quantity of fuel in Slovenia. This methodology is used to calculate the balance sheet on past use of energy and emissions and for projecting further development. The methodology is used to compare the results of the analysis with objectives set out in the OP-TGP, as was applied when producing the Operative Programme. The GHG emissions objectives were used across EU Member States, according to the same methodology to 2030. After that year, changes to the methodology within the EU is planned.

5.3 Entry information – traffic volume

Being situated at a junction of major transport corridors, Slovenia is heavily exposed to transit traffic, which has a significant impact on the Slovenian transport situation. For this reason, the model features separate forecasts for domestic traffic volume, resulting from domestic transport needs, and transit traffic volume, resulting from satisfying transport needs outside Slovenia. The purchase of fuel by foreign vehicles is specified in the next step, in terms of driven kilometres by foreign vehicles with fuel

purchased in Slovenia. This approach enable both an actual capture of the actual situation, and quality analysis of the effects of the development scenario in this area in the future. Nevertheless, transit transport projections are highly uncertain, due to the lack of data.

The same assumptions used for calculating projections with additional measures for the 2014 OP-TGP have been used for the traffic volume analysis. When creating the scenario, four study results were used: The long-term transport forecast and the verification of development scenarios at the Slovenian level, and the justifiability study for a new train connection between Divača-Ljubljana and Ljubljana-Zidani Most, which was prepared by the company PNZ for the Slovenian Roads Directorate and the Ministry of Infrastructure and Spatial Planning. The study contains a plan for the development of road and railway transport to 2030.

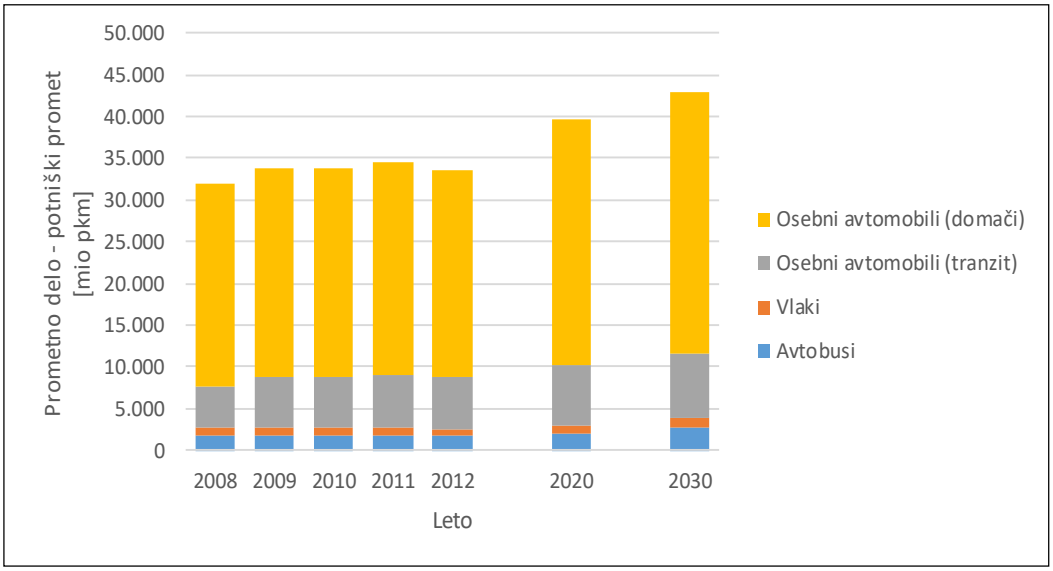

Figure 2: Development of traffic volume in passenger transport from 2008–2012, and projections for 2020 and 2030 [domestic cars / transit cars / trains / buses]

On the basis of all documents and information, projections indicate that passenger transport by domestic vehicles will, compared to 2012, increase 18 % by 2020 and 30 % by 2030. Passenger transport by foreign vehicles will increase comparably, 19 % by 2020 and 27 % by 2030. The structure of passenger transport will undergo minimal changes. The share of passenger kilometres by bus will be the same in 2020 as in 2012 (7 %), and increase to 8 % by 2030. Traffic volume by train will amount to 3 % by 2020, which is the same as in 2012, but increase 1 percentage point by 2030.

Greater growth is forecasted for the transport of goods. The transport of goods by domestic vehicles, compared to 2012, will increase 12 % by 2020 and 56 % by 2030. Transport of goods by foreign vehicles, compared to 2012, will increase 27 % by 2020 and 51 % by 2030. Domestically, the share of traffic volume by HGVs was 56 % in 2012. This will decrease to 55 % by 2020 and to 50 % by 2030. The decrease will be achieved by increasing the share of rail traffic, which will carry 33 % of volume by 2030, which is 9 percentage points more than in 2012. The share for light commercial vehicles will decrease from 20 % in 2012 to 17 % in 2030. Within the transport of goods by foreign vehicles the majority, e.g. 98 %, of traffic volume was by goods vehicles. This share will decrease to 94 % by 2030. The remaining share of traffic volume was by rail. The share of traffic volume by foreign HGVs is significantly higher than the traffic volume of domestic goods vehicles, since foreign goods vehicles are mostly semi-trailers, while the structure of domestic goods vehicles is more varied.

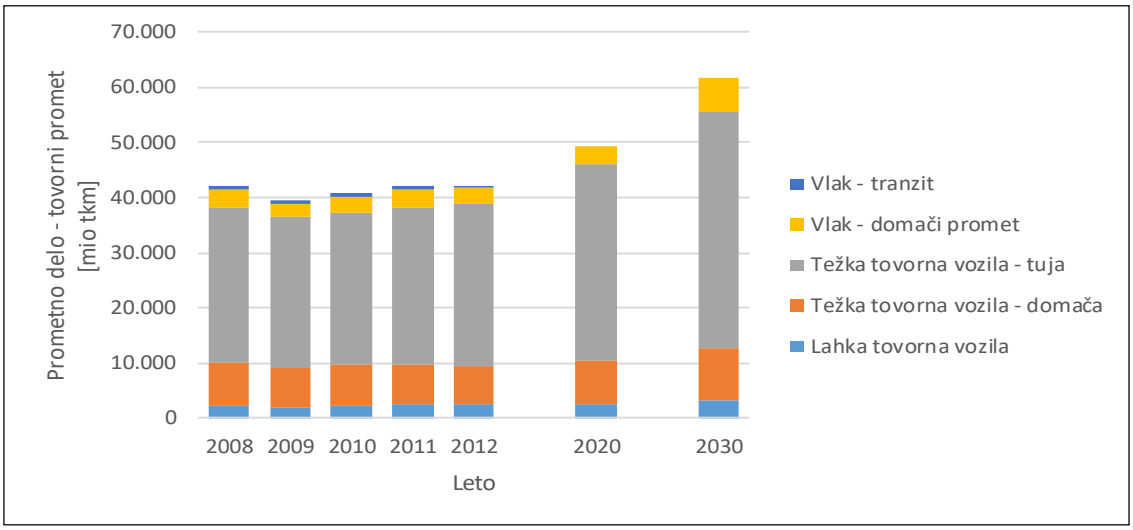

Figure 3: Development of traffic volume by goods traffic from 2008–2012 and projections for 2020 and 2030 [train – transit / train – domestic / HGV, foreign / HGV, domestic / LCV]

5.4 Vehicle structure required to realise objectives

To realise the objectives related to the process of decarbonising transport in Slovenia and meet the indicative objectives of the OP-TGP and the commitments accepted by Slovenia under international treaties and EU laws, the vehicle structure or mix in Slovenia will need to change in coming years. The share of passenger and commercial vehicles and buses powered by alternative fuel will have to increase. This will realise the vision of an increasingly higher share of passenger kilometres and traffic volume by commercial vehicles being carried out by alternative fuel vehicles. These will need and increasingly make use of a recharging infrastructure for alternative fuel, which Slovenia will have to deploy in accordance with the Directive. A sufficient number of alternative fuel vehicles will be possible by setting up a sustainable operating model for managing the infrastructure. With sound business models, users of alternative fuel vehicles will have user experiences comparable to that of standard petrol and diesel vehicles, which will lead to the general adoption of measures that will usher in the gradual decarbonisation of transport. All these factors form a "virtuous circle", which must be moved into the desirable and forecast direction through a decisive increase in the number of alternative fuel vehicles.

5.4.1 Passenger cars

The Strategy proposal's optimal scenario forecasts an increase in the share of personal vehicles powered by alternative fuel or alternative power on the total Slovenian car fleet of 20 % by 2030. This can only be realised by intensive work to introduce the measures proposed. According to the optimal scenario one in two newly registered vehicles in Slovenia will be electric by 2030 (33 % BEV and 17 PHEV). Realising these objectives would meet Slovenia's commitments on transport. If Slovenia wants to be a leading country in the field of green mobility, then it would have to enact the intensive scenario. The intensive scenario requires a higher share of passenger vehicles powered by alternative fuels and zero-carbon vehicles by 2030: 37 %, of which 81% of first-time registered vehicles on alternative fuels: 79 % being electric vehicles and 2 % hydrogen vehicles.

Table 10: Passenger vehicle structure for first-time registered vehicles in Slovenia in 2015, and for 2020 and 2030 (P - petrol, D - diesel, LPG - liquefied petroleum gas, CNG - compressed natural gas, Hi - hybrid, PHEV - plug-in hybrid, BEV - battery electric vehicles, H2 - hydrogen)

		Optimal	
	2015	2020	2030
PV-P	34 %	33 %	18 %
PV-D	62 %	49 %	22 %
PV-LPG	1 %	10 %	1 %
PV-CNG	0 %	1 %	1 %
PV-Hi1	4 %	2 %	5 %
PV-PHEV	0 %	3 %	17 %
PV-BEV	0 %	3 %	33 %
PV-H2	0 %	0 %	2 %

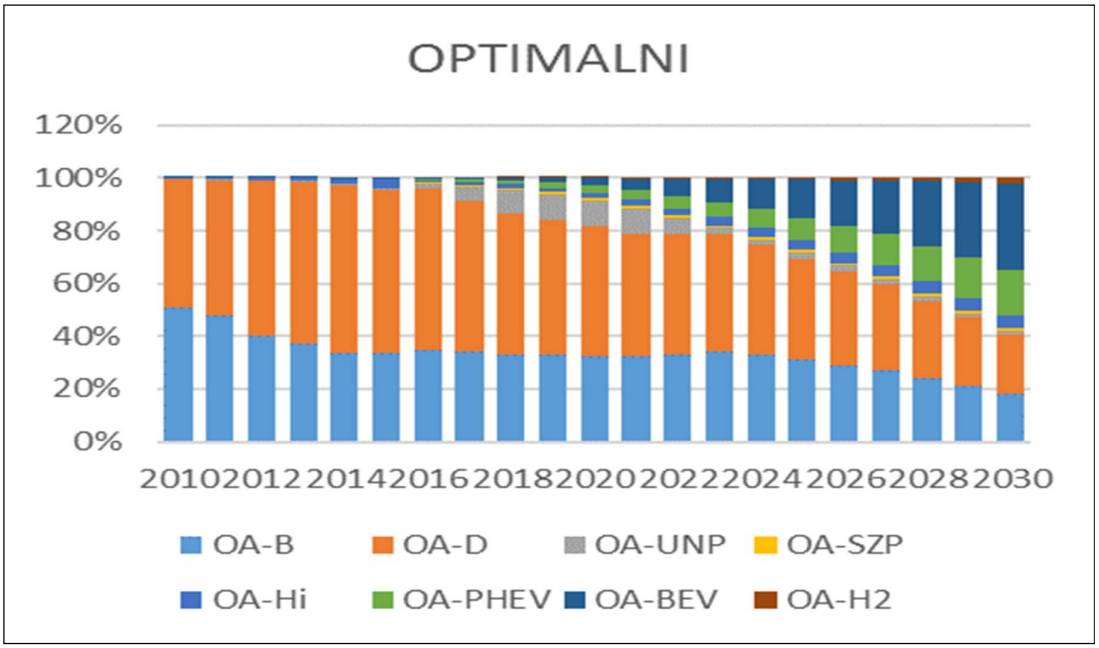

Figure 4: Changing share of passenger vehicles (OA) by fuel type on first registration from 2010–2030 in the optimal scenario [OA = PV; UNP=LPG, SZP=CNP]

Table 11: Cumulative number of first-time registered passenger vehicles by fuel type in five-year periods from 2016–2030

		Optimal	
	2016–2020	2021–2025	2026–2030
PV-P	134 450	124 449	86 608
PV-D	218 456	165 440	105 854
PV-LPG	28 542	16 637	6 068
PV-CNG	2 563	3 754	4 006
PV-Hi	5 560	12 153	16 627
PV-PHEV	6 047	21 280	48 414
PV-BEV	4 998	35 638	89 374
PV-H2	77	947	4 687
	400 692	380 299	361 638

Table 12: Total number of passenger vehicles in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
Year	2015	2020	2025	2030
PV-P	622 126	483 841	421 738	361 257
PV-D	501 305	613 445	622 775	550 622
PV-LPG	8 782	32 789	38 932	31 374
PV-CNG	157	2 558	5 498	7 688
OA-Hi	5 352	10 426	20 981	33 307
PV-PHEV	70	6 033	26 591	71 664
PV-BEV	383	5 311	40 096	129 690
PV-H2	0	77	1 008	5 559
	1 138 175	1 154 479	1 177 619	1 191 161

Table 13: Total number of passenger vehicles in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
PV-P	55.71 %	41.91%	35.81%	30.33 %
PV-D	44.04 %	53.14%	52.88%	46.23 %
PV-LPG	0.77 %	2.84%	3.31%	2.63 %
PV-CNG	0.01 %	0.22%	0.47%	0.66 %
PV-Hi1	0.47 %	0.90%	1.78%	2.80 %
PV-PHEV	0.01 %	0.52%	2.26%	6.02 %
PV-BEV	0.03 %	0.46%	3.40%	10.89 %
PV-H2	0 %	0.01%	0.09%	0.47 %

5.4.2 Light commercial vehicles

The way in which the scenario is implemented for light commercial vehicles, i.e. how targets set out in the OP-TGP and other strategic documents will be met, is similar to plans for passenger vehicles. The differences are found in the forecasted share of electric vehicles.

Table 14: Light commercial vehicle structure for first-time registered vehicles in Slovenia in 2015 and for 2020 and 2030 (P - petrol, D - diesel, LPG - liquefied petroleum gas, CNG - compressed natural gas, Hi1 - hybrid, PHEV - plug-in hybrid, BEV - battery electric vehicles, H2 - hydrogen)

		Optimal	
	2015	2020	2030
LCV-P	2 %	2 %	1 %
LCV-D	97 %	94 %	56 %
LCV-LPG	0 %	0 %	0 %
LCV-CNG	0 %	0 %	1 %
LCV-BEV	0 %	3 %	40 %
LCV-H2	0 %	0 %	2 %

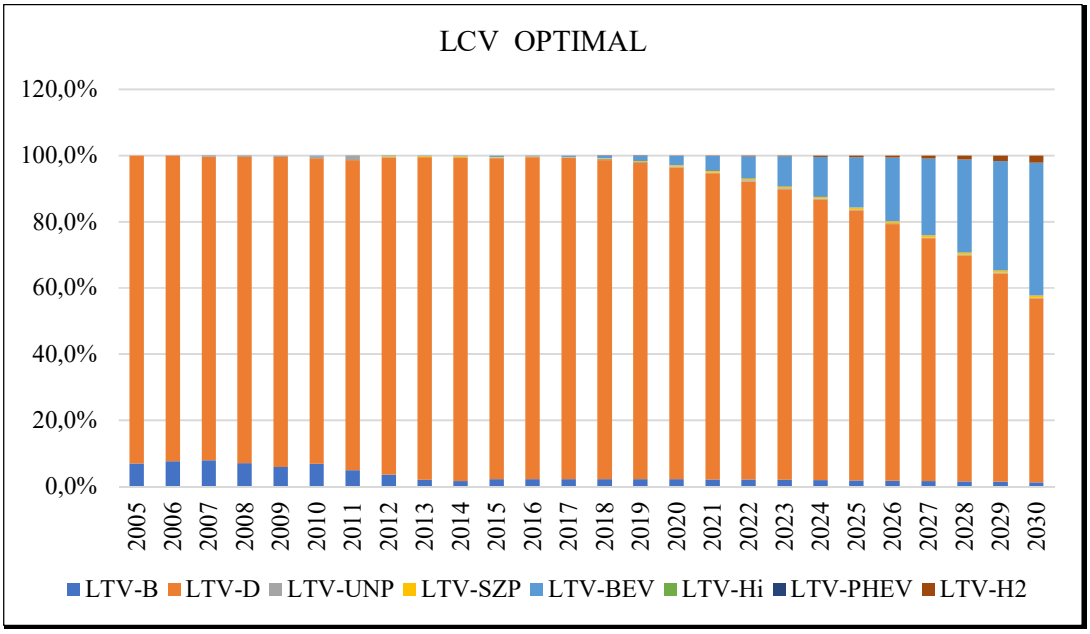

Figure 5: Changing share of light commercial vehicles by fuel type on first registration from 2010–2030 in the optimal scenario [LTV = LCV; UNP=LPG, SZP=CNP]

Table 15: Cumulative number of first-time registered light commercial vehicles by fuel type in five-year periods from 2016–2030

	Optimal		
	2016–2020	2021–2025	2026–2030
LCV-P	727	635	567
LCV-D	31 303	27 358	24 400
LCV-LPG	96	93	112
LCV-CNG	64	169	248
LCV-E	379	3 009	11 793
LCV-H2	7	79	577
	32 576	31 343	37 697

Table 16: Total number of light commercial vehicles in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
LCV-P	4 326	2 694	1 860	1 428
LCV-D	67 332	77 499	80 386	75 519
LCV-LPG	348	300	251	224
LCV-CNG	54	102	232	355
LCV-E	40	398	3 189	11 020
LCV-H2	0	7	81	455
	72 100	81 000	86 000	89 000

Table 17: Total number of light commercial vehicles in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
LCV-P	6.00 %	3.33%	2.16%	1.60 %
LCV-D	93.39 %	95.68%	93.47%	84.85 %
LCV-LPG	0.48 %	0.37%	0.29%	0.25 %
LCV-CNG	0.07 %	0.13%	0.27%	0.40 %
LCV-E	0.06 %	0.49%	3.71%	12.38 %
LCV-H2	0.00 %	0.01%	0.09%	0.51 %

5.4.3 Buses and coaches

For buses, compressed natural gas (CNG) is the key to meeting targets. This is in line with the obligation under the Directive requiring Slovenia to deploy recharging infrastructure for CNG in urban areas by 31 December 2020. The Strategy proposal plans for recharging infrastructure to be deployed in all urban municipalities and in the Zasavje region, as buses powered by CNG offer a real solution for reducing air pollution from traffic. The planned changes to the composition of the public transport bus fleet entail introducing vehicles that will meet the OP-TGP objectives by establishing sustainable business models for managing infrastructure and the sale of CNG for use in transport based on the infrastructure that will be deployed in line with obligations under the Directive. Meeting environmental targets will go hand in hand with providing a healthier living environment.

Table 18: Structure for first-time registered vehicles in Slovenia in 2015 and for the years 2020 and 2030 (P - petrol, D - diesel, LPG - liquefied petroleum gas, CNG - compressed natural gas, Hi - hybrid, PHEV - plug-in hybrid, BEV - battery electric vehicles, H2 - hydrogen)

		Optimal	
	2015	2020	2030
BUS-P	0 %	0 %	0 %
BUS-D	98 %	76 %	18 %
BUS-LPG	0 %	0 %	0 %
BUS-CNG	2 %	23 %	62 %
BUS-E	0 %	2 %	17 %
BUS-H2	0 %	1 %	4 %

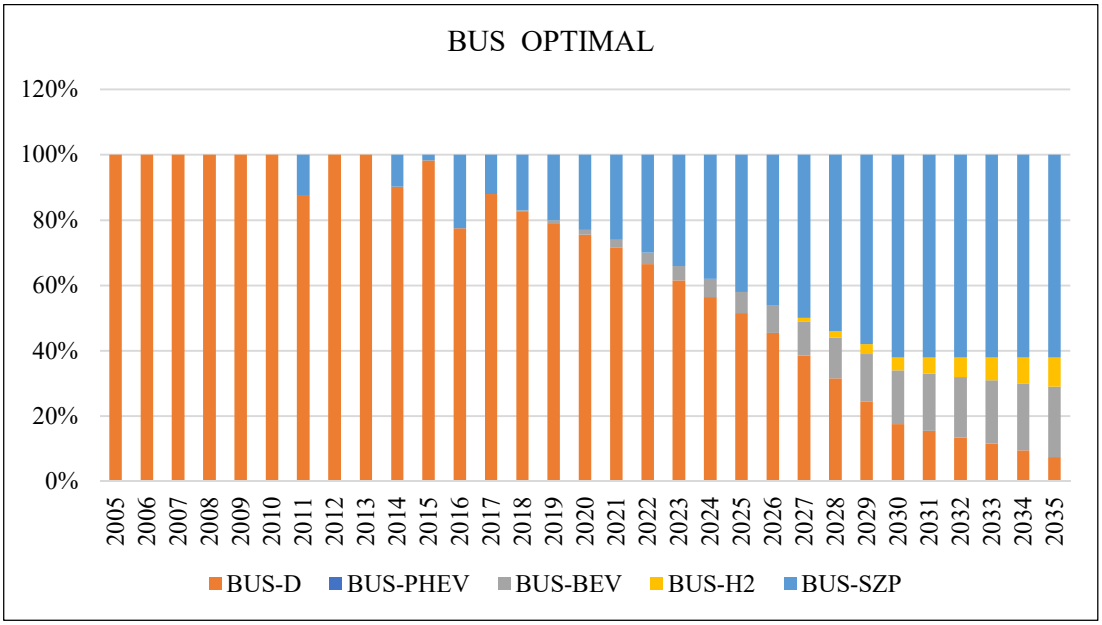

Figure 6: Changing share of buses by fuel type on first registration from 2010–2030 in the optimal scenario [SZP=CNP]

Table 19: Cumulative number of first-time registered buses by fuel type in five-year periods from 2016–2030

	Optimal		
	2016–2020	2021–2025	2026–2030
BUS-P	0	0	0
BUS-D	1 059	826	475
BUS-LPG	0	0	0
BUS-CNG	248	460	926
BUS-E	8	61	224
BUS-H2	2	12	43
	1 317	1 359	1 667

Table 20: Total number of buses in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
BUS-P	0	0	0	0
BUS-D	2 589	2 624	2 505	2 004
BUS-LPG	0	0	0	0
BUS-CNG	51	268	631	1 154
BUS-E	0	8	64	215
BUS-H2	0	2	14	57
	2 640	2 902	3 214	3 457

Table 21: Total number of buses in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
BUS-P	0.00 %	0.00%	0.00%	0.00 %
BUS-D	98.07 %	90.49%	78.27%	58.94 %
BUS-LPG	0.00 %	0.00%	0.00%	0.00 %
BUS-CNG	1.93 %	9.25%	19.72%	33.94 %
BUS-E	0.00 %	0.26%	2.01%	6.32 %
BUS-H2	0.00 %	0.00%	0.00%	0.82 %

5.4.4 Heavy goods vehicles

Heavy goods vehicles (HGVs) are the most challenging group in terms of the use of alternative energy products. The range of HGVs powered by alternative fuels currently available on the market is very poor. There is a more diverse range of smaller commercial vehicles available on the market, including electric and other alternative fuel systems. For international transport, liquefied natural gas (LNG) has been recognised as the most promising solution, and the share of LNG heavy-duty vehicles is forecast to increase. Further potential for reducing GHG emissions is offered by bi-fuel systems, in which engines use gas together with diesel fuel. Bi-fuel systems also allow for the use of LPG, CNG and LNG, with the gas replacing diesel fuel by up to 30 % in these systems. Fuel properties means that a greater impact on reducing GHG emissions is achieved through CNG and LNG. Introducing LNG is also economically sound, which is a fundamental factor in development and decision-making in goods transport. Bi-fuel systems can be introduced by modifying the engines of existing, diesel-only trucks to enable the use of alternative fuels even by the vehicles that comprise the current fleet and those involved in international transit through Slovenia.

Table 22: HGV structure for first-time registered vehicles in Slovenia in 2015 and for 2020 and 2030 (P - petrol, D - diesel, LPG - liquefied petroleum gas, CNG - compressed natural gas, Hi - hybrid, PHEV - plug-in hybrid, BEV - battery electric vehicles, H2 - hydrogen)

		Optimal	
	2015	2020	2030
HGV-P	0 %	0 %	0 %
HGV-D	100 %	94 %	44 %
HGV-LPG	0 %	0 %	0 %
HGV-LNG	0 %	3 %	21 %
HGV-BEV	0 %	0 %	2 %
HGV-BHi	0 %	0 %	1 %
TTV-H2	0 %	0 %	6 %
HGV-D-ZP/LPG	0 %	4 %	26 %

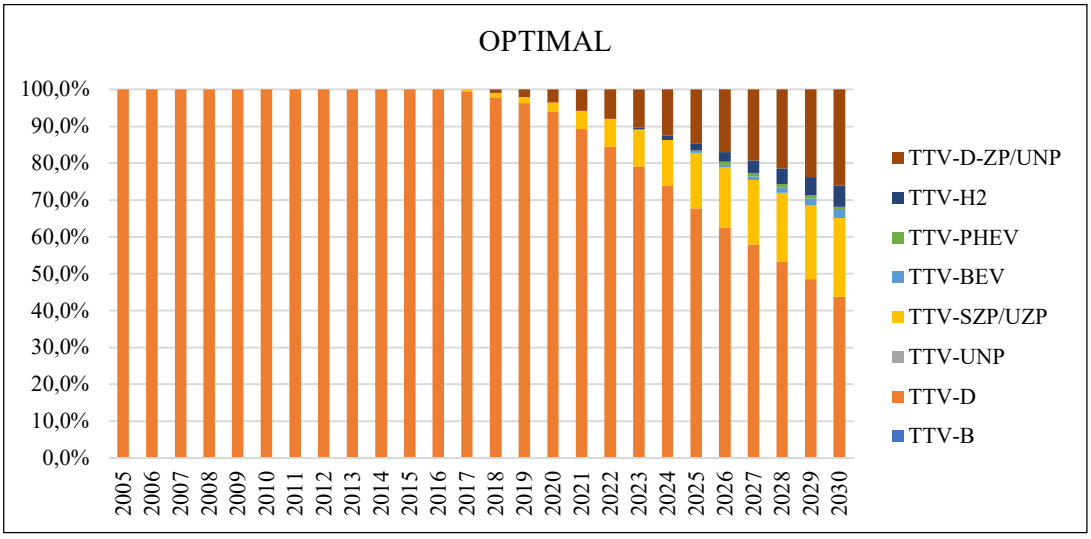

Figure 7: Changing share of HGVs by fuel type on first registration from 2010–2030 in the optimal scenario [TTV = HGV; Zp=gas, UNP=LPG, SZP=CNP, UZP=LNG]

Table 23: Cumulative number of first-time registered HGVs by fuel type from 2016–2030

	Optimal		
	2016–2020	2021–2025	2026–2030
HGV-P	4	4	3
HGV-D	15 148	15 094	11 163
HGV-LPG	0	0	0
HGV-LNG	183	1 936	4 206
HGV-BEV	0	14	356
HGV-BHi	0	18	196
TTV-H2	0	141	992
HGV-D-ZP/LPG	202	1 982	4 872
	15 537	19 189	21 788

Table 24: Total number of HGVs in 2015, 2020, 2025 and 2030 by fuel type

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
HGV-P	34	22	14	10
HGV-D	29 589	30 742	31 204	26 611
HGV-LPG	18	10	5	3
HGV-LNG	8	179	1 906	4 337
HGV- BEV	0	0	14	258
HGV- PHEV	0	0	18	160
TTV-H2	0	0	137	800
HGV-D-ZP/LPG	0	196	1 957	4 839
	29 649	31 149	35 255	37 018

Table 25: Share of HGVs by fuel type in the total number of vehicles in 2020, 2025 and 2030

		Optimal	Optimal	Optimal
	2015	2020	2025	2030
HGV-P	0.11 %	0.07%	0.04%	0.03 %
HGV-D	99.80 %	98.69%	88.51%	71.89 %
HGV-LPG	0.06 %	0.03%	0.02%	0.01 %
HGV-LNG	0.03 %	0.58%	5.41%	11.72 %
HGV-BEV	0.00 %	0.00%	0.04%	0.70 %
HGV-BHi	0.00 %	0.00%	0.05%	0.43 %
TTV-H2	0.00 %	0.00%	0.39%	2.16 %
HGV-D-ZP/LPG	0.00 %	0.63%	5.55%	13.07 %

5.4.5 Use of biofuels

Planning the optimal scenario and how to meet targets and objectives indicated that they can only be met by using a significant share of all the alternative fuels set out in the Directive. The introduction of zero-carbon vehicles on the Slovenian market is behind schedule for many reasons, and this delay will have to be compensated for by using low-carbon fuels for the existing fleet where possible. This includes a range of different uses of biofuel. To realise the planned objectives, the optimal scenario plans for a 7 % mixing of biodiesel with fossil-based diesel and the gradual increase of the share of HGVs that use clean biodiesel (B 100) from 0 to 10 % from 2020 to 2030. Vehicles will need to be modified for such use. Solutions already exist and are available on the market, and the number of such vehicles is expected to increase proportionately.

It must be noted that the proposal for the new directive on renewable sources of energy (RED II) of 2016 has taken a different position on biofuels than that found in the Directive now applicable. The current Directive targets a 10 % share of renewable energy sources (RES) in transport by 2020, 7 % being first generation biofuel. Reaching this target is the responsibility of Member States. The RED II target is a 6.8 % share of RES in transport by 2030, without taking into consideration first generation biofuel for that figure. Only biofuel not produced from products primarily intended for food are taken into account, i.e. renewable liquid and gaseous fuel of non-biological origin, fossil fuel based on waste, and electricity produced from renewable sources. RED II transfers the obligation to realise this target to fuel distributors. Biofuels based on products used for food can be accounted for in realising the overall RES target (27 % at the EU level), but are not taken into account in realising RES in transport. Aside from that, their contribution in the total share of RES is limited. By 2021 the use of biofuel in road and rail transport was to be at 7 % and by 2030 the share was to be less than 3.8 %. Despite this, a State can have a higher share of biofuel if it is used to meet targets for GHG emission reduction.

According to projections looking at minimum shares of biofuels to meet the RED II objectives, GHG emissions from transport will be 21 % higher in 2030 than in 2005 (3 percentage points higher than the objective). For this reason, because transport represents a large share in the use of final energy, which is constantly increasing, for GES to hold a 25 % share in the use of final energy, it is necessary to include more biofuels (including first generation), in accordance with the minimum commitment under RED II criteria.

A small share of biofuel use by 2030 in the optimal scenario would necessitate significantly increasing the share of zero-carbon passenger vehicles: i.e. electric and hydrogen vehicles. The scenario plans for every other newly registered vehicles to be electric in Slovenia by 2030 (BEV and PHEV). The remaining vehicles will use other alternative fuels in commensurate share. According to current sales, this is very optimistic. Vehicle manufactures are not forecasting a significant breakthrough in the use of hydrogen vehicles, its availability, or aggressive marketing before the end 2025. This is particularly true for leading vehicle providers on the Slovenian market.

The idea of mandatory use of biofuels and the intensive use of all alternative fuels already available in Slovenia, including LPG, comes from the fact that OP-TGP projections past years (which were used to set indicative objectives on the introduction of alternative fuels vehicles) proved to be ambitious, since the targets set for the number of vehicles powered by alternative fuels were not realised.

5.5 Evaluation of scenarios in terms of emission of air pollutants

Transport contributes significantly to NO_x and PM 2.5 emissions. As a result, an analysis was made addressing reductions in emissions of these two pollutants by 2020 and 2030, with 2005 as the base emissions year. The realised reduction of emissions was compared with the reduction of emissions calculated for the purposes of the negotiation processes when adopting the new directive on reducing national emissions of certain pollutants (hereinafter: Directive NEC) in 2016 (Directive 2016/2284/EU). According to these projections, NO_x in transport is to be reduced 23 % by 2030 and 68 % by 2030, while PM 2.5 emissions are to be reduced 42 % by 2020 and 62 % by 2030. Aside from introducing alternative fuels to reduce emissions of air pollutants, an important effect is to also have technical measures on cleaning exhaust gases of internal combustion engine vehicles and, for this reason, these emissions are being reduced to a greater extent than GHG emissions. The assessment of air pollutant emissions, by taking into account the development of fleet under the optimal scenario, has shown that we will not fully realise the objective of reducing NO_x and PM 2.5 emissions, but the discrepancy from the targeted values will be low, while the objective with regard to PM 2.5 will be realised.

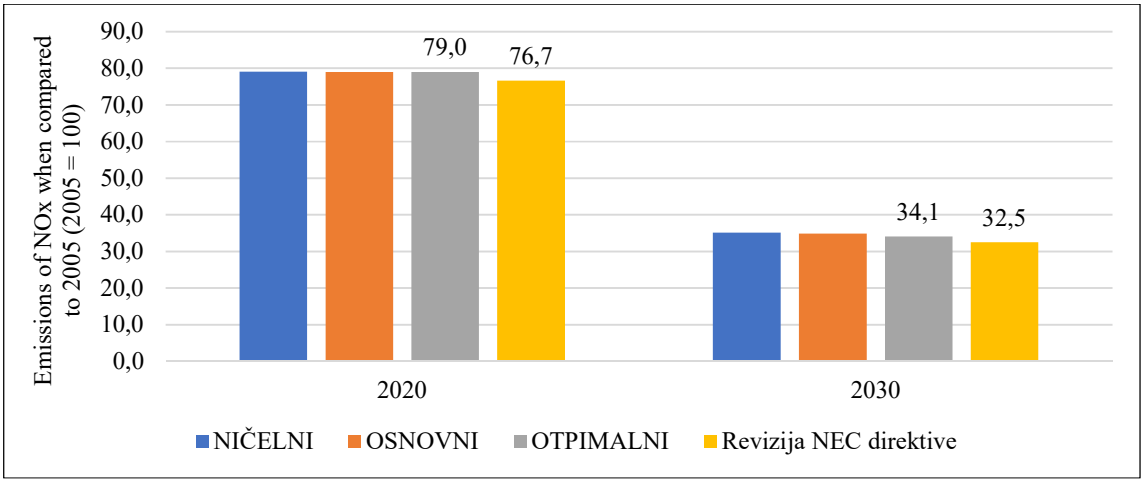

Figure 8: Emissions of NOx in 2020 and 2030 compared to emissions in 2015, under different scenarios, and comparison with emissions in the projection that was used at the time of negotiating the Directive NEC [null, basic, optimal, Revised NEC]

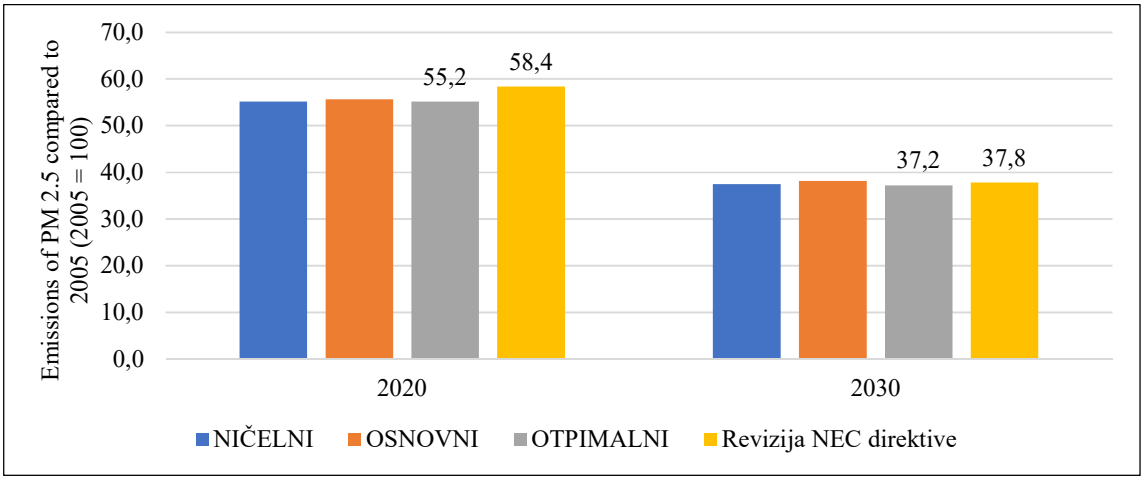

Figure 9: Emissions of PM 2.5 in 2020 and 2030 compared to emissions in 2015, under different scenarios, and comparison with emissions in the projection that was used at the time of negotiating the Directive NEC [null, basic, optimal, Revised NEC]

5.6 Objectives in the field of recharging infrastructure

Meeting the planned number of vehicles powered by alternative fuels in Slovenia and the requirements under Directive 94/2014, will require adequate recharging infrastructure.

Table 26: Required total number of public recharging stations by alternative fuel type in 2015, 2020, 2025 and 2030.

		Required recharging infrastructure under the optimal scenario		
	2016	2020	2025	2030
Recharging points for BEV	227	1 200	7 000	22 300
Refuelling points for CNG	4	14 (12[1])	14 (12)	14 (12)
Refuelling points for LNG	0	3	3	3
Recharging points for H2[2]	1	2	5 - 9	5 - 9

[1] – If recharging points in the vicinity of or on the TEN-T network are also used to serve urban areas.
[2] – depending on the capacity of an individual recharging point.

In the Port of Koper, Slovenia's only port, which is a part of the Adriatic TNT-T network, refuelling ships with LNG will be provided by 2025 in a manner that meets safety, environmental and economic efficiency norms.

The Port of Koper will require sufficient shore-side electricity recharging for ships berthed at port.

As prescribed by the Directive, recharging infrastructure for CNG must first also be deployed in urban agglomerations with many dispersed areas no later than by 2020. The two largest cities in Slovenia (Ljubljana and Maribor) already have suitable infrastructure available for a number of alternative fuels.

6 Measures to meet objectives for alternative fuels in transport

6.1 Promotional activities for electric mobility

Measures to meet commitments from the optimal scenario are spread across various areas, which together will ensure that objectives are realised. The measures are interdependent and it is only through an integrated approach that Slovenia can ensure that it realises its wide-ranging commitments on transport. This is a set of optimal, but realistic, solutions that can only be implemented through large-scale engagement and effort. They are mostly based on the provision of suitable infrastructure and positive incentives. For Slovenia to be a leading country in green mobility, it must introduce measures that go beyond the Directive, but which importantly contribute to reducing the transport carbon footprint. An important share in the reductions come from measures to significantly lower the use of fuels, GHG emissions, and pollutants in new generations of standard vehicle engines. In Slovenia, 46 % or fewer passenger vehicles in use comply with EURO 3 standards. Upgrading these and gradually withdrawing those meeting lower standards would be a significant advance. To meet Slovenia's aim of becoming one of the most advanced countries in green mobility, we would also need to introduce measures that would remove incentives to use vehicles powered by established (i.e. fossil) fuels, which the Strategy does plan for.

In Slovenia, a low vehicle tax rate (0.5 %) for vehicles with emissions under 100 g/km CO_2 is already in effect. This measure applies to electric vehicles. Electric vehicles are also exempt from the payment of the annual road tax. The Slovenian environmental fund (Eko fund) supports the co-financing of energy efficient vehicles, with grant incentives for electric vehicles of up to 7 500 EUR for M1 vehicles and 4 500 EUR for N1 or L7e vehicles, as well as for plug-in hybrids M1 and N1 with emissions under 50 g/km. For L6e electric vehicles, grant incentives of 3 000 EUR are available. The Eko Fund provides financing for environmental investments, which includes the purchase of passenger vehicles, motorcycles and electric or hybrid bicycles, with maximum CO_2 emissions of 110 g/km. The loan is limited to 40 000 EUR.

6.1.1 Promoting development of technology and the economy

The automotive industry has made great progress over the last decade in developing technologies for electric vehicle manufacture; however, it still faces serious challenges. Coordinating key properties of electric vehicles with internal combustion-powered vehicles (availability, price of product, use of battery) can be expected by 2025 which is much too late in terms of realising the objectives in the field of alternative sources of energy expected from electric vehicles.

The Slovenian automotive industry's strength lies in recognising and managing production technologies which could form an important foundation on the automotive industry map. Other innovative companies are contributing to their development. The trend for large manufacturers to move production to less developed countries has stopped and production locations are moving back to Europe. Slovenian companies established on the global market have obtained certificates of quality and business excellence to demonstrate having the required product quality. Another important comparative advantage for Slovenia's automotive industry is in innovation since, although represented 10 % of Slovenian GDP, these producers have won 25 % of all annual innovation awards. This comparative advantage is found in actual technical and technological solutions.

Measures in innovation, research activities and economy stimulation will encourage Slovenia to develop a range of winners in individual fields.

6.1.2 Recharging infrastructure

Slovenia has a well-developed recharging infrastructure for electric vehicles, with 31 fast recharging points on the motorway network and more than 400 recharging points in agglomerations. Some areas have been equipped via special projects (for example, the Zelena Keltika (Green Celtic) project) to enable electric vehicle users to travel without difficulty in the whole area.

Recharging infrastructure with high-power recharging points will be expanded on the TEN-T network where coverage is not optimal, and will keep in step with the number of electric vehicles. This will promote the deployment of public recharging infrastructure in town centres and larger cities in Slovenia, as well as recharging infrastructure in apartment buildings and for personal use. Setting up a central system to manage smart networks and smart communities will promote the use of recharging points with intelligent measuring systems, as well as purchases of independent battery systems. Slovenia will keep the number of recharging points in the right proportion to the number of electric vehicles, i.e. one public recharging point per seven vehicles. Simplified payment for recharging will be provided, allowing for 'ad hoc' recharging for users without an agreement with a supplier, with favourable conditions that will ensure non-discriminatory treatment.

Recharging infrastructure will comply with conditions under point 1.1 and 1.2 of Annex II to Directive 94/2014/EU. Standard AC recharging points for electric vehicles will be equipped, for inter-operability purposes, at least with socket outlets or vehicle Type 2 connectors, as described in standard EN 62196-2. High-power recharging points for electric vehicles for alternating current (AC) will be equipped, for inter-operability purposes, with at least Type 2 connectors, as described in standard EN 62196-2. High-power recharging points for electric vehicles for direct current (DC) will be equipped, for inter-operability purposes, with at least COmbo 2 combined charging system connectors, as described in standard EN 62196-3.

6.1.3 Financial incentives for vehicles

Slovenia has already introduced financial incentives for purchasing electric vehicles, which cover 50 % of the price difference between such vehicles and equal or comparable petrol or diesel engine vehicles. The subsidy is paid by the EKO Fund on the basis of public tenders for legal entities and individuals for co-financing electric vehicles. In 2017, the subsidy for purchasing an electric vehicle was 7 000 EUR and 4 500 EUR for plug-in hybrids. The subsidy for purchasing electric vehicles will continue until there is large scale production and harmonisation of prices for electric vehicles with comparable vehicles powered by various fuels based on range and use. Procedures for distributing subsidies will be simplified and subsidises unlocked for test vehicles. The subsidies will gradually be reduced as the prices for electric vehicles fall. Electric vehicles are exempt from the payment of the annual fee for use of vehicles in road transport, as per the Annual Fee for Use of Motor Vehicles Act (UL RS No 57/08). Exemptions are planned for as long as the purchase and use of electric vehicles is being promoted. Because the number of registered electric vehicles will reach 10 % of total number of registered vehicles under individual categories, an annual fee will be introduced and be comparable to the annual road tax for vehicles with a lower share of GHG emissions and pollutants. The annual road tax will be adjusted to vehicle environmental parameters and proportionate with GHG emissions and pollutants.

Companies that pay corporation tax and the self-employed can claim 40 % of the amount invested in hybrid or electric vehicles and hybrid or electric buses back against their tax base (up to the maximum of the tax base).

Options for other financial incentives are being examined to accelerate the use of electric vehicles during the introduction period, such as benefits for using company vehicles for personal use.

Public tenders for vehicles for the public sector now include vehicles powered by alternative fuels. Co-financing is also provided for vehicles of category L1e and L3e, for electric bicycles for co-use bicycle systems.

6.1.4 Legislative changes and elimination of administrative barriers

Changing laws and eliminating administrative barriers will provide a normative environment which will promote the use of electric vehicles. Measures are planned for:

- a regulatory framework in the field of transport that promotes preferential treatment for electric vehicles for parking, use of certain transport areas, special markings or registration plates;
- inclusion in advanced network systems and advanced communities;
- online and user-friendly applications for subsidising the purchase of electric vehicles where sellers will take care of all the documentation and records on behalf of the purchaser;
- enabling the sale of test electric vehicles as new, for which the purchaser could claim a subsidy;
- promoting dynamic tariffing;
- organising parking places reserved for electric vehicles;
- allowing the deployment of recharging infrastructure for apartment buildings.

6.1.5 Providing public transport

Electric buses and electric taxi vehicles significantly contribute to reducing environmental pollution in town centres, in natural and local parks, and in protected areas. Incentives will be available to replace public transport vehicles of EURO IV or lower standards with vehicles powered by alternative fuels, especially in areas with poor air quality. The environmental parameters of vehicles used in the provision of mandatory public passenger transport services will be part of the conditions in public tenders to grant licences. By 2030, public passenger transport buses will have to comply with the most modern environmental requirements.

6.1.6 Promotional activities for electric mobility

Personal experience and sound understanding of technological and user information are important factors in deciding on one's method of mobility. Promoting sustainable mobility is the best answer to the challenges faced by providing mobility to the public because of environmental changes and the abundance of environmental pollution. For short distances, the best replacement for transport in passenger vehicles is walking, cycling, and well-organised and effective public passenger transport. In town centres, passenger traffic by the vehicles that pollute the environment with GHG emissions and pollutants the most will be restricted, and by 2030 vehicles powered by alternative fuels or in the under 50 g CO_2/km class are to be annually sold. Promoting co-use and co-ownership of vehicles would significantly reduce the number of vehicles in the centres of larger towns. Passenger vehicles are in actual use only 8 to 10 % of the day, and the rest of the time they are parked at home, near home, or at work. As a result, co-ownership and co-use of vehicles is one solution to reduce the high share of individual trips as vehicle occupancy is exceptionally low in Slovenia.

As part of the transition to low-carbon vehicles in road transport, a communication strategy will be prepared, with information on the effect of transport on climate change and the environment, on features of vehicles powered by alternative fuels and options for their use. Up-to-date online information on recharging infrastructure for alternative fuel, on their use and accessibility and on all types of sustainable mobility will be prepared. Promotional activities and promoting the use of electric vehicles will take place in cooperation with non-governmental organisations.

An advanced training programme for professional drivers (programme for code 95) will be prepared on the strengths and weaknesses of using alternative fuel for the transport of goods. In cooperation with the Slovenian Chamber of Crafts and Small Business and the Slovenian Chamber of Commerce, information on the use of alternative fuels that relate to the deployment of recharging infrastructure will also be prepared. All the strengths and weaknesses of using alternative fuels in business operations will be presented.

6.1.7 Reports to local communities

The Strategy sets out objectives and paths for realising its targets and objectives at the State level. A breakthrough in electric mobility, needs much to be done at the local and municipal levels as well. For this reason, the Strategy Proposal sets out measures for municipalities, which it is recommends for introduction at the local level. These measures will facilitate the development of electric mobility,

reduce environmental pollution from transport and provide a healthier living environment for the local population.

Measure 1: Ensuring public recharging points are deployed in dense apartment building neighbourhoods

This measure proposes that communities prepare a long-term plan for the spatial siting and deployment of recharging points, adapted to developing market trends in electric vehicle sales, and coordinated with a system operator and distribution networks. For the effective implementation of this measure, the key selected parking spaces would be those that can most easily connect to the electricity grid, to provide car parks with electricity and to provide the preliminary preparations to expand the recharging points at that location.

Providing recharging points is urgently needed to increase the use of electric vehicles among residents in apartment building neighbourhoods, where buildings generally have a common parking area and installing own parking points and reserved parking for BEV and PHEV is impractical.

Measure 2: Ensuring the preparation of decrees to install parking places for electric vehicles near public recharging infrastructure and to determine procedures for installing recharging points and reserved parking places

This measure recommends that communities to adopt municipal acts which will regulate transport policy at a local level on parking spaces for use by electric vehicles.

Measure 3: Promoting city transport and taxi services powered by alternative fuels

This measure recommends that communities adopt municipal acts which will impose an obligation on the providers of urban passenger transport and taxi services to gradually replace diesel vehicles with electric vehicles or vehicles powered by suitable alternative fuels.

Measure 4: Driving in 'yellow driving lanes'

Based on experience abroad, this measure allows electric vehicles to drive in 'yellow driving lanes' (i.e. bus/priority lanes) as an incentive to use electric vehicles in towns. This results in less environmental pollution from vehicle emissions and reduced noise, while the share of environment-friendly vehicles increases. This allows for the more effective realisation of the indicative OP-TGP objectives. In unusual situations, such as if the yellow driving lane is congested, this measure may be suspended. Introducing yellow driving lanes will need to be matched by the marking of electric vehicles.

The effect of the measure:

- more electric vehicles;
- faster realisation of the indicative OP-TGP objectives;
- a healthier living environment.

The measure is temporary to build up to a certain number of electric vehicles in a particular environment, without inhibiting the smooth and timely provision of public passenger transport.

Marking electric vehicles will be needed to ensure effective control over the use of yellow driving lanes.

Measure 5: Waiving parking charges for electric vehicles

The waiving of parking charges for electric vehicles is used in towns to promote the use of vehicles that do not pollute the environment with emissions and noise. Consequently, a healthy living environment is created and pollutants from transport and noise are reduced. Investment in recharging infrastructure and the availability of recharging electric vehicles would be increased since users of electric vehicles would not use recharging points as free parking spaces. This measure has financial

consequences, as it will reduce the income of local communities from parking charges. As with all the other measures, it will be in place temporarily, while its efficacy and any negative consequences are examined. It will be in place until the number of electric vehicles in Slovenia increases until the indicative OP-TGP objectives and the objectives related to reducing emissions of pollutants from transport are realised.

The effect of the measure:

- more electric vehicles;
- faster realisation of the indicative OP-TGP objectives;
- faster realisation of the indicative objectives on air pollutants from transport;
- providing a healthier living environment;
- increased effectiveness of investment into recharging infrastructure;
- greater frequency of using recharging points for electric vehicles.

The measure is intended to be in place during the period electric vehicles are being introduced in order to realise a 10 % share of electric vehicles among all registered vehicles.

6.1.8 Shore-side supply of electricity to seagoing ships

The Directive provides that Member States must identify ports where it will be possible to supply berthed seagoing ships with electricity and LNG. In Slovenia the Port of Koper is the only port of this kind.

Shore-side electricity supply for seagoing ships, including the design, installation and testing of the systems, must comply with the technical specifications of the IEC/ISO/IEEE 80005-1 standard.

In accordance with the Directive, seagoing ships must be supplied with electricity from the shore-side by 31 December 2025 unless there is no demand for such a service or the costs are greater than the benefits (including the environmental benefits) or are disproportionately high. The Port of Koper is already preparing the first assessment on the suitability of the existing distribution network for the purposes of supplying electricity to berthed seagoing ships. It was found that upgrading and strengthening the network would require a relatively large investment.

The existing electricity network in the Port of Koper is connected to the electricity network through the 20 kV distribution network. The current use at the port is around 10 MW, which is assessed as still an acceptable connecting power for the distribution network. By expanding the port and with new investments into the infrastructure (without berthing seagoing ships), the use is planned to increase to 25 MW by 2030. At the same time, we have determined that by 2025 peak power involved in ships connecting to the electricity would be 50 MW, since the connecting power of a passenger ship itself exceeds 10 MW. This assessment takes into account the concurrency factor, as electricity will potentially supply cargo ships while berthed at the port.

Because of the limitations of the distribution network, it will not be possible to provide adequate electrical power to supply ships at the same time as providing enough for the increased demand for electricity inside the port. To this end, as part of the European project POSEIDON-MED, a document titled ‘Feasibility of connecting the Port of Koper to the 110 kV network’ was prepared, which discusses in detail the technical solutions for connecting the ‘RTP 110/20 kV Luka Koper’ distribution transformer station to the 2x110 kV power line on the transmission electricity system of Slovenia. 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.

6.1.9 Supply of stationary aircraft with electric power

Slovenia must supply of electricity to stationary aircrafts by 31 December 2025. At Jože Pučnik airport, Brnik, this requirement has been satisfied because all stationary aircraft already have a supply of

electric power. At the airport in Maribor and Portorož the supply will be in place by the planned deadline.

6.2 Measures promoting use of hydrogen and fuel cell vehicles

As an alternative source of energy, hydrogen's role is seen as an energy carrier for producing electric power in fuel cells for vehicle propulsion. Currently, the largest obstacle is the slow growth of hydrogen recharging infrastructure, the poor availability of hydrogen vehicles on the market, and their high price compared to other vehicles.

In Slovenia, the first public recharging point for hydrogen was installed at the 'Petrol' petrol station in Lesce in September 2013 (300/350 bar). The recharging point was installed as a ‘demo project’, the objective of which was for Slovenia to obtain the necessary experience to install such facilities and, at the same time, to prepare relevant laws for the spatial siting of such projects.

The Directive allows Member States to independently decide whether their national policy frameworks will include hydrogen refuelling points. Slovenia had decided to go forward with hydrogen technology and therefore it must provide a suitable number of publicly accessible recharging points by 31 December 2025, which will allow for local transport as well as cross-border connections.

6.2.1 Promoting research work and innovation

Hydrogen technologies are still a very big challenge for the automotive industry, and research and innovation are required to make such vehicles and the recharging infrastructure cheaper. Slovenia will promote research connected with the industry to retain a position among producers and suppliers in the automotive industry.

6.2.2 Recharging infrastructure

Slovenia has a recharging point for hydrogen. In accordance with the selected technology, four or eight recharging points for hydrogen should be installed. Full subsidies for the installation of recharging points/infrastructure is required (in particular, grants from EU funds - in our experience, these funds were obtained only by large and powerful EU city consortiums and the largest bus manufacturers). Because of the economic scales of the use of hydrogen vehicles, these investments are not recovered within an acceptable time, from an economic point of view. Private investors therefore do not have an economic interest. At the same time, as with recharging points for electric vehicles, recharging points for hydrogen need to be subsidised to meet the latest standards. Technical specifications for hydrogen refuelling points will be applied as stated in point 2 of Annex II to the Directive.

6.2.3 Financial incentives

Financial incentives planned for electric vehicles are available for hydrogen vehicles as well. Measures to promote the use of hydrogen vehicles are managed separately in order to continue them even after the threshold values for promoting electric vehicles are realised.

6.2.4 Spatial siting

Larger municipalities in particular need to be encouraged to consider hydrogen powered public passenger transport in their comprehensive transport strategy, and if they decide to install hydrogen recharging points, they must also have adequate solutions in their municipal spatial plans.

Until relevant laws are developed, it is important to enable the installation of recharging infrastructure in line with current technical guidelines, and to permit their installation at locations where other energy sources are already being offered.

6.2.5 Promotional activities to incentivise the use of hydrogen

Because of the very limited use of such vehicles and the lack of knowledge as well as distrust of hydrogen technology, a special communication campaign on hydrogen technologies is also needed. It is to be prepared concurrently with the installation of recharging infrastructure for hydrogen.

6.2.6 Demonstration project

The demonstration project plans installation of 700 bar recharging points (4 to 8 recharging points), at a cost of 2.8 to 3.2 million EUR. There is also a need for funds for an awareness campaign and public information on the safe use of hydrogen vehicles. The demonstration project could include test drives and public presentations on the operation of hydrogen vehicles, in particular in schools and public institutions.

Introducing hydrogen technologies raises many unanswered questions, which prevent their extensive use. By supporting the demonstration project, research is to be supported to answer these questions and facilitate the introduction of hydrogen technologies.

This would set up a Slovenian value-added chain for hydrogen technologies.

6.2.7 Fuels on the market and pricing policy

The price of hydrogen for vehicle propulsion has not yet been set on the Slovenian market because it is not yet available here. In the first, promotional phase, the price of one kilo of hydrogen will be 8 EUR. The price of hydrogen will need to be subsidised.

6.2.8 Introducing hydrogen technologies to educational programmes

Educational programmes in secondary schools, and in occupational and expert training, are to include hydrogen technologies, to educate and train experts to work with hydrogen technologies in all areas.

6.2.9 Eliminating administrative barriers

Obtaining a building permit to install a recharging point is a great barrier because there is no legislative basis for doing so. There are only good engineering practices. To deploy infrastructure for hydrogen vehicles, the laws need to be amended.

6.3 Measures promoting use of liquefied petroleum gas (LPG)

Liquefied petroleum gas has a particular position and role as an alternative fuel in Slovenia. Recharging infrastructure has been deployed to a satisfactory extent, users are using it and trust it. In comparison with petrol vehicles, LPG vehicles use less energy and have around 14 % less emissions. The effect of converting thousands of petrol engine vehicles to LPG use, is equivalent to 142 electric vehicles, based on the assumption they drive the same number of kilometres and have constant use. The effect on reducing GHG emissions in transport in Slovenia from seven LPG powered vehicles is the same as from one electric vehicle.

Advantages of LPG include the fact that recharging infrastructure is internationally well developed, as Italy and Croatia are leading countries in the use of LPG in transport.

No subsidies are planned to promote LPG use, neither for recharging infrastructure, which is adequate, nor for the vehicles because the extra cost is recovered in the lower cost of operation within three years. It has been proposed to keep the level of excise duty and environmental duties on LPG at the lower taxation rate compared to other fossil fuels. LPG already enjoys proportionately lower taxation than other fossil origin fuels. Retaining the current level of excise duty while the promotion of

the purchase and use of LPG vehicles goes on will allow its consumer price to be lower than that of other fuels, such as petrol and diesel.

Promoting sustainable mobility is the best answer to challenges faced by providing mobility to the public because of environmental changes and the abundance of environmental pollution.

As part of the transition to low-carbon vehicles in road transport, a communication strategy will be prepared, with information on the effect of transport on climate change and the environment, on features of vehicles powered by alternative fuels and options for their use. Up-to-date online information on recharging infrastructure for LPG, on its use and availability and on all forms of sustainable mobility are to be prepared.

A programme on the strengths and opportunities for using alternative fuels for the transport of goods is to be prepared for various chambers of commerce as well as a mandatory programme for the code 95. In cooperation with the Slovenian Chamber of Crafts and Small Business and the Slovenian Chamber of Commerce, information on the use of alternative fuels that relate to the deployment of recharging infrastructure is to be prepared. Information on the strengths and weaknesses of using alternative fuels in business operations is to be prepared.

The public needs to be aware that Slovenia has adequately installed infrastructure for alternative fuel which allows the widest range of the population to reduce its carbon footprint in transport. . A more responsible approach to the environment (and care for de-carbonising transport) by driving on LPG is attainable by a wide range of consumers.

6.3.1 Promotional activities to incentivise LPG use

Promoting sustainable mobility is the best answer to the challenges faced by providing mobility to the public because of environmental changes and the abundance of environmental pollution.

As part of the transition to low-carbon vehicles in road transport, a communication strategy will be prepared, with information on the effect of transport on climate change and the environment, on features of vehicles powered by alternative fuels and options for their use. Up-to-date online information on recharging infrastructure for LPG, on its use and availability and on all forms of sustainable mobility are to be prepared.

A programme on the strengths and opportunities for using alternative fuels for the transport of goods is to be prepared for various chambers of commerce as well as a mandatory programme for code 95. In cooperation with the Slovenian Chamber of Crafts and Small Business and the Slovenian Chamber of Commerce, information on the use of alternative fuels that relate to the deployment of recharging infrastructure is to be prepared. Information on the strengths and weaknesses of using alternative fuels in business operations is to be prepared.

The public needs to be aware that Slovenia has adequately installed infrastructure for alternative fuel which allows the widest range of the population to reduce its carbon footprint in transport. A more responsible approach to the environment (and ensuring the de-carbonisation of transport) can be achieved by getting more people to use LPG in vehicles.

6.3.2 Co-financing of LPG and bi-fuel system vehicles

The possibility of co-financing the purchase of a LPG-vehicle when exchanging a vehicle of EURO 0, EURO 1 or EURO 2 standards is to be examined, to promote the market availability of vehicles and to shift to the use of other fuels.

6.3.3 Insurance for converting goods vehicles to a bi-fuel diesel/LPG system

Insurance for vehicles converted to a bi-fuel system is not yet regulated in Slovenia. The insurance industry does not yet provide insurance products that would insure providers of conversions and

modifications for damages that could arise on vehicles if the bi-fuel system does not function properly. There is a need for measures encouraging insurance companies to offer comparable insurance products. This proposal refers to bi-fuel systems which allow for the simultaneous use of diesel fuel and one of the gaseous fuels - LPG, CNG or LNG.

6.3.4 Type approval

Converting vehicles to reduce GHG emissions requires appropriate laws to be adopted and further training for authorities issuing type-approvals. The bureaucratic barriers which make type approval procedures difficult for expert providers of high quality modifications need to be eliminated. To incentivise LPG-conversion and the purchase of LPG-powered vehicles, supervisory measures for emissions measurements within roadworthiness testing will also be also important.

6.3.5 Excise duty on liquefied petroleum gas (LPG)

Maintaining or possibly further reducing the level of excise duty and environmental duties on CNG in the period 2018-2020 to a figure which ensures a lower taxation rate, compared to other fuels of fossil origin, ensures that there is an incentive to introducing CNG to power vehicles as an important contribution to environmental objectives.

6.4 Measures promoting use of compressed natural gas (CNG)

In accordance with the Directive, there are two important milestones in introducing compressed natural gas in transport in Slovenia:

By 31 December 2020: Slovenia must have deployed an adequate number of publicly accessible refuelling points for CNG in order for motor vehicles powered by CNG to drive in dense urban/pre-urban agglomerations and in other populated areas, in accordance with indent 6 of Article 3(1). This also satisfies the objective of deploying infrastructure for alternative fuel for public passenger transport services, and for vehicles used for municipal and other urban activities.

By 31 December 2025: a network of publicly deployed refuelling points for CNG must be deployed on the Adriatic TEN-T network, which is on Slovenia's motorways along the Pan-European corridors X and V. Slovenia will have to deploy five recharging points for CNG on the motorway network by this date to ensure smooth transport with neighbouring States.

6.4.1 Recharging infrastructure for compressed natural gas (CNG)

By 31 December 2020, publicly accessible refuelling points for CNG are to be deployed in the following municipalities in Slovenia: Ljubljana, Maribor, Ptuj, Celje, Kranj, Novo Mesto, Nova Gorica, Koper, Murska Sobota, Slovenj Gradec and Velenje, and in Zasavje as an area degraded with air pollutants. The number of refuelling points for CNG can be increased in accordance with public demand to provide recharging infrastructure for CNG in other areas of Slovenia as well. We plan to subsidise the deployment of refuelling points for CNG. This would deploy an adequate number of publicly accessible refuelling points for CNG, which ensures uninterrupted driving by CNG vehicles in dense urban and pre-urban agglomerations and other well populated areas, in accordance with the Directive. Deploying refuelling points for CNG, will also meet the objective of deploying infrastructure for alternative fuel for public passenger transport services, and for vehicles used for municipal and other urban activities. Because the use of CNG in passenger vehicles is economically attractive and has a positive environmental impact, the deployment of a network of recharging points is of key importance for a breakthrough in CNG use.

By 31 December 2025, a suitable number of publicly accessible CNG refuelling points along the existing TEN-T Core Network will have been deployed. This means three locations with recharging

points on the Mediterranean corridor, and two locations on the Baltic-Adriatic corridor. It will also be necessary to coordinate locations with neighbouring countries to ensure uninterrupted driving by vehicles powered by CNG on the trans-European network TEN-T.

6.4.2 Promotional activities to incentivise CNG use

The public needs to be aware that Slovenia has an adequate CNG infrastructure, which allows the widest range of the population to reduce its carbon footprint in transport. Driving vehicles powered by CNG is a good example of a responsible approach to the environment.

A programme on the strengths and opportunities of using CNG for the transport of goods is to be prepared for the commercial chambers as well as the mandatory programme for the code 95. In cooperation with the Slovenian Chamber of Crafts and Small Business and the Slovenian Chamber of Commerce, information on the use of CNG relating to the deployment of recharging infrastructure is to be prepared.

6.4.3 Insurance for converting goods vehicles to a bi-fuel diesel/LPG system

The insurance of vehicles converted to a bi-fuel system is not yet regulated in Slovenia. The insurance industry does not yet provide insurance products that would insure providers of conversions and modifications for damages that could arise on vehicles if the bi-fuel system does not function properly. Options are to be examined and measures prepared to encourage insurance companies to offer comparable insurance products. This proposal refers to bi-fuel systems which allow for the simultaneous use of diesel fuel and one of the gaseous fuels: LPG, CNG or LNG.

6.4.4 Type approval

Converting vehicles to reduce GHG emissions requires appropriate laws to be adopted and further training for authorities issuing type-approvals. The bureaucratic barriers which make type approval procedures difficult for expert providers of high quality modifications need to be eliminated. To incentivise CNG-conversion and the purchase of CNG-powered vehicles, supervisory measures for emissions measurements within roadworthiness testing will also be also important.

6.4.5 Excise duty on CNG

Maintaining or possibly further reducing the level of excise duty and environmental duties on CNG in the period 2018-2020 to a figure which ensures a lower taxation rate, compared to other fuels of fossil origin, ensures that there is an incentive to introducing CNG to power vehicles as an important contribution to environmental objectives.

6.4.6 Subsidising purchase of vehicles

In 2017 there were not many CNG vehicles available for sale by authorised sellers in Slovenia. Subsidies are planned for purchasing CNG buses for a period of two to five years. The feasibility of providing subsidies for the purchase of passenger vehicles will be examined in relation to promote the availability of CNG vehicles, to increase positive user experiences and to deploy suitable recharging infrastructure. Four vehicles or light commercial vehicles reduce CO_2 emissions in transport to the same extent as one electric vehicle.

If CO_2 emissions from CNG and diesel vehicles are comparable, exhaust gas, in particular from passenger vehicles and light commercial vehicles, are cleaner in CNG vehicles.

New CNG buses and other heavy-duty vehicles are currently around 15 % more expensive than diesel vehicles. The same difference in prices also applies to bi-fuel system of diesel-CNG vehicle. For bi-fuel system CNG vehicles, their mass marketing will quickly bring their prices close to diesel vehicles. In a diesel-CNG bi-fuel system, HGV and bus CO_2 emissions are 10 - 13 % lower than vehicles powered exclusively by diesel fuel. In terms of the number of kilometres driven annually by HGVs (assuming 120 000 km/year) and consequently a large quantity of used fuel (36 000 litres of

diesel/year when using 30 litres/100 km), the dual use of natural gas reduces CO_2 emissions around 11.5 tonnes per year for a single HGV.

6.4.7 Public procurement - ending exemption under Directive EU/2009/33.

By deploying adequate recharging infrastructure, the exemption in the application of Directive EU/2009/33 ends, which would allow Slovenia to amend its public procurement of vehicles in accordance with the OP-TGP and environmental objectives. Deploying a fleet of CNG vehicles will allow for the economic sustainability of recharging points that must be deployed in accordance with obligations under Directive 2014/94/EU.

6.5 Measures promoting use of liquefied natural gas (LNG)

In accordance with Directive EU/2014/94, Slovenia must, along with other EU Member States, deploy a network of publicly accessible LNG refuelling points for heavy-duty vehicles, at least on the existing Adriatic network TEN-T. This must match the lowest range of heavy-duty LNG-powered vehicles, which means that the average distance between refuelling points can be around 400 km.

An appropriate number of publicly accessible LNG refuelling points must deployed on the existing Adriatic network TEN-T by 31 December 2025, and subsequently on other parts of the TEN-T network.

By 31 December 2025, an adequate number of LPG refuelling points must have been deployed at ports to allow for the movement of vessels powered by LNG in the entire Adriatic network TEN-T. This obligation in Slovenia relates to the Port of Koper.

Recharging infrastructure for LNG will be established for Slovenian road transport in accordance with the requirements under the Directive by no later than 2019.

The European projects SiLNGT (2015-EU-TM-0104-S Mediterranean Corridor) and cHAMeleon, in which the companies Butanplin and ENOS are participating, will allow Slovenia to deploy an infrastructure network for LNG significantly earlier than the deadline prescribed by the Directive. As part of both projects and by no later than the second half of 2019, Slovenia will have three LPG refuelling points which will satisfy requirements under Directive 2009/94/EU, according to which there must be an LPG refuelling point every 400 km on the Adriatic network TRN-T. Two refuelling points will already start operating in 2018.

6.5.1 Promoting the purchase of LNG vehicles

LNG vehicles will have at least 10 to 20 % lower share of CO_2 than diesel vehicles and significantly lower emission of dust particles and, taking into account large number of annually driven kilometres (120 000 km), they can importantly effect carbon footprint. In Italy and Germany, incentives for purchasing LNG vehicles of 20 000 or 18 000 EUR are stimulating the exchange of vehicles, in particular, where there are adequate LPG refuelling points. Financial incentives are available for 100 LNG vehicles.

6.5.2 Excise duty and tax policy for LNG

Maintaining or possibly further reducing the level of excise duty and environmental duties on CNG in the period 2018-2020 to a figure which ensures a lower taxation rate, compared to other fuels of fossil origin, ensures that there is an incentive to introducing CNG to power vehicles as an important contribution to environmental objectives.

6.5.3 Promoting LNG with suitable transport policy

The possibility of waiving the lowering of road tax and introducing special pay toll classes for LNG in the period 2018-2020 is being looked into as an incentive to promote LNG.

6.5.4 OP-TGP supply of ships with LNG

By 31 December 2025, an adequate number of LNG refuelling points must be deployed at ports to allow for the movement of vessels powered by LNG in the entire Adriatic network TEN-T. This obligation in Slovenia relates to the Port of Koper. In the setting up of infrastructure for supply ships with LNG, Slovenia can cooperate with neighbouring Member States. The deploying of LNG refuelling points for ships must take into account actual market needs.

Detailed specifications are laid down in point 3.1 of the Technical specifications for refuelling points for LNG for vessels sailing in inland waterways or seagoing ships under Annex II to Directive 94/2014/EU.

The paper 'Possibilities for the supply and use of LNG as an alternative fuel for the Port of Koper' was prepared as part of the international project POSEIDON II-MED. The document discusses reasons and presents solutions in the field of supplying ships with LNG. It includes a review of the current shipping, transport and cargo vehicles in the Port of Koper and presents forecasts in this field. The document contains a description of the baseline, in terms of the possibility of using LNG and an analysis of the LNG supply chain.

As part of the project GAINN4MOS, a study was prepared on different technical options for supplying ships with LNG in the Port of Koper. Based on the study's findings, and security and spatial restrictions, mobile solutions for supplying ships with LNG in the Port of Koper will have to be examined in detail. The siting of buildings and infrastructure for LNG within the area of the Port of Koper can be carried out only in accordance with conditions and criteria prescribed by the National Spatial Plan and relevant environmental laws. LNG is not listed in the National Spatial Plan as a fuel but administrative procedures for obtaining relevant environmental and building permits can be based on the general provisions of Article 93(5) of Energy Infrastructure - energy self-supply, in particular, if LNG were to be used for shiploading machinery and towing ships.

Prepared by: Ministry of Infrastructure and the Port of Koper

6.6 Promoting bio-fuel use

Biofuels are used in many forms as alternative propulsion fuels. The most common and extensive forms of use are:

6.6.1 Biodiesel – as a supplement to the existing fossil diesel (Bx)

Biodiesel can be added in different shares to conventional fossil diesel. If the share of biodiesel is only up to 7 % of the volume, the mixture can be used under the same conditions as those that apply to pure fossil diesel (such biofuel content is permitted by the diesel standard (EN590)). If the content is higher than 7 % (B10, B20, B30, etc.), the mixture can be used only in vehicles which are modified for using biofuels and under the same conditions that apply to pure biodiesel (B100).

6.6.2 Biodiesel – used in pure form as 100 % biodiesel (B100)

Its use is permitted only in engines which are specially modified for using biodiesel and have a manufacturer's certificate. Points of sale must be separate and marked.

6.6.3 Bioethanol – as a supplement to petrol. This can be used as:

- E5 (bioethanol content up to 5 %); and

- E10 (bioethanol content up to 10 %).

Both forms (points b) and c)) are today standardised but all other limitations laid down by the standard for petrol must be taken into account (such as vapour pressure, limitations on the content of oxygen compounds, etc.) When using E10 fuel, points of sale must be marked and users must check with the producer or the servicer about the possibility of its use in a particular vehicle (engine).

6.6.4 E85 – mixture of petrol and ethanol, with 85 % ethanol content (bioethanol)

This fuel can be used only with dedicated or modified vehicles. The Slovenian market has few such vehicles and the supply of E85 is not set up.

Special features for using biofuels are:

The quality of biodiesel, regardless if used as pure biodiesel or mixed with diesel, is standardised. It is set by the uniform European standard EN 14214 (in Slovenia: SIST EN14214). Only the use of biofuel which fully complies with this standard is permitted.

When using biofuels, special features related to their stability and specific behaviour during storage and handling must be respected.

Biodiesel is less stable and more prone to aging compared to fossil fuels. Its use is therefore suitable only for ongoing needs, which means that the fuel can be stored between 4-6 months at most.

The use of bioethanol requires greater care during storage and handling; care is needed in terms of influences an added bio-component can have on other parameters (in particular, vapour pressure). In Slovenia, where there are no sources nor own production of fuels, the use and subsequent adding of bioethanol is usually limited by the existing fuel structure (restrictions in terms of oxygen compounds). Required points of sale for such fuel causes higher logistic costs.

Synthetic fuels, which can substitute for diesel, petrol and jet fuel, can be produced from different raw materials by converting biomass, gas, coal or plastic waste into liquid fuels, methane and dimethyl ether (DME). Synthetic paraffinic diesel fuels, such as hydro-treated vegetable oils (HVO) and Fischer-Tropsch diesel, are interchangeable and can be blended into fossil diesel fuel at very high blending ratios, or can be used pure in all existing and future diesel vehicles. Therefore, these fuels can be distributed, stored and used with the existing infrastructure. Synthetic fuels substituting petrol, such as methanol and other alcohols, can be blended with petrol and can be technically used with current vehicle technology with minor adaptions. Synthetic and paraffinic fuels have the potential to reduce the use of oil sources in the energy supply to transport. The use of synthetic fuels allows for the realisation of circular economy principles in transport.

The proposal for the new directive on renewable sources of energy (RED II) from the winter package, has taken a different position concerning biofuels than the one in the currently valid Directive. The RED II target is a 6.8 % share of RES in transport by 2030, without taking into consideration first generation biofuel for that figure. Only biofuel not produced from products primarily intended for food are taken into account, i.e. renewable liquid and gaseous fuel of non-biological origin, and fossil fuel based on waste.

The obligation to realise the objective can be carried out by fuel distributers. Biofuels based on products used for food can be taken into account in realising the overall RES target (27 % at the EU level), but are not taken into account in realising RES in transport. Aside from this, their contribution is limited. By 2012, the use of this fuel in road and rail transport was to be 7 % and by 2030 the share was to be less than 3.8 %.

On the basis of Article 380(2) of the Energy Act (UL RS No 17/14 and 81/15), the Slovenian Government issued a Decree on renewable sources of energy in transport. This Decree partially transposes the following into Slovenian laws:

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140, 5. 6. 2009, p. 16; hereinafter: Directive 2009/28/EC); and

Directive (EU) 2015/1513 of the European Parliament and of the Council of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources (OJ L 239, 15. 9. 2015, p. 1; hereinafter: Directive (EU) 2015/1513).

The Decree on sustainability criteria for biofuels and life cycle GHG emissions in transport fuels is in effect in Slovenia (UL RS No 19/17).

DEFINITIONS

This Strategy uses terms which have the same meaning as laid down in the Energy Act (UL RS No 17/14 and 81/15); in addition, the terms have the following meanings:

‘alternative fuels’ means fuels or sources of energy which serve, at least partly, as a substitute for fossil oil sources in the energy supply, to transport and contribute to its decarbonisation and enhance the environmental parameters in the performance of the transport sector; namely:

- electricity;
- hydrogen;
- biofuels;
- synthetic and paraffinic fuels;
- natural gas, including biomethane, in gaseous form as compressed natural gas (hereinafter: CNG), and in liquid form as liquefied natural gas (hereinafter: LNG) and
- liquefied petroleum gas (hereinafter: LPG);

‘electric vehicle’ means a motor vehicle equipped with a powertrain containing at least one non-peripheral electric machine as an energy converter with an electric rechargeable energy storage system, which can be recharged externally;

‘recharging point’ means an interface where one electric vehicle at a time can be recharged or exchanging a battery of one electric vehicle at a time;

‘standard power recharging point’ means a recharging point that allows for the transfer of electricity to an electric vehicle with power less than or equal to 22 kW, excluding devices with a power less than or equal to 3.7 kW, which are installed in private households or the primary purpose of which is not recharging electric vehicles, and which are not accessible to the public;

‘high power recharging point’ means a recharging point that allows for the transfer of electricity to an electric vehicle with power of more than 22 kW;

‘shore-side electricity supply’ means the provision of shore-side electrical power through a standardised interface to seagoing ships or inland waterway vessels at berth;

‘recharging or refuelling point accessible to the public’ means a recharging or refuelling point to supply an alternative fuel which provides users non-discriminatory access. Non-discriminatory access may include different terms of authentication, use and payment;

‘refuelling point’ means a refuelling facility for the provision of any fuel, with the exception of LNG, through a fixed or a mobile installation;

‘LNG refuelling point’ means a refuelling point for the supply of LNG, which is a stationary or mobile facility, station at sea or another system.