GOVERNMENT OF THE GRAND DUCHY OF LUXEMBOURG
Ministry of Sustainable Development and Infrastructure
Department for Transport

National policy framework for alternative fuels infrastructure in the transport sector

under Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure

Luxembourg, 31 October 2016

TABLE OF CONTENTS

TABLES

ANNEXES

GLOSSARY

AVL	Autobus de la Ville de Luxembourg [Luxembourg City Buses]
CO_2	carbon dioxide
EV	electric vehicles
GHG	greenhouse gas
CNG	compressed natural gas
LNG	liquefied natural gas
LPG	liquefied petroleum gas
DSO	distribution system operator
ILR	Institut Luxembourgeois de Régulation [Luxembourg Regulatory Authority]
MDDI	Ministère du Développement durable et des Infrastructures [Ministry of Sustainable
NO_x	nitrogen oxides
P+R	park-and-ride facilities
PHEV	plug-in hybrid electric vehicles
RGTR	Régime général des transports routiers [Luxembourg Road Transport System]
RTD&D	research, technological development and demonstration
TEN-T	Trans-European Transport Network
SNCA	Société Nationale de Circulation Automobile [National Agency for Automobile Traffic]
STATEC	National Institute for Statistics and Economic Studies
TICE	Transport Intercommunal de Personnes dans le Canton d'Esch-sur-Alzette [Inter-

Background

The European Council of March 2007 made a firm commitment to a 20 % reduction in the European Union's overall greenhouse gas (GHG) emissions by 2020 as compared to 1990 levels. As part of that commitment, under Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009, Luxembourg was given the objective of reducing its GHG emissions by 20% as compared to 2005 levels.

In line with this overall objective, the European Union is pursuing a transport policy aimed at reducing GHG emissions, reducing its dependence on oil and increasing the share of renewable energy sources:

- Directive 2009/28/EC sets the objective of a 10% market share for renewable energy sources in the transport sector by 2020;

- in its White Paper of 28 March 2011, the Commission advocates the development of competitive, resource-efficient and clean transport in order to meet the objective of a 60% reduction in GHG emissions from transport by 2050 as compared to 1990 levels;

- in the Commission Communication of 24 January 2013 entitled 'Clean power for transport: a European alternative fuels strategy', electricity, natural gas in gaseous form (compressed natural gas – CNG) or liquefied form (liquefied natural gas – LNG), hydrogen, biofuels and liquefied petroleum gas (LPG) are identified as the main alternative fuels currently able to replace oil in the long term.

Based on the above, Directive 2014/94/EU of 22 October 2014 'establishes a common framework of measures for the deployment of alternative fuels infrastructure in the Union in order to minimise dependence on oil and to mitigate the environmental impact of transport'.

The Directive focuses on six types of alternative fuel:

- electricity,
- natural gas, including biomethane, in the form of CNG and LNG,
- hydrogen,
- biofuels as defined in Directive 2009/28/EC[1],
- synthetic and paraffinic fuels,
- liquefied petroleum gas.

The Directive lays down minimum requirements for introducing infrastructure intended for alternative fuel which must be put in place by each Member State by means of a national policy framework. National policy frameworks must be notified to the Commission by 18 November 2016. The requirements only apply to electricity, natural gas and hydrogen. Moreover, they vary in strictness depending on the type of alternative fuel. The precise requirements as laid down in the Directive and the national objectives set by Luxembourg in order to meet them are listed in Section 3.

Annex II to the Directive lays down minimum technical specifications for the three types of alternative fuel which future supply infrastructure must comply with.

Finally, Article 3 of the Directive sets out the minimum content of national policy frameworks which each Member State must adopt and notify to the Commission. It includes in particular:

- an assessment of the current state and future development of the market as regards alternative fuels in the transport sector,
- targets for deploying public infrastructure to supply vehicles with electricity, natural gas and, where appropriate, hydrogen,
- measures for reaching those targets.

[1] 'Biofuels' means liquid or gaseous fuel for transport produced from biomass (source: Directive 2009/28/EC)

1. Status of the alternative fuels market in Luxembourg

1.1. Percentage use of alternative fuel vehicles

At the end of 2015, as in most European countries, alternative fuel vehicles continued to account for a small share of the range of fuels used in Luxembourg. With the exception of biofuels which may be used in existing vehicles in combination with petrol or diesel, the share of other alternative fuel vehicles as defined in Directive 2014/94/EU is still small as a proportion of the approximately 430 000 vehicles comprising Luxembourg's vehicle fleet.

By the end of 2015, fully electric vehicles accounted for approximately 0.17% of registered vehicles. This figure is supplemented by a further 0.06% corresponding to plug-in hybrid electric vehicles (PHEV). Thus, plug-in electric vehicles accounted for a total of 0.22% of the entire vehicle fleet at the end of 2015. CNG vehicles represented only 0.05% of the entire vehicle fleet at the end of 2015. At that same time, no LNG or hydrogen vehicles had been registered, resulting in a 0% share for both types of vehicle.

1.2. Number of registered alternative fuel vehicles

Below are the number of alternative fuel vehicles within the total fleet of 427 103 vehicles registered with the National Agency for Automobile Traffic (SNCA) as of 31 December 2015:

Table 1-1: Alternative fuel vehicles registered – as at end 2015

TYPE OF VEHICLE	NUMBER OF VEHICLES
	31.12.2015
Electric vehicles	**970**
Electric cars	852
Electric vans	88
Electric trucks	0
Electric buses and coaches	2
Electric motorcycles	28
CNG vehicles	**280**
CNG cars	192
CNG vans	39
CNG trucks	1

TYPE OF VEHICLE	NUMBER OF VEHICLES
	31.12.2015
CNG buses and coaches	48
LNG vehicles	**0**
LNG vans	0
LNG trucks	0
LNG buses and coaches	0
Hydrogen vehicles	**0**
Hydrogen cars	0
Hydrogen vans	0
Hydrogen trucks	0
Hydrogen buses and coaches	0

1.3. Electricity

Currently, Luxembourg has 155 public charging points. The majority of these charging points provide regular charging. There is only one rapid charging point. As there are 852 plug-in electric vehicles in Luxembourg, this means that there is one public charging point for every 5.49 electric vehicles.

In terms of charging points which are not accessible to the public, it emerged following a survey of home charger vendors that 287 charging stations have, at present, been installed in Luxembourg. The majority of these charging stations are 'Wallbox' chargers which are used for charging up at home. As there are 852 plug-in electric vehicles in Luxembourg, this means that there is one non publicly-accessible charging point for every 2.97 electric vehicles.

Four rapid charging points have been installed by Tesla Motors in Munsbach which are currently only accessible to customers of that car manufacturer.

Table 1-2: Existing charging points

ELECTRICITY	Charging points
	2015

ELECTRICITY	Charging points
	2015
Charging points ≤ 22kW (public)	154
Charging points > 22kW (public)	1
Charging points ≤ 22kW (private)	287
Charging points > 22kW (private)	4

Luxembourg Airport currently has 24 electric power sources for stationary aircraft:

- 5 'static power' sources (115 V 400 Hz) in Terminal A;
- 9 'static power' sources (115 V 400 Hz) in Terminal B. Although this terminal is not yet open its apron is already occasionally being used by Luxair.
- 10 'static power' sources (115 V 400 Hz) in Cargo Centre East for all cargo planes arriving at the Cargo Centre.

Currently, Mertert inland port does not have any on-shore electricity supply infrastructure in place for inland waterway vessels.

Table 1-3: Existing port and airport electric power sources

ELECTRICITY	Electric power sources
	2015
Port on-shore electric power sources (terminals)	0
Electric power sources for stationary aircraft	24

1.4. Natural gas

Well-developed infrastructure is currently in place for distributing compressed natural gas (CNG), with six publicly accessible stations. This equates to 1.09 stations per 100,000 inhabitants. These six stations have been in place for 10 years and supply a fleet of approximately 280 CNG vehicles.

CNG is used to a significant extent in public transport in the south west of the country by the bus operator *Transport Intercommunal de Personnes dans le Canton d'Esch-sur-Alzette* (TICE). Nearly one in every two buses (48 in total) runs on CNG. To that end, a gas compression station for buses is located on the premises of the TICE in Esch-sur-Alzette. Importantly, these buses are all powered exclusively by biogas.

Table 1-4: Existing CNG refuelling points

CNG	**Refuelling points**
	2015
CNG refuelling points (public)	6
CNG refuelling points (private)	1

Luxembourg does not have any liquefied natural gas (LNG) refuelling infrastructure in place for either road or waterway transport.

As regards road transport, none of the six corridors identified by the various parties involved in the LNG Blue Corridor pass through Luxembourg. No LNG refuelling points are therefore planned as part of this.

In terms of waterway transport, no particular installations are planned along the Moselle as part of the LNG Masterplan, despite the fact that the Moselle is one of the tributaries of the main rivers covered by the project (Rhine, Main, Meuse, Danube).

Table 1-5: Existing LNG refuelling points

LNG	**Refuelling points**
	2015
LNG road vehicle	0

refuelling points (public)	
LNG road vehicle refuelling points (private)	0
Sea ports – LNG refuelling points	/
Inland ports – LNG refuelling points	0

1.5. Hydrogen

Currently there are no hydrogen refuelling points in service in Luxembourg. Between 2004 and 2006, Luxembourg City was part of a project involving hydrogen buses. For that purpose, it installed a hydrogen station in Hollerich. That station is now out of service.

Table 1-6: Existing hydrogen refuelling points

Hydrogen	**Refuelling points**	
	2015 (350 bar)	**2015 (700 bar)**
Refuelling points (public)	0	0
Refuelling points (private)	0	0

2. National targets and objectives

Directive 2014/94/EU lays down minimum requirements for introducing infrastructure intended for alternative fuel. The requirements only apply to electricity, natural gas and hydrogen. Moreover, they vary in strictness depending on the type of alternative fuel.

Regarding electricity, Article 4 states that 'Member States shall ensure, by means of their national policy frameworks, that an appropriate number of recharging points accessible to the public are put in place by 31 December 2020'. As an indication, it mentions one charging point accessible to the public for every ten electric vehicles.

Regarding natural gas, Article 6 similarly states that

- 'Member States shall ensure, by means of their national policy frameworks, that an appropriate number of CNG refuelling points accessible to the public are put in place by 31 December 2020, in order to ensure [...] that CNG motor vehicles can circulate in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States'. As an indication, it mentions an average distance of 150 km between refuelling points.
- 'Member States shall ensure, by means of their national policy frameworks, that an appropriate number of CNG refuelling points accessible to the public are put in place by 31 December 2025, at least along the existing TEN-T Core Network, to ensure that CNG motor vehicles can circulate throughout the Union'.
- 'Member States shall ensure, by means of their national policy frameworks, that an appropriate number of refuelling points for LNG accessible to the public are put in place by 31 December 2025, at least along the existing TEN-T Core Network, in order to ensure that LNG heavy-duty motor vehicles can circulate throughout the Union, where there is demand, unless the costs are disproportionate to the benefits, including environmental benefits'. As an indication, it mentions an average distance of 400 km between refuelling points.
- 'Member States shall ensure, by means of their national policy frameworks, that an appropriate number of refuelling points for LNG are put in place at inland ports, to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2030'.
- Regarding hydrogen, Article 5 gives Member States the choice of whether or not to include public hydrogen refuelling points for road transport in their national policy framework. It states that where such refuelling points are put in place there must be 'an appropriate number [...] to ensure the circulation of hydrogen-powered motor vehicles, including fuel cell vehicles, within

networks determined by those Member States, including, where appropriate, cross-border links'.

2.1. Envisaged importance of the different alternative fuels

Taking into account the inventory of existing fuel infrastructure, planned investment projects and outlooks and trends in the transport sector, Luxembourg evaluated the number of alternative fuel vehicles planned for 2020, 2025 and 2030. Within the future array of alternative fuel vehicles, different types of technology will need to be promoted depending on the type of vehicle and use made of those vehicles.

With this in mind, Luxembourg considers the development of electric vehicles to be a key part of meeting CO_2 reduction objectives. As has been pointed out in a technical-economic study[2], electric mobility is a type of technology which must be promoted in particular in private and commercial vehicles. In Luxembourg, vehicles travel on average no more than 60 km per day and most electric cars on the market already have such a range. Furthermore, for heavy-duty vehicles and buses operated in the urban and suburban environment, electric mobility remains the most viable alternative for the future.

Natural gas had been considered a type of transition technology for decarbonising the transport sector. As a consequence, significant CNG refuelling infrastructure was rolled out (see Section 1.4). However, due to low use of CNG stations, limited interest in particular from private customers and ultimately the anticipated growth in electric mobility, the future role of natural gas in the transport sector was re-assessed. The Government believes that CNG will only play a marginal part and, as a consequence, it is of greater interest to focus on promoting electric mobility. This view has been confirmed in discussions and work carried out as part of the Third Industrial Revolution Strategy Study in Luxembourg[3], as part of which electromobility was also identified as an area to be promoted in the decarbonisation of the transport sector. Nevertheless, given that there are to date few viable alternatives to diesel for long-distance road freight transport, the use of LNG in this area has been recognised. For this reason, the development of this sector will be encouraged.

Hydrogen propulsion technology is not deemed sufficiently developed at present. There is continued hope that hydrogen will be one of the main solutions in future mobility as no CO_2 is emitted when producing hydrogen by electrolysis where powered by zero-carbon electricity. The main disadvantages

2Technical-economic study on rolling out electromobility nationally in Luxembourg, December 2011.

[3] The Third Industrial Revolution Strategy Study for the Grand Duchy of Luxembourg, November 2016

of hydrogen which are currently hindering its development are the high – and therefore uncompetitive – cost of producing zero-carbon hydrogen, distribution infrastructure and vehicles. However, given the advantages in terms of range and the zero emissions from vehicles running on hydrogen-powered fuel cells, the technology is believed to have the potential to play an important role in the future in terms of private and commercial vehicles but also heavy-duty vehicles and buses operating in the urban and rural environment.

2.2. Estimate of the number of alternative fuel vehicles

In accordance with Directive 2014/94/EU, Member States must estimate the number of alternative fuel vehicles planned for 2020, 2025 and 2030.

As regards electric mobility, a technical-economic study carried out on electric mobility recommended that public infrastructure comprising 1,600 charging points (≤ 22kW) accessible to the public would be sufficient to power at least 40,000 electric cars assuming that 95% of recharging was carried out at home. By 2025 and 2030, following a slight increase in the number of charging points expected as a result of public and private investment (Section 2.3), this ratio would equate to a total capacity powering more than 40,000 electric vehicles. The European Commission's indicative recommendation of at least one public charging point for every ten electric vehicles would not be followed as the technical-economic study in question considers that given the preference in Luxembourg for private charging points, only some 5% of recharging would occur in public spaces, with most occurring at home or at work[4].

In view of the change in significance of CNG as an alternative fuel, the Government believes the number of refuelling points will fall over the coming years until only one such refuelling point remains. The existing fleet of 280 CNG vehicles (see Section 1.2) is naturally expected to shrink once most of the refuelling points have been shut down. However, by maintaining one CNG refuelling point, there will continue to be a limited number of private and heavy-duty CNG vehicles registered in Luxembourg. In the area of public transport, TICE also has no intention of moving away from CNG technology and is planning to gradually increase the CNG bus fleet.

The main objective with regard to LNG is to install LNG refuelling infrastructure for road transport whilst at the same time developing a fleet of LNG vehicles in order to make the infrastructure cost effective. A fleet of 30 LNG vehicles is envisaged. No objective has been set for 2025 or 2030 in terms of the number of vehicles in operation as this will depend greatly on the number of LNG refuelling points in place and,

[4] Technical-economic study on rolling out electromobility nationally in Luxembourg.

in particular, given the considerable range of LNG vehicles, on the development of the LNG sector at European level.

With regard to hydrogen, the Government has decided not to include public hydrogen refuelling points in its national policy framework in accordance with Directive 2014/94/EU. This alternative fuel sector is still not deemed to be mature and the development of direct electromobility which does not use hydrogen fuel cells is considered more important. However, the Ministry of Sustainable Development and Infrastructure will continue to closely follow developments regarding hydrogen as an alternative fuel for transport. Depending on how the technology evolves in the coming years, a captive fleet or demonstration project involving hydrogen-powered buses or taxis could be envisaged. However, as national targets for hydrogen are not included in the national policy framework, a target in terms of the planned number of vehicles has not be set for 2025 or 2030.

Table 2-1: Estimate of the number of alternative fuel vehicles

TYPE OF VEHICLE	**NUMBER OF VEHICLES**		
	2020	**2025**	**2030**
Electric vehicles	40,000*	44,000*	48,000*
CNG vehicles	200	100	100
LNG vehicles	150	/**	/**
Hydrogen vehicles	/***	/***	/***

* The number of electric vehicles which the charging infrastructure in place is able to cater for.
** The estimated number of vehicles will greatly depend on how the technology evolves.
*** Hydrogen is not part of the national policy framework

2.3. Electricity

Luxembourg already has legislation and an action plan in place for setting up public charging infrastructure for electric vehicles. A technical-economic study[5] carried out by the Government and the Luxembourg Regulatory Authority (ILR) in 2011 enabled a joint national concept to be developed for rolling out electric mobility in Luxembourg. The conclusions of that study were included in a Law establishing a framework which sets out the major principles for developing electric mobility[6]. On the basis of the study which – justified by an analysis of the situation in Luxembourg – assumes that 95% of

5 Technical-economic study on rolling out electromobility nationally in Luxembourg, December 2011.

6 Law of 7 August 2012 amending the amended Law of 1 August 2007 on the organisation of the market in electricity.

primary charging would be with private charging points (in particular at home) and approximately 5% of all charging would use public charging infrastructure, the Luxembourg Government has set the objective of installing approximately 800 regular public charging stations (≤ 22kW) by 2020. As each charging station has two charging points, this equates to 1,600 public charging points by 2020. Public infrastructure will be a means of reassuring users with access to a private charger as regards their secondary charging needs. Such infrastructure will be installed at key sites (park-and-ride facilities and public roads). These 800 stations, which will be installed on an ad-hoc basis, will make the public infrastructure more visible. In line with the aforementioned study, this public infrastructure, together with private chargers, will be enough to power at least 40,000 electric cars. All charging points will be integrated into a shared central management system.

In 2015, a Grand-Ducal Regulation[7] was published laying down the working features, technical specifications, number of charging points to be installed, timetable and general organisation for the deployment of electric vehicle charging infrastructure in Luxembourg. This Regulation specified the installation, operation and maintenance services for the public charging infrastructure which will be provided for future users by distribution system operators (DSOs). In February 2016, a general installation plan was published by way of a Ministerial Regulation[8] laying down the park-and-ride facilities or car-sharing carparks in which charging points would be installed, and the number of stations to be installed in each of those carparks (Annex 1). Furthermore, it established the number of public charging stations to be installed in public carparks or parking bays in each municipality (Annex 2).

It is also important to mention that the 1,600 charging points will be in addition to the 154 charging points which already exist. Distribution system operators are required to cooperate on a non-discriminatory basis with all public or private persons wishing to set up or operate charging stations at publicly accessible sites with a view to integrating such stations free of charge into the shared central system. In this way, existing public charging points may be integrated into the central system or may co-exist alongside that system whilst remaining accessible to the public.

In addition, those 1,600 charging points are charging points which the distribution system operators will be installing at park-and-ride facilities and in the municipalities. That being said, municipal authorities and other private operators may also add additional charging points. Provided that these charging stations meet the minimum functional and technical characteristics set out in the aforementioned Grand-Ducal Regulation and that they are accessible to the public, they may be integrated free of charge into the shared central management system. The Government also believes the knock-on effect of the

[7] Grand-Ducal Regulation of 3 December 2015 on public infrastructure associated with electric mobility.

[8] Ministerial Regulation of 5 February 2016 laying down a general public infrastructure installation plan.

1,600 charging points installed by distribution system operators will be that a further 200 public charging points are installed by 2025 and 2030 by other private or municipal operators. This means that there would ultimately be 1,800 charging points by 2025 and 2,000 charging points by 2030.

The Grand-Ducal Regulation of 3 December 2015 on public infrastructure associated with electric mobility does not lay down a requirement for distribution system operators to install rapid electric charging points, i.e. with over 22 kW of power. However, to encourage long-distance travel by electric vehicle, the installation of rapid charging points at service stations along national motorways is planned. The aim is for 4 charging points to be installed by 2020, increasing to 8 by 2025 and 16 by 2030. Six motorway service stations would thus be equipped with at least two rapid charging points. These stations could be integrated into the same management system used for regular charging stations.

Table 2-2: Planned number of charging points

ELECTRICITY	**Charging points**		
	2020	**2025**	**2030**
Charging points ≤ 22kW (public)	1600	1800	2000
Charging points > 22kW (public)	4	8	16

The targets set for providing electric power supply to parked aircraft are in line with the current infrastructure and development projects in place for Luxembourg Airport. Currently, Luxembourg Airport has 24 electric power sources for parked aircraft with four additional power sources already in the pipeline as part of the extension to apron P7, planned for 2017-2018.

Table 2-3: Planned electric power sources at airports

ELECTRICITY	**Electric power sources**
	2020
Electric power sources for stationary aircraft	28

The Port of Mertert, which is part of the TEN-T Core Network, currently has no on-shore electric power sources in place for inland waterway vessels. It was observed as part of an assessment carried out in the

context of the national policy framework that demand for such on-shore electric power sources for inland waterway vessels was limited and that the installation cost would be disproportionate to the benefits they would bring. Consequently, no on-shore electric power sources are planned until 2025.

Table 2-4: Planned electric power sources at ports

ELECTRICITY	Electric power sources	
	2020	2025
Port on-shore electric power sources (terminals)	0	0

2.4. Natural gas

With 280 vehicles fuelled by CNG (of which 48 are buses using a private refuelling station) and, at present, a relatively dense network of six public CNG stations run by a single operator, the present view is that these stations are not really economically viable in the medium term. It is not yet clear how operators will proceed with these stations in the future. Nevertheless, following the reassessment of the role of CNG in achieving a zero-carbon transport sector, the Government believes that a single CNG refuelling point will be sufficient in the medium-term. This would mean there is considerably less infrastructure for this type of alternative fuel. However, its size would be suited to demand from national and international users and would also comply with the maximum distance criterion of 150 km between CNG stations as suggested by Directive 2014/94/EU.

Table 2-5: Planned number of CNG refuelling points

CNG	Refuelling points	
	2020	2025
CNG refuelling points (public)	1	1
CNG refuelling points (private)	1	1

LNG road transport refuelling infrastructure is planned to be in place by 2020. The aim of this infrastructure will be to refuel not only LNG tractor units registered in Luxembourg but also heavy goods

vehicles in transit in Luxembourg. As current legislation on heavy goods vehicles in transit requires vehicles to remain on the motorways where no freight transfer is intended, refuelling points will likely be located at motorway service stations. Initially, it is conceivable that a mobile LNG refuelling station mounted on a lorry may be used. During the early stages, this type of 'truck-to-truck' refuelling vehicle will help to provide greater flexibility and better adapt supply to demand. As a single LNG refuelling point comfortably covers demand in Luxembourg, no additional LNG refuelling points are planned at the present time.

Table 2-6: Planned number of road vehicle LNG refuelling points

LNG	**Refuelling points**	
	2020	**2025**
LNG road vehicle refuelling points (public)	1	1

As LNG vessels have considerable range, LNG refuelling infrastructure at the Port of Mertert is not considered viable. The decision has therefore been taken not to install LNG infrastructure in Luxembourg for vessels operating on the Moselle. LNG vessels are able make a return journey between the Port of Rotterdam and the Port of Basel without needing to refuel with LNG. However, a 'ship-to-ship' refuelling vessel operating in the surrounding waters or a 'truck-to-ship' refuelling truck may assist in individual instances where required at the Port of Mertert.

Table 2-7: Planned number of port LNG refuelling points

LNG	**Refuelling points**
	2020
Seaports – LNG refuelling points	/
Inland ports – LNG refuelling points	0

2.5. Hydrogen

Hydrogen produced by electrolysis using electricity generated from renewable sources undeniably offers real advantages in terms of increasing range and lowering emissions. However, it also presents unreasonable disadvantages, namely the uncompetitive cost of the vehicles and of producing zero-carbon hydrogen. Significant technological progress is still needed in order to transform the sector into a competitive industry. If industry maintains or indeed steps up its efforts in terms of developing this technology and its environmentally-friendly production, it could become competitive post 2030.

As regards development targets for hydrogen refuelling points, the Government has decided not to include public hydrogen refuelling points at present in its national policy framework in accordance with Directive 2014/94/EU (Section 2.2).

Table 2-8: Planned number of hydrogen refuelling points

Hydrogen	**Refuelling points**	
	2020	**2025**
Refuelling points – 350 bar (public)	/*	/*
Refuelling points – 700 bar (public)	/*	/*

** Hydrogen is not part of the national policy framework

3. Necessary measures for achieving national targets

3.1. Legal measures

3.1.1. Law of 7 August 2012 amending the amended Law of 1 August 2007 on the organisation of the market in electricity

The Law of 7 August 2012 amending the amended Law of 1 August 2007 on the organisation of the market in electricity[9] lays down the legal basis as regards the responsibilities of distribution system operators and the organisational principles for rolling out national public charging infrastructure managed via a single central system. This amended Law forms the Government's legal basis for the planned roll-out of public infrastructure comprising 1,600 charging points for electric cars by the end of 2020.

In accordance with the aforementioned Law, the roll-out, operation and maintenance of this public electric mobility equipment will be financed by usage tariffs for low voltage electricity networks.

3.1.2. Grand-Ducal Regulation of 3 December 2015 on public infrastructure associated with electric mobility

The amended Law on the organisation of the market in electricity (Section 3.1.1) is also the legal basis for the Grand-Ducal Regulation of 3 December 2015 on public infrastructure associated with electric mobility[10]. It lays down the working features of this public infrastructure, the technical specifications of the central system, the total number of charging points, the timetable and the general organisation of deployment by distribution system operators. In line with this basis, half of the 1,600 charging points will be installed at park-and-ride facilities and car-sharing carparks in Luxembourg and the remaining 800 charging points near sites presenting a shared interest. The definitive location of the charging stations allocated to the municipalities must be decided by the municipal authorities and rolled out in accordance with a general installation plan adopted by way of the Ministerial Regulation of 5 February 2016[11]. The general installation plan determines the park-and-ride facilities or car-sharing carparks in which public charging stations will be installed and the number of stations to be installed in each of those carparks (Annexes 1 and 3). One charging station equates to two charging points. The general installation plan also establishes the number of public charging stations to be installed in public carparks or parking bays in each municipality (Annexes 2 and 4). The municipal authorities must decide

[9] Law of 1 August 2007 on the organisation of the market in electricity http://eli.legilux.public.lu/eli/etat/leg/loi/2007/08/01/n13/jo.

[10] Grand-Ducal Regulation of 3 December 2015 on public infrastructure associated with electric mobility http://eli.legilux.public.lu/eli/etat/leg/rgd/2015/12/03/n2/jo

[11] Ministerial Regulation of 5 February 2016 laying down a general public infrastructure installation plan for electric mobility http://eli.legilux.public.lu/eli/etat/leg/rmin/2016/02/05/n1

the location of the charging stations allocated to public parking bays and carparks in close consultation with the distribution system operators. The locations must meet the criteria for being near points of shared interest as set out in Article 10 of the Grand-Ducal Regulation.

3.1.3. Law of 5 July 2016 on the organisation of taxi services

The Law of 5 July 2016 on the organisation of taxi services which reformed the taxi market in Luxembourg established the 'zero-emission taxi' – defined as a taxi emitting zero CO_2 or NO_x locally, i.e. electric vehicles or vehicles running on hydrogen-powered fuel cells. These are the only taxis which will be granted additional operating licences in the future, thereby helping to achieve urban environmental objectives as imposed by EU legislation in particular as regards limits on NO_x emissions.

3.1.4. Law of 22 December 2006 promoting job retention and laying down special measures in the area of social security and environment policy

The Law of 22 December 2006 promoting job retention and laying down special measures in the area of social security and environment policy introduced a new tax calculation formula for M1 passenger vehicles first registered on or after 1 January 2001. The new calculation formula is such that the amount of tax to be paid increases in proportion to the CO_2 emission value in g/km (as of 90 g/km). Furthermore, vehicles without a diesel engine also benefit from more favourable treatment than those with a diesel engine.

3.1.5. 2017 tax reform

In the context of the planned tax reform for 2017, the Government has approved Bill No 7020A implementing the 2017 tax reform which introduces, in particular, tax incentive measures for purchasing alternative fuel vehicles. The incentive is due to take the form of an allowance for sustainable mobility which may be deducted from taxable income for natural persons in the event of vehicles being purchased which emit noticeably less carbon dioxide (CO_2) and nitrogen oxide (NO_x) than similar vehicles powered mostly by petrol or diesel, or even vehicles which emit nothing at all in the case of zero-emission vehicles.

A tax allowance of €5,000 for zero-emission vehicles will therefore be introduced for private individuals. An allowance of €300 for purchasing bicycles or electrically assisted pedal cycles is also planned.

As part of this reform, the flat-rate incentive for company cars will be staggered in future such that low CO_2 emitting vehicles, in particular 100% electric vehicles and plug-in hybrid vehicles will be treated more favourably than vehicles running on petrol or diesel (Annex 5).

This reform is due to enter into force on 1 January 2017.

3.2. Incentives and financing

3.2.1. Infrastructure deployment and construction measures

Distribution system operators are currently implementing the public infrastructure project comprising 1,600 electric vehicle charging points which will be installed by the end of 2020. The legal basis for this is described in Sections 3.1.1 and 3.1.2. Two European calls for tender were published at the beginning of 2016 (one on the central system and another for the construction of 800 charging stations). A testing phase is also planned for the same year, with entry into service for the general public expected in March 2017.

The Grand-Ducal Regulation (see Section 3.1.2) sets out the timetable with targets regarding the installation of the charging points. Article 5 lays down that by July 2017, at least 50% of park-and-ride facilities must be equipped with charging stations. By July 2019, the target is for at least 80% of operational park-and-ride facilities to be equipped. Moreover, by the end of 2020, all operational park-and-ride facilities should be equipped with charging stations. As regards the deployment of municipal charging stations, Article 6 of the Grand-Ducal Regulation lays down that a minimum network of 100 charging stations must be deployed by July 2017, 240 by July 2019 and 400 by the end of 2020.

Article 7 states that during the entire period of deployment, distribution system operators must endeavour to deploy the public charging stations included in the general installation plan such that they are evenly distributed over time and across the areas covered by their concession.

3.2.2. Research, technological development and demonstration (RTD&D)

The most important project to highlight from among the research, technological development and demonstration projects for alternative fuels currently underway in Luxembourg (Tableau 3-2) is the pilot project being run by the Ministry of Sustainable Development and Infrastructure and Volvo Buses (Section 5.1).

With a view to modernising the bus fleet operated by the Luxembourg Road Passenger Transport System (RGTR), the Ministry of Sustainable Development and Infrastructure has decided to invest in new technology and, more specifically, to deploy plug-in hybrid buses. The project will see 12 buses deployed over a maximum of two phases. Through the project it will be possible to test this new technology on existing regional routes and obtain important information to decide which buses are acquired in future.

Table 3-2: RTD&D investment programmes

		TOTAL INVESTMENT AMOUNT			
Name of programme	**Description**	**2015**	**2016**	**2017**	**2018**
Plug-in hybrid bus route demonstration project	Volvo plug-in hybrid buses will be operated on bus route 26 in Luxembourg City.	€100,000	€1,552,000	€1,052,000	€552,000
OPTILYS	The aim of the CORE 2014 project is to optimise the decomposition of lignocellulose in order to increase the efficiency of biogas plants.	€115,817	€347,450	€347,450	€231,633
EnergyCell	The CORE 2013 project in the field of materials explores	€339,000	€339,000	€84,750	

	coatings for increasing the lifetime of fuel cells.				
LPG for downsized engines	This Eurostars-Eureka project seeks to develop a system for using liquefied petroleum gas in downsized engines and turbo-charged engines (Renault 1.2/1.6 T GDI). In cooperation with the Netherlands.	€571,837	€762,450	€190,612	

3.2.3. Other measures

The incentives for purchasing alternative fuel vehicles as defined in the 2017 Tax Reform Bill (Section3.1.5) are considered a way of promoting alternative fuels. It is believed that the tax allowance and reassessment of the flat-rate tax relief for company cars to take emissions into account will result in more alternative fuel vehicles being bought, thereby enabling the national targets to be met (Annex 5). As these measures take the form of tax allowances and a reassessment of flat-rate tax relief, they do not, by definition, constitute an investment programme. However, by the state forgoing tax revenue, an incentive is created for alternative fuel vehicles to be purchased.

Luxembourg also has another instrument for ensuring that alternative fuels infrastructure is set up. Motorway service stations in Luxembourg are leased by concession contract to fuel retailers. Under those concession contracts, fuel retailers undertake to install and maintain equipment for supplying alternative fuel at the request of the Minister responsible for environmental matters. They must do so by the stipulated deadline and in compliance with the legislation in force, namely the amended Law of 10 June 1999 on classified establishments. This arrangement guarantees that the concession contracts in force can be used to set up the planned alternative fuels infrastructure at service stations.

3.3. Cooperation with other Member States

As Member States must comply with a common framework and minimum requirements for the deployment of a continued network of alternative fuels infrastructure, Article 3(4) of Directive 2014/94/EU lays down that, where necessary, Member States must cooperate, by means of consultations or joint policy frameworks, to ensure that the measures required to achieve the objectives of the Directive are coherent and coordinated.

In terms of the need for regional cooperation, the Grand Duchy of Luxembourg focuses on cooperating with the Benelux countries. Taking into account Benelux Recommendation M(2015)10 regarding cooperation on the deployment of alternative fuels infrastructure[12], signed in October 2015 by the three Benelux countries, the aim of cooperating is to step up the sharing of knowledge and best practice as regards the local deployment of alternative fuels infrastructure by ensuring minimum coverage by the end of 2020, 2025 and 2030.

This Benelux Recommendation focuses in particular on the cross-border aspects of infrastructure deployment. Furthermore, initiatives relating to infrastructure concessions may require neighbouring

[12] Recommendation of the Benelux Committee of Ministers regarding cooperation on the deployment of alternative fuels infrastructure – M(2015)10 http://www.benelux.int/files/4814/4896/9787/Bulletin_2015-5_FR.pdf

countries to cooperate to ensure the coordinated development of sustainable infrastructure, in particular in border regions. Finally, it is necessary to also take interoperability into account and the exchange of information between systems and with citizens in the case of cross-border journeys.

Bearing in mind that Benelux cooperation is coordinated by a Working Group with the support of the Benelux General Secretariat, any opportunity to establish a link with other neighbouring regional projects and to play an enabling role is welcomed. Bringing together different expert networks, legislative incentives or financing possibilities represents a major asset at European level with a view to guaranteeing that strategies are implemented and clean energy provided for all types of transport.

Table 3-4: Cross-border cooperation

	Electricity	**CNG**	**LNG**	**Hydrogen**	**Other**
Belgium	Benelux Recommendation M(2015)10 regarding cooperation on the deployment of alternative fuels infrastructure				
Netherlands	Benelux Recommendation M(2015)10 regarding cooperation on the deployment of alternative fuels infrastructure				

4. Measures for promoting and assisting the deployment of charging points not accessible to the public

At present, no measures or legislation are planned to assist with the deployment of charging points not accessible to the public. Furthermore, the obligation to equip or replace all charging points not accessible to the public in order to ensure they comply with the technical specifications set out in Annex II to Directive 2014/94/EU is not workable for private charging stations.

However, the Grand-Ducal Regulation of 3 December 2015 on public infrastructure associated with electric mobility provides that for public charging infrastructure, distribution system operators must cooperate on a non-discriminatory basis with all public or private persons wishing to set up or operate charging stations at publicly accessible sites with a view to integrating such stations into the shared central management system. These stations must meet the minimum functional and technical characteristics set out in the aforementioned Grand-Ducal Regulation and must be managed via the same shared central system in place for public charging stations.

5. Measures for promoting the deployment of alternative fuels infrastructure for public transport

5.1. Public transport measures

In Luxembourg, road-based public transport is essentially split between four major operators. *Autobus de la Ville de Luxembourg* (AVL) operates public transport in the agglomeration of the capital city, with 31 bus routes. In the south of the country, *Transport Intercommunal de Personnes dans le Canton d'Esch-sur-Alzette* (TICE) operates road transport services between the nine municipalities which form TICE (Dudelange, Differdange, Esch-sur-Alzette, Käerjeng, Kayl, Pétange, Rumelange, Schifflange, Sanem) by means of 14 regular bus routes. Across the rest of the country and along certain cross-border routes, *Régime Général des Transports Routiers* (RGTR) operates a network of 310 bus routes.

The Ministry of Sustainable Development and Infrastructure assists all public transport operators in running a modern fleet. RGTR, under the responsibility of the Ministry of Sustainable Development and Infrastructure, currently already operates some thirty hybrid buses. No financial aid exists. However, the Ministry of Sustainable Development and Infrastructure plays a direct role in financing buses.

As part of the demonstration project between the Ministry of Sustainable Development and Infrastructure and Volvo Buses (see Section 3.2.2), four charging stations – to be constructed in two phases – are needed for the fleet of plug-in hybrid buses. The charging stations are prototypes built by ABB, Volvo's strategic partner. However, all other makes of bus will also be able to access the stations ('open platform').

At the same time, the Ministry of Sustainable Development and Infrastructure is looking to draw on synergies with AVL by introducing electric buses on the Luxembourg City urban network, including the coordinated network operated by RGTR. The aim is that that same charging infrastructure will be used by different bus operators. A similar strategy is intended for the town of Differdange whereby municipal buses will be able to use charging stations designed for RGTR.

The Ministry of Sustainable Development and Infrastructure will play an active role in particular in setting up the bus charging infrastructure. However, the Ministry of Sustainable Development and Infrastructure will also assist TICE in introducing biogas buses.

5.2. National public transport targets

As of 2016, AVL will be introducing plug-in hybrid buses across the Luxembourg City agglomeration to serve the city districts. In the medium term, the plan is to move to 100% electric buses.

Unlike their urban counterparts, most RGTR bus routes entail longer journeys through the different regions of Luxembourg. This is why RGTR is currently operating hybrid buses and plans to operate plug-

in hybrid buses as of 2016 (Section 3.2.2). The latter will operate in particular on bus routes running in regions closer to urban areas so that vehicles operating in those areas are 100% electric and produce zero emissions.

In the south of the country, TICE wishes to continue operating CNG and biogas buses as part of the public transport services provided in the municipalities covered by TICE and to progressively expand the fleet of CNG buses. The number of biogas buses is set to increase from the current fleet of 48 buses to 110 buses.

Table 5-1: Planned number of alternative fuel buses

	Public transport		
Buses and coaches	**2020**	**2025**	**2030**
CNG	110	110	110
LNG	0	0	0
Electric	50	100	150
Hydrogen	/*	/*	/*
Total	**160**	**220**	**270**

* Hydrogen is not part of the national policy framework

6. Infrastructure installed in urban/suburban agglomerations, other densely populated areas and along the road network

6.1. Urban/suburban agglomerations and other densely populated areas

In Luxembourg, the list of urban/suburban agglomerations and other densely populated areas as defined by Directive 2014/94/EU are municipalities covered by the following municipal agreements: 'DICI' (Bertrange, Hesperange, Leudelange, Luxembourg and Strassen), 'Pro-Sud' (Bettembourg, Differdange, Dudelange, Esch-sur-Alzette, Käerjeng, Kayl, Mondercange, Pétange, Rumelange, Sanem and Schifflange), 'Nordstad' (Bettendorf, Colmar Berg, Diekirch, Erpeldange, Ettelbruck and Schieren), 'Airregioun' (Contern, Luxembourg, Niederanven, Sandweiler and Schuttrange) and 'Uelzechtdall' (Lintgen, Lorentzweiler, Mersch, Steinsel and Walferdange). The estimated number of inhabitants in each municipality in 2020, 2025 and 2030 is calculated on the basis of structural data from the Spatial Planning Department of the Ministry of Sustainable Development and Infrastructure and projections by the National Institute for Statistics and Economic Studies (STATEC). By 2025 and 2030, it is estimated that as a result of knock-on effects and the release of new electric cars, a further 200 charging points will have been constructed by each of these years. As these may be financed by private or public operators, it is difficult to predict how they will be distributed. For the purposes of calculating the tables, identical distribution to the distribution of the 1,600 charging points planned for the first phase was assumed.

Table 6-1: Planned number of charging points in urban/suburban agglomerations and other densely populated areas in 2020

2020	Estimated number of	Charging points > 22kW	Charging points ≤ 22kW**	CNG stations	LNG stations
Bertrange	9,075	0	21	0	0
Bettembourg	11,327	0	14	0	0
Diekirch	7,554	0	26	0	0
Differdange	25,289	0	29	0	0
Dudelange	22,262	0	35	0	0

Esch-sur-Alzette	36,694	0	122	0	0
Ettelbruck	9,377	0	32	0	0
Hesperange	17,799	0	25	0	0
Käerjeng	10,860	0	20	0	0
Kayl	8,950	0	8	0	0
Leudelange	3,006	0	13	0	0
Lorentzweiler	4,040	0	10	0	0
Luxembourg	115,029	0	395	1	0
Mamer	8,687	0	22	0	0
Mondercange	7,041	0	11	0	0
Niederanven	6,291	0	24	0	0
Pétange	18,043	0	72	0	0
Rumelange	5,728	0	8	0	0
Sandweiler	4,001	0	12	0	0
Sanem	19,041	0	18	0	0
Schifflange	11,849	0	20	0	0
Steinsel	5,428	0	6	0	0
Strassen	10,930	0	18	0	0
Walferdange	8,382	0	13	0	0

* Data from the Ministry of Sustainable Development and Infrastructure and the National Institute for Statistics and Economic Studies

** Planned number of charging stations under the general installation plan for park-and-ride facilities and municipalities, including additional charging stations

Tableau 6-2 : Planned number of charging points in urban/suburban agglomerations and other densely populated areas in 2025

2025	Estimated number of inhabitants*	Charging points > 22kW	Charging points ≤ 22kW**	CNG stations	LNG stations
Bertrange	9,614	0	25	0	0
Bettembourg	11,999	0	17	0	0
Diekirch	8,002	0	28	0	0
Differdange	26,790	0	33	0	0
Dudelange	23,584	0	40	0	0
Esch-sur-Alzette	38,872	0	135	0	0
Ettelbruck	9,934	0	35	0	0
Hesperange	18,856	0	30	0	0
Käerjeng	11,505	0	23	0	0
Kayl	9,481	0	10	0	0
Leudelange	3,184	0	15	0	0
Lorentzweiler	4,280	0	11	0	0
Luxembourg	12,1858	0	446	1	0
Mamer	9,203	0	25	0	0
Mondercange	7,459	0	13	0	0
Niederanven	6,664	0	28	0	0
Pétange	19,114	0	77	0	0

Rumelange	6,068	0	9	0	0
Sandweiler	4,239	0	14	0	0
Sanem	20,171	0	22	0	0
Schifflange	12,552	0	23	0	0
Steinsel	5,750	0	8	0	0
Strassen	11,579	0	21	0	0
Walferdange	8,880	0	15	0	0

* Data from the Ministry of Sustainable Development and Infrastructure and the National Institute for Statistics and Economic Studies

** Planned number of charging stations under the general installation plan for park-and-ride facilities and municipalities, including additional charging stations

Tableau 6-3 : Planned number of charging points in urban/suburban agglomerations and other densely populated areas in 2030

2030	Estimated number of inhabitants*	Charging points > 22kW	Charging points ≤ 22kW**	CNG stations	LNG stations
Bertrange	10,152	0	32	0	0
Bettembourg	12,672	0	29	0	0
Diekirch	8,451	0	20	0	0
Differdange	28,291	0	30	0	0
Dudelange	24,905	0	37	0	0
Esch-sur-Alzette	41,051	0	45	0	0
Ettelbruck	10,490	0	148	0	0
Hesperange	19,912	0	38	0	0
Käerjeng	12,149	0	35	0	0
Kayl	10,013	0	26	0	0
Leudelange	3,363	0	12	0	0
Lorentzweiler	4,520	0	17	0	0
Luxembourg	12,8686	0	12	1	0
Mamer	9,718	0	497	0	0
Mondercange	7,877	0	28	0	0
Niederanven	7,038	0	15	0	0
Pétange	20,185	0	32	0	0

Rumelange	6,408	0	82	0	0
Sandweiler	4,476	0	10	0	0
Sanem	21,302	0	16	0	0
Schifflange	13,256	0	26	0	0
Steinsel	6,072	0	26	0	0
Strassen	12,228	0	10	0	0
Walferdange	9,377	0	24	0	0

* Data from the Ministry of Sustainable Development and Infrastructure and the National Institute for Statistics and Economic Studies

** Planned number of charging stations under the general installation plan for park-and-ride facilities and municipalities, including additional charging stations

6.2. TEN-T core network

Luxembourg is part of the 'North Sea-Mediterranean' corridor of the TEN-T core network which stretches from Ireland and the north of the United Kingdom through to the Mediterranean Sea in the south of France via the Netherlands, Belgium and Luxembourg (Annex 5).

6.2.1. Charging points

Of the 1,600 charging points ≤ 22kW which must be installed by distribution system operators (Section 2.3), 800 charging points are earmarked for existing park-and-ride facilities and are due to be installed by 2020. The park-and-ride facilities at Windhof (500 bays), Howald-Sud (881 bays), Howald-Fourrière (1100 bays), Mamer-A6 (500 bays), LuxExpo (500 bays), Höhenhof (2500 bays) and Mesenich-frontière (1500 bays) are located close to (< 1 km) motorway slip roads forming part of the 'North Sea-Mediterranean' corridor (A3; A6) and the Luxembourg - Koblenz (A1) connection on the TEN-T core network. A total of 204 charging points (≤ 22 kW) accessible to the public are planned at these park-and-ride facilities by the end of 2020. During the second phase in the development of the Höhenhof park-and-ride facility, an additional 42 charging points will be installed for 2025 and 2030.

In order to encourage long-distance travel by electric vehicle, the installation of rapid charging points at motorway service stations is planned (> 22kW). The six motorway service stations to be equipped with four rapid charging points are all located along the 'North Sea-Mediterranean' corridor on the TEN-T core network.

Tableau 6-4: Planned number of charging points on the TEN-T core network

Corridor name		**2020**	**2025**	**2030**
North Sea-Mediterranean (A3; A6)	Charging points ≤ 22kW (public)	82	82	82
	Charging points > 22kW (public)	8	16	24
Other (A1)	Charging points ≤ 22kW (public)	124	166	166
	Charging points > 22kW (public)	4	4	4

* Only charging points with a direct link to public roads are taken into account (e.g. park-and-ride facilities and motorway service stations).

6.2.2. Natural gas refuelling points

LNG road transport refuelling infrastructure is planned to be in place by 2020 (see Section 2.4). The infrastructure is due to be located in the immediate vicinity of the TEN-T core network so that it can be accessed by heavy goods vehicles in transit.

Tableau 6-5: Planned number of liquefied natural gas refuelling points on the TEN-T core network

Corridor name		2020	2025
North Sea-Mediterranean	LNG	1	1

6.2.3. Hydrogen refuelling points

Hydrogen is not part of the national policy framework.

6.3. Outside of the TEN-T core network

6.3.1. Charging points

Of the 1,600 charging points ≤ 22kW which must be installed by distribution system operators (Section 2.3), 800 charging points are earmarked for existing park-and-ride facilities and are due to be installed by 2020. The park-and-ride facilities at Frisange-Est (268 bays) and Frisange-Ouest (500 bays) are located on the TEN-T comprehensive network. 22 publicly accessible charging points ≤ 22kW are planned by the end of 2020. At present, no additional regular charging points are planned for 2025 or 2030.

Tableau 6-6: Planned number of charging points on the TEN-T comprehensive network

Road No		2020	2025	2030
A13	Charging points ≤ 22kW (public)	22	22	22
	Charging points > 22kW (public)	0	0	0

6.3.2. Natural gas refuelling points

No CNG refuelling points are planned on the TEN-T comprehensive network.

Tableau 6-7: Planned number of natural gas refuelling points on the TEN-T comprehensive network

Road No		2020	2025
A13	CNG	0	0

6.3.3. Hydrogen refuelling points

Hydrogen is not part of the national policy framework.

6.4. Other types of public road

6.4.1. Charging points

Of the 1,600 charging points ≤ 22kW which must be installed by distribution system operators (Section 2.3), 800 charging points are earmarked for existing park-and-ride facilities. The other charging points have been allocated to various municipalities which may choose which parking spaces they install them at in line with public interest. Consequently, 118 charging points ≤ 22kW will be installed at park-and-ride facilities outside of agglomerations and the TEN-T network by 2020, with most at carparks located near railway stations. 286 charging points are due to be installed in rural municipalities.

By 2025 and 2030, it is estimated that an additional 200 charging points will be installed during each of the two phases. As these may be financed by private or public municipal operators, it is difficult to

predict how they will be distributed. For the purposes of calculating the tables, identical distribution to the distribution of the 1,600 charging points planned for the first phase was assumed.

Tableau 6-8: Planned number of charging points outside of the TEN-T network, urban/suburban agglomerations and other densely populated areas

Infrastructure		**2020**	**2025**	**2030**
Park-and-ride facilities	Charging points ≤ 22kW (public)	118	158	158
Public roads (municipalities)	Charging points ≤ 22kW (public)	286	357	428

7. LNG refuelling points at maritime and inland ports on the TEN-T core network

7.1. Maritime ports on the TEN-T core network

There are no maritime ports in Luxembourg.

7.2. Inland ports on the TEN-T core network

As LNG vessels have considerable range, LNG refuelling infrastructure at the Port of Mertert is not considered viable. The decision has therefore been taken not to install LNG infrastructure in Luxembourg for vessels operating on the Moselle. LNG vessels are able make a return journey between the Port of Rotterdam and the Port of Basel without needing to refuel with LNG. Any refuelling would take the form of 'ship-to-ship' or 'tank-to-ship' refuelling in individual instances where required at the Port of Mertert.

Tableau 7-1: Refuelling points at inland ports on the TEN-T core network

PORT NAME	**2020**	**2025**	**2030**
Port of Mertert	0	0	0

8. LNG refuelling points at maritime and inland ports outside of the TEN-T core network

8.1. Maritime ports on the TEN-T core network

No maritime ports on the TEN-T core network are located in Luxembourg.

8.2. Maritime ports outside of the TEN-T core network

No maritime ports outside of the TEN-T core network are located in Luxembourg.

9. On-shore power sources at maritime and inland ports

9.1. Maritime ports on the TEN-T core network

No maritime ports on the TEN-T core network are located in Luxembourg.

9.2. Maritime ports outside of the TEN-T core network

No maritime ports outside of the TEN-T core network are located in Luxembourg.

9.3. Inland ports on the TEN-T core network

The Port of Mertert, which is part of the TEN-T Core Network, currently has no on-shore electric power sources in place for inland waterway vessels. It was observed as part of an assessment carried out in the context of the national policy framework that demand for such on-shore electric power sources for inland waterway vessels was limited and that the installation cost would be disproportionate to the benefits they would bring. Consequently, no on-shore electric power sources are planned until 2025.

Tableau 9-1: On-shore power sources at inland ports on the TEN-T core network

Port name	**2020**	**2025**
Port of Mertert	0	0

9.4. Inland ports outside of the TEN-T core network

No inland ports outside of the TEN-T core network are located in Luxembourg.

10. Electric power sources for stationary aircraft

10.1. Airports on the TEN-T core network

Luxembourg Airport is part of the TEN-T core network and currently has 24 electric power sources for stationary aircraft. Four additional 'static power' sources are already in the pipeline as part of the extension to apron P7, planned for 2017-2018. At present, no other sources are planned. Once Terminal B enters into service in 2017, it will be used by most aircraft. This will result in considerably less use of ground power units (diesel engines linked to 115 V 400 Hz generators). The policy at Luxembourg Airport is to request that all operators shut down their auxiliary power units (small turbine mounted to the tail of an aircraft and connected to a 115 V 400 Hz generator) and connect to an electric 'static power' source or ground power unit.

Tableau 10-1: Electric power sources at airports on the TEN-T core network

AIRPORT NAME	**2020**
Luxembourg Airport	28

10.2. Airports outside of the TEN-T core network

No airports outside of the TEN-T core network are located in Luxembourg.

Annex1: General installation plan – Table of park-and-ride facilities where charging stations are to be installed

Annex 1: Distribution of public charging stations at park-and-ride facilities						
				Partners		
Corridor	Location of park-and-ride facility	Area type	Mode transfer	Site manager	Distribution system operator (DSO)	No of charging stations
A	Echtemach	Border	Bus	Echternach	Creos	7
	Junglinster-Contournement	Rural	Bus	APC	Creos	3
						10
B	Wasserbillig- Gare	Border	Train	CFL	Creos	5
	Mesenich-Frontière	Border	Bus	APC	Creos	21
	Grevenmacher	Border	Bus	Grevenmacher	Creos	1
	Wecker	Rural	Train	CFL	Creos	1
	Roodt-Syre	Rural	Train	CFL	Creos	1
	Munsbach	Rural	Train	CFL	Creos	1
	Höhenhof	Urban	Bus/Tram	APC	Creos	55
	Kirchberg	Urban	Bus	FUAK	Creos	7
						92
C	Oetrange	Rural	Train	CFL	Creos	1
	Sandweiler/Contern	Rural	Train	CFL	Creos	1
						2
D	Frisange-Est	Border	Bus	APC	Creos	4
	Frisange-Ouest	Border	Bus	APC	Creos	7
						11
E	Dudelange-Usines	Border	Train	CFL	Creos	1
	Dudelange-Centre	Border	Train	Dudelange	Creos	2
	Dudelange-Ville	Border	Train	CFL	Creos	2
	Rumelange	Border	Train	CFL	Creos	2
	Kayl	Border	Train	CFL	Creos	1
	Bettembourg	Rural	Train	CFL	Creos	15
	Berchem	Rural	Train	CFL	Creos	2
	Kockelscheuer	Urban	Bus	VDL	Creos	3
	Howald-Sud	Urban	Bus	VDL	Creos	12
	Howald-Fourrière	Urban	Bus	APC	Creos	15
						60
F	Belval-Université	Border	Train	CFL	Creos	33
	Schifflange	Rural	Train	CFL	Creos	2
	Cloche d'Or	Urban	Bus/Tram	APC	Creos	28
	Bouillon	Urban	Bus	Luxembourg	Creos	34
						97
G	Differdange	Border	Train	Differdange	Creos	4
	Rodange	Border	Train	CFL	Creos	22
	Pétange-Nord	Border	Train	CFL	Creos	4
	Pétange-Sud	Border	Train	Pétange	Creos	1
	Bascharage-Sanem	Rural	Train	CFL	Creos	3
	Dippach-Reckange	Rural	Train	CFL	Creos	7
	Leudelange-Gare	Rural	Train	CFL	Creos	1
						42
H	Steinfort	Border	Bus	APC	Creos	3
	Kleinbettingen	Border	Train	CFL	Creos	2
	Windhof	Border	Train	APC	Creos	7
	Capellen	Rural	Train	CFL	Creos	1
	Mamer-A6	Rural	Bus	APC	Creos	7
	Mamer-Gare	Rural	Train	CFL	Creos	1
	Bertrange-Strassen	Urban	Train	CFL	Creos	1
						22
I	Schwebach-Pont	Rural	**Bus**	APC	Creos	2
	Quatre-Vents	Rural	**Bus**	APC	Creos	2
						4
J	Troisvierges	Border	Train	CFL	Creos	3
	Clervaux	Rural	Train	CFL	Creos	4
	Wilwerwiltz	Rural	Train	CFL	Creos	1
	Wiltz	Rural	Train	CFL	Creos	3
	Kautenbach	Rural	Train	CFL	Creos	1
	Diekirch	Rural	Train	CFL/Diekirch	Diekirch Town	5
	Ettelbruck	Rural	Train	APC	Ettelbruck Town	7
	Schieren	Rural	Train	CFL	Creos	1
	Colmar-Berg	Rural	Train	CFL	Creos	10
	Mersch-Gare	Rural	Train	CFL	Electris	5
	Mersch-Impasse Kayser	Rural	Train	APC	Electris	2
	Mersch-Rond-Point	Rural	Train	APC	Electris	1
	Lintgen	Rural	Train	CFL	Creos	2
	Lorentzweiler	Rural	Train	CFL	Creos	2
	Walferdange	Urban	Train	CFL	Creos	1
	Beggen	Urban	**Bus**	VDL	Creos	2
	Dommeldange	Urban	Train	CFL	Creos	1
	Gare Centrale	Urban	Train	CFL	Creos	9
						60
	COUNTRY TOTAL					**400**

Annex2: General installation plan – Table of electric charging stations at public parking bays by municipality

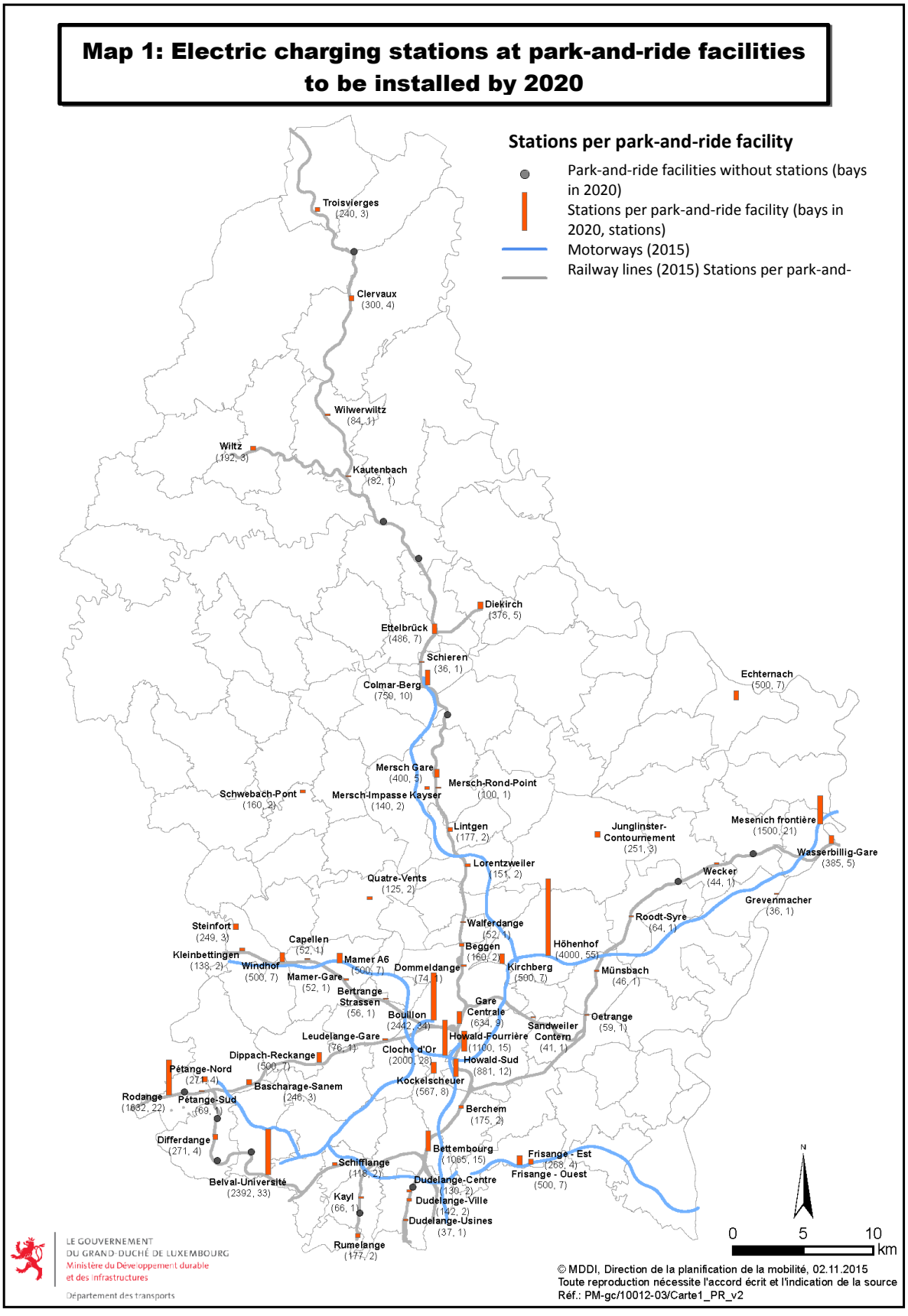
Annex 2: Distribution of public charging stations at public carparks and municipal public parking bays

Development region		Municipality	Distribution system operator (DSO)	No of charging stations
DICI VDL		Luxembourg	Creos	102
		Hesperange	Creos	10
		Strassen	Creos	7
		Bertrange	Creos	7
		Leudelange	Creos	4
				130
REGION SUD		Käerjeng	Creos	6
		*Belval**	*Creos/Sudstroum*	10
		Bettembourg	Creos	6
		Differdange	Creos	8
		Dudelange	Creos	10
		Esch-sur-Alzette	Sudstroum	17
		Kayl	Creos	3
		Mondercange	Creos	*5*
		Pétange	Creos	9
		Rumelange	Creos	2
		Sanem	Creos	9
		Schifflange	Creos	*5*
				90
NORDSTAD		Bettendorf	Creos	1
		Colmar-Berg	Creos	3
		Diekirch	Diekirch Town	4
		Erpeldange-sur-Sûre	Creos	2
		Ettelbruck	Ettelbruck Town	*5*
		Schieren	Creos	1
				16
VALLEE DE DALZETTE		Lintgen	Creos	1
		Lorentzweiler	Creos	2
		Mersch	Electris	5
		Steinsel	Creos	3
		Walferdange	Creos	4
				15
AIRREGIOUN		Contem	Creos	4
		Niederanven	Creos	8
		Sandweiler	Creos	4
		Schuttrange	Creos	4
				20
Rest of the country	Marner Steinfort	Dippach	Creos	3
		Hobscheid	Creos	2
		Kehlen	Creos	4
		Koerich	Creos	2
		Kopstal	Creos	2
		Septfontaines	Creos	1
		Steinfort	Creos	3
		Garnich	Creos	1
		Marner	Creos	7
		Reckange-sur-Mess	Creos	2
				27
	Clervaux	Clervaux	Creos	3
		Parc Hosingen	Creos	2
		Troisvierges	Creos	2
		Weiswampach	Creos	1
		Wincrange	Creos	3
				11
	Echternach	Beaufort	Creos	1
		Bech	Creos	1
		Berdorf	Creos	1
		Consdorf	Creos	1
		Echternach	Creos	4
		Mompach	Creos	1
		Rosport	Creos	1
		Waldbillig	Creos	1
				11
	Grevenmacher	Betzdorf	Creos	3
		Biwer	Creos	1
		Flaxweiler	Creos	1
		Grevenmacher	Creos	4
		Mantemach	Creos	1
		Mertert	Creos	3
		Wormeldange	Creos	2
				15
	Junglinster	Junglinster	Creos	3
		Fischbach	Creos	1
		Heffingen	Creos	1
		Larochette	Creos	1
		Nommem	Creos	1
				7

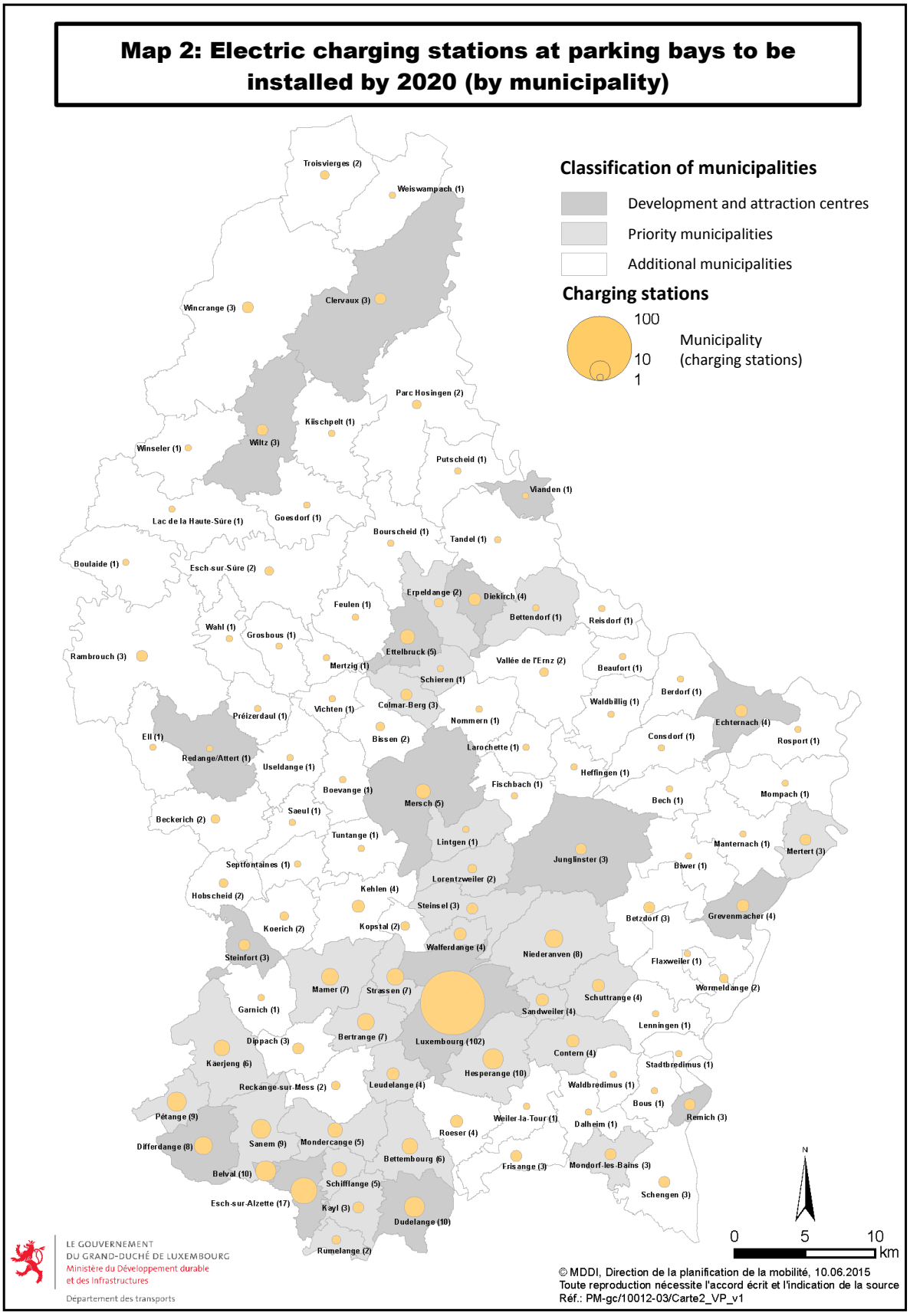
Development region		Municipality	Distribution system operator (DSO)	No of charging stations
Rest of the country	Redange	Beckerich	Creos	2
		Ell	Creos	1
		Grosbous	Creos	1
		Préizerdaul	Creos	1
		Rambrouch	Creos	3
		Redange-sur-Attert	Creos	1
		Saeul	Creos	1
		Useldange	Creos	1
		Vichten	Creos	1
		Wahl	Creos	1
		Bissen	Creos	2
		Boevange-sur-Attert	Creos	1
		Tuntange	Creos	1
				17
	Remich Mondorf-les-Bains	Bous	Creos	1
		Dalheim	Creos	1
		Lenningen	Creos	1
		Frisange	Creos	3
		Roeser		*4*
		Weiler-la-Tour	Creos	1
		Mondorf-les-Bains	Creos	3
		Remich	Creos	3
		Schengen	Creos	3
		Stadtbredimus	Creos	1
		Waldbredimus	Creos	1
				22
	Wiltz	Boulaide	Creos	1
		Esch-sur-Sûre	Creos	2
		Goesdorf	Creos	1
		Kiischpelt	Creos	1
		Lac de la Haute-Sûre	Creos	1
		Wiltz	Creos	3
		Winseler	Creos	1
		Mertzig	Creos	1
		Bourscheid	Creos	1
		Feulen	Creos	1
				13
	Vianden	Putscheid	Creos	1
		Tandel	Creos	1
		Vianden	Creos	1
		Reisdorf	Creos	1
		Vallée de l'Ernz	Creos	2
				6
COUNTRY TOTAL				**400**

* Belval is considered a separate entity to the municipalities of Sanem and Esch-sur-Alzette

Annex 3: General installation plan – Map of park-and-ride facilities where charging stations are to be installed



Annex4: General installation plan – Map of electric charging stations at public parking bays by municipality



Annex 5: 2017 tax reform – incentives for purchasing alternative fuel vehicles

2017 TAX REFORM — For sustainable transport

Tax reform for sustainable transport

Introduction of a new tax allowance for zero-emission passenger vehicles

Electric

€5,000

Hydrogen

Bicycle

€300

Electric bicycle

Reassessment of flat-rate tax relief for company cars

Leasing

CO_2 emissions categories	Current situation	Reform			New concept
	All CO_2 emissions categories and types of engine power combined	Percentage of vehicle value (new VAT included)/M1 category vehicles)			Percentage of bicycle or electric bicycle value
		Vehicles powered by petrol (only or hybrid) or by compressed natural gas (CNG)	Vehicles powered byt diesel (only or hybrid)	100% electric or hydrogen-powered vehicles	Bicycles within the meaning of the Highway Code (bicycles or electric bicycles)
0 g/km	1.5			0.5	0.5
>0-50 g/km	1.5	0.8	1.0		
>50-110 g/km	1.5	1.0	1.2		
>110-150 g/km	1.5	1.3	1.5		
> 150 g/km	1.5	1.7	1.8		

Factor of +0.2% for diesel vehicles with a minimum rate of 1.8%

In parallel

800 new public charging stations for electric vehicles by 2020

Annex 6: TEN-T network corridors