National policy framework for the development of alternative fuels in the transport sector and deployment of the relevant infrastructure

Adopted under Directive 2014/94/EU of 22 October 2014 on the deployment of alternative fuels infrastructure

1. Introduction

This document is the national policy framework for the development of alternative fuels in the transport sector and deployment of the relevant infrastructure, adopted by France under Directive 2014/94/EU of 22 October 2014 on the deployment of alternative fuels infrastructure.

Alternative fuels are defined as fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector. They include, inter alia, electricity, natural gas in gaseous or liquefied form, biofuels, liquefied petroleum gas, hydrogen, and synthetic and paraffinic fuels.

This document forms part of the commitments made by France globally through the implementation of the Paris Agreement on climate change, at EU level in terms of the European Union's efforts to combat climate change and reduce the transport sector's dependence on oil, and at national level in terms of the objectives set by Law No 2015-992 of 17 August 2015 on the energy transition for green growth, namely:

- reduce greenhouse gas emissions by 40% between 1990 and 2030 and by 75% between 1990 and 2050;
- reduce final energy consumption by 50% by 2050 compared to the 2012 reference year, with an intermediate target of 20% by 2030;
- reduce primary energy consumption of fossil fuels by 30% by 2030 compared to the 2012 reference year, with this target being modulated for each fossil fuel according to its greenhouse gas emission factor;
- increase the share of renewable energy to 23% of gross final energy consumption by 2020 and to 32% by 2030. In 2030, renewable energy must account for 15% of final fuel consumption and 10% of gas consumption.

It is one of the actions included in France's clean mobility development strategy (*stratégie de développement de la mobilité propre* – SDMP), which is annexed to the multi-year energy programme (*programmation pluriannuelle de l'énergie* – PPE). This strategy was drawn up pursuant to Article 40 of the Law on the energy transition for green growth.

The SDMP identifies six levers for developing clean mobility:

- managing demand for mobility;
- developing low-emission vehicles;
- developing the alternative fuels market and deploying the relevant infrastructure;
- optimising existing vehicles and networks;
- improving modal shifts;
- developing collaborative modes of transport.

This strategy, which includes development of an alternative fuel market and deployment of the relevant infrastructure, has undergone a strategic environmental assessment to ensure that the environmental impact is taken into account when actions are defined.

The ambitions of the national policy framework (SDMP action, p. 36) are to develop a network of alternative fuel recharging or refuelling infrastructure and to ensure the long-term security needed for investments in alternative fuel and vehicle technologies. It aims, firstly, to limit as far as possible the dependence of transport on oil by diversifying the power sources used in transport and, secondly, to mitigate the environmental impact of travel by helping to develop clean, low-emission mobility. It forms part of the government's efforts to diversify the

energy mix in the transport sector, whatever the mode of transport, in particular by promoting electromobility, NGV and bio-NGV, biofuels, LPG and bio-LPG.

The national policy framework was established using, firstly, the work carried out to prepare the clean mobility development strategy referred to above and, secondly, a consultation process involving all the relevant stakeholders (transport operators, manufacturers, distributors, environmental protection associations, local communities) during the various stages of drawing up the document.

The second part of the national policy framework reviews the current situation as regards the alternative fuel market and the relevant infrastructure.

The third part sets out all the different measures that already exist or are under development (legislative and regulatory, incentive, informative) and that directly or indirectly encourage the deployment of alternative fuels and relevant infrastructure. These measures are described in the annex to the document.

The fourth part sets targets for:

- electric recharging networks, in accordance with Article 4 of the Directive;
- natural gas refuelling networks, in accordance with Article 6 of the Directive;
- hydrogen refuelling networks, solely on the basis of the number of existing and planned refuelling stations.

These targets are based on measures that already exist or are being developed. They are in line with expected coordinated infrastructure development and take account of various uncertainties in terms of macro-economics (energy prices, growth rates, etc.) and technology (alternative fuel vehicle technologies, pollutant emission reduction technologies, etc.) or linked to changes in mobility behaviour (level of future demand, share of individual motorised mobility, etc.). They also take account of previous feedback so as to minimise the economic risks while encouraging forward planning by private operators in terms of investment in alternative fuels. Lastly, the targets for electric recharging and natural gas refuelling road networks accessible to the public have been set in view of the correlation between:

- expected recharging or refuelling infrastructure development;
- the results of a technical approach based on the concept of physical accessibility to recharging or refuelling points;
- the results of market and fuel development projections conducted by economic operators.

The final part of the national policy framework concerns the arrangements for monitoring the alternative fuel market and the deployment of relevant infrastructure. The progress achieved in developing alternative fuels and infrastructure will be assessed by 2019, which will allow the targets set by this national policy framework and the measures required to achieve them to be updated as necessary.

The annex contains detailed technical, statistical and/or reference information.

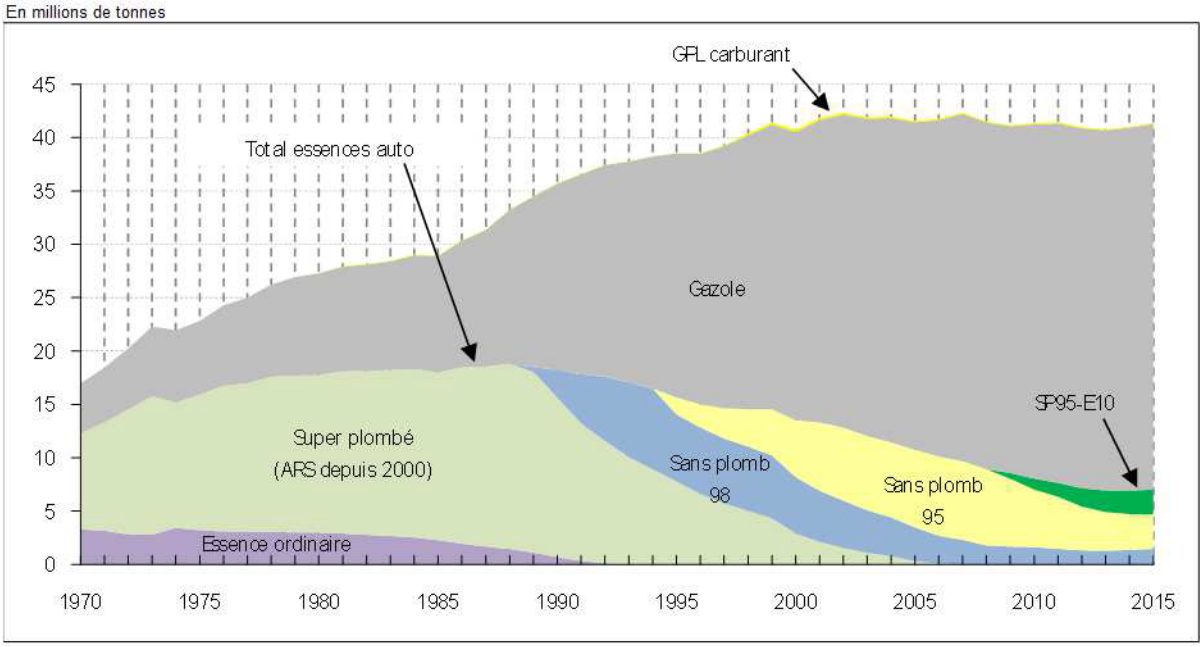
2. Current situation of alternative fuels in the transport sector

2.1. Introduction

In 2015, final energy consumption in the transport sector in France (excluding bunkers) totalled 49.4 Mtoe. After a period of steep increase between 1985 and 2002 (+2.4% a year on average), it declined gradually, at an average rate of -0.2% a year between 2003 and 2014. A growing fleet of diesel-powered vehicles and the improved energy performance of engines helped bring about this downward trend in energy consumption by transport.

However, it is now on the rise again, for a second consecutive year, due in particular to increased transport consumption by households (+2.4%), associated with falling oil prices and renewed growth. Final energy consumption in the transport sector accounts for nearly three-quarters of the final overall consumption of oil products (petrol, diesel, part of LPG, jet fuel, excluding incorporated biofuels), which stands at 45.4 Mtoe and has been slowly increasing since 2013. Half of the remainder is used by air transport, with the rest being split between rail, inland waterway and coastal transport[1].

In 2015, domestic passenger transport grew significantly (+2.1%), at a much higher rate than the annual average since 2010 (+0.8%), due to increased travel in private vehicles (+2.4%), which accounts for around 80% of such transport. The increase in 2015 was fuelled by the sharp rise in vehicle purchases by households (+5.8% by volume). Purchases of new cars rose by 6.8% after four consecutive years of decline between 2010 and 2013. These concerned, in particular, petrol cars or alternative fuel cars, which accounted for 4.1% of registrations in 2015[2].



Source : calculs SOeS, d'après Comité professionnel du pétrole (CPDP)

Figure 1 - Trend in total consumption of road fuels (including biofuels) Extracted from the SOeS [French observation and statistics department] 'Énergie, bilan 2015: chute de la facture - Juillet 2016' publication

[1] Datalab - Essentiel No 17 - July 2016 - 'Énergie, bilan 2015: chute de la facture'.

[2] Datalab - Essentiel No 23 - August 2016 - 'Transport en 2015 : plus de voyageurs, moins de marchandises, un peu plus de GES'

[Key to figure:]	
En millions de tonnes	In millions of tonnes
GPL carburant	LPG
Total essences auto	All petrol
Gazole	Diesel
Super plombé (ARS depuis 2000)	Super leaded (ARS [petrol with additive to improve resistance to valve burn-out] since 2000)
Sans plomb	Unleaded
SP95-E10	SP95-E10 [mix of 90% SP95 petrol and 10% ethanol]
Essence ordinaire	Ordinary petrol
Source : calculs SOeS, d'après Comité professionnel du pétrole (CPDP)	Source: SOeS calculations, according to the Comité professionnel du pétrole (CPDP) [French oil committee]

Overall, the energy mix in the transport sector remained stable in 2014: 92% for oil products, 5.5% for renewable energies, 2.2% for electricity and a negligible share for the consumption of natural gas.

2.2. Electricity

2.2.1. Electricity for road vehicles

In France, electromobility is growing, driven by developments in the plug-in electric vehicle market and the installation of recharging points accessible to the public across the country.

Plug-in electric vehicle market

Although the number of plug-in electric vehicles (electric or plug-in hybrid electric) in France remains limited compared to the total number of road vehicles, the plug-in electric vehicle market has grown steadily in recent years.

At the end of 2015, the number of plug-in electric vehicles in use was estimated at around 85 000 vehicles, mainly light-duty vehicles, accounting for around 0.2% of the total number of road vehicles[3].

Table 1 - Number of electric or plug-in hybrid electric vehicles as at 31 December 2015

Electric passenger cars	42 893
Plug-in hybrid electric passenger cars	9 230
Electric light-duty commercial vehicles	25 376
Plug-in hybrid electric light-duty commercial vehicles	33
Electric or plug-in hybrid electric heavy-duty vehicles	96
Plug-in hybrid electric heavy-duty vehicles	5
Electric buses	354
Plug-in hybrid electric buses	101
Electric two-wheeled vehicles	7 372
Plug-in hybrid electric two-wheeled vehicles	approx. 90
Total	**85 550**

(Source: SOeS)

[3] The total number of road vehicles is estimated at around 38 million units (source: SOeS).

The number of plug-in electric vehicles registered each year has steadily increased from 980 registrations in 2010 to 27 227 in 2015, of which 22 187 were electric vehicles, corresponding to nearly 1% of registrations per year[4]. In 2015, France was therefore the leading electric vehicle market in the European Union, ahead of Germany, and second in Europe, behind Norway[5].

In 2016, the electric vehicle market in France has continued to grow strongly: with 7 278 electric vehicles registered in the first quarter of 2016 (1.2% of all registrations in that period), France has become the leading market in Europe, ahead of Norway[6]. As part of the clean mobility development strategy, France has set itself a target of 2.4 million electric vehicles and plug-in hybrid electric vehicles by 2023 (passenger cars and light-duty commercial vehicles with a payload of less than one tonne).

The growth in the plug-in electric vehicle market in France is due to incentive measures aimed at expanding clean mobility, which are expected to accelerate the current trend. For example, electric or plug-in hybrid electric vehicles benefit from a subsidy scheme for the purchase and leasing of less polluting vehicles (up to a maximum of €10 000 per vehicle) and the obligation to replace public fleets with more environmentally friendly vehicles.

Within a few years, technological progress in energy storage is expected to halve the cost of batteries, which is one of the main cost items in plug-in electric vehicles, or to increase the range of electric vehicles (up to 400 km), thus reducing the current constraints on their use. These technological developments are expected to help expand electromobility, as electric or plug-in hybrid electric passenger cars become affordable and practical to use for everyone.

Recharging infrastructure

The development of recharging infrastructure is a necessary prerequisite for the development of electromobility.

Current use shows that most recharging is private, taking place at home or at work. There are therefore incentives in place for the installation of private recharging points: a recharging system at home benefits from a tax break (tax credit of 30% of the cost) or is supported through the Advenir programme. Numerous other measures have been adopted since 2011 to encourage the installation of recharging terminals at home or at work. Their general aim is for pre-fitting work (installation of ducts, general electrical installations, etc.) as well as the installation of the actual recharging points, to be carried when this can be done at the lowest possible cost, in particular during construction or when existing car parks are undergoing major works.

To supplement private recharging (at home or at work), recharging infrastructure accessible to the public must also be developed. This is to ensure that users who do not have access to a private recharging point will be able to access electromobility, and to give all users assurance of safe travel without fear of becoming stranded. It is also about increasing the range of electric vehicles by offering the option of intermediate recharges between the start and the end of a journey.

Work to equip the national territory with recharging points accessible to the public, including on interurban roads, has already started and will continue.

[4] Source: Avere-France [French association for the development of electromobility] / AAA [French data company].
[5] Registrations of electric vehicles in 2015: 13 381 in Germany, 26 757 in Norway (source: Avere-France / Renault / AAA).
[6] In the first quarter of 2016, 6 622 electric vehicles were registered in Norway (source: Avere-France / Renault / AAA).

At the end of 2015, the total number of recharging points accessible to the public was 11 281, of which 10 813 normal power recharging points and 468 rapid recharging points[7]. In terms of recharging points accessible to the public, France is in third place in Europe, behind Germany and the Netherlands, but ahead of the United Kingdom and Norway[8].

Table 2 - Number of recharging points accessible to the public as at 31 December 2015

Number of normal power recharging points	10 813
Number of rapid recharging points	468
Total	**11 281**

(Source: AVERE-GIREVE [French group promoting the availability of vehicle recharging points])

All departments in metropolitan France are equipped with recharging points accessible to the public. At the end of 2015 each French department had, on average, approximately 1 public recharging point per 10 000 inhabitants. Some departments are leading the way in deploying recharging networks, with more than 2 public recharging points per 10 000 inhabitants already available. This was particularly the case, at the end of 2015, for several departments of Ile-de-France, Rhône, Vendée, Gironde, Eure-et-Loir and Indre-et-Loire. Conversely, around 30 French departments have less than half the average number[9].

As regards interurban roads, the Corri-Door project, co-financed by the European Union, has already led to the installation of over 180 public rapid recharging points (200 terminals will have been installed by the end of the project), located around 80 km apart on the motorway networks operated by the SANEF, APRR, Vinci Autoroutes and ATLANDES groups and on the outskirts of towns and cities[10]. The CNR project is also worth mentioning (see the annexed list of measures), along with stores such as Ikea or Auchan that are installing rapid charging across a national network. Numerous local communities have also installed rapid recharging points on the main roads in their territory.

The development of rapid recharging, where the aim is to recharge a vehicle as quickly as possible, may require impact and installation studies and, in certain cases, reinforcement of electricity grids to allow the supply of potentially very large amounts of power. As the capacity of batteries increases, it will in fact become necessary to deploy rapid or even ultra-rapid recharging terminals, allowing vehicles to regain a long range (in the order of 500 km) in around 20 minutes. The Combined Charging System (CCS) international standard is working on 350 kW recharging terminals to achieve this. Clusters of recharging terminals offering power at this scale may result in huge power demands on electricity grids[11].

2.2.2. Shore-side electricity supply in maritime and inland ports

The purpose of shore-side electricity is to reduce the pollution of coastal and inland areas caused by auxiliary engines of vessels when in port. The energy needs of vessels (heating, lighting, refrigeration, handling, ballast pumps, etc.) can be met by allowing them to be connected to a shore-side electricity system (or other alternative technological solutions, see

[7] A normal power recharging point has a maximum power of 22 kW or less, whilst a rapid recharging point has a maximum power of more than 22 kW.
[8] Source: European Alternative Fuels Observatory (www.eafo.eu, consulted in July 2016). According to the EAFO, on the date of consultation, the number of recharging points was: 23 475 in the Netherlands, 14 148 in Germany, 13 434 in France, 11 480 in the United Kingdom and 7 652 in Norway.
[9] Source: authors' calculation based on Gireve and INSEE [French national institute for statistics and economic research] data.
[10] Source: Gireve with regard to the current situation (Sodetrel terminals), www.corri-door.com for the Corri-Door network.
[11] Source: 'Intégration des véhicules rechargeables dans les réseaux électriques', Afnor, June 2016

Annex 6.3). The issue of air quality in ports, which are often located close to urban areas, is a major public health challenge. In addition to improving air quality, shore-side electricity eliminates the noise pollution and vibrations caused by auxiliary engines.

However, providing shore-side electricity supply services is not an obligation, and there are competing technological solutions (LNG, fume scrubbers, etc.) that allow vessels to comply with the applicable European and international standards. Furthermore, for vessels and maritime ports, the lack of international standardisation of shore-side electricity connection systems has long acted as a brake on projects of this kind[12], as have the investments required to install the facilities (on board and ashore) that can amount to several millions of euros with only a limited business case, or none at all, depending on the price of marine fuel.

Current demand for shore-side electricity is therefore limited, with considerable uncertainty about the market potential. As a result, at the moment only one French maritime port (Marseille-Fos) offers a high-power electricity connection (in excess of 1 MVA), intended for merchant vessels when in port. Since 2016, three RoPax vessels (vehicles and passengers) operating between Marseille and Corsica have been adapted to be able to use the electricity supply offered by the port, which has invested in its electrical facilities so that it can provide the power and voltage required by these vessels.

Furthermore, several maritime ports (such as Marseille, Nantes and Bordeaux) already offer – or will do so very shortly – a shore-side electricity supply service for vessels in port for long periods (overwintering and ship repair). The lower energy requirements of this type of stopover allow vessels to be connected directly to the low-voltage distribution system. The port of Brest is looking into electricity supply options for vessels undergoing repair and for cruise ships, and the ports of Le Havre and Bordeaux offer a low-voltage electricity supply for dredgers operating in these ports.

However, nearly all the French commercial maritime ports that belong to the TEN-T core network[13] have conducted consultations and/or local studies on this issue, with the development of shore-side electricity forming an integral part of their strategy for developing more environmentally friendly activities. There are therefore potentially considerable prospects for development, but the economic cost of equipping vessels and quays is a major problem to which solutions will need to be found in order to persuade economic operators to invest.

For inland waterway transport and inland ports, the challenges are different as, firstly, the energy needs of vessels are lower – the power requirements of motor boats allow them to be directly connected to the low-voltage system[14] – and, secondly, compared to maritime traffic, reducing or even eliminating the noise pollution caused by vessels when in port, sometimes in the heart of a city, is often a more pressing social issue. Other important factors include the frequency and regularity with which vessels use the same quay at a port and the homogeneity of facilities in all the ports used.

Currently, in France, shore-side electricity supply terminals for inland waterway vessels are available in the municipality of Andelys (Normandy), at the ports of Lyon and Gennevilliers, and in the river basin of the Nord and Pas-de-Calais departments, which has around 60 electricity supply terminals. Several projects are also being considered at sites managed by the port of Paris. Moreover, over the next few months Haropa and VNF are expected to complete the installation of a harmonised shore-side electricity supply service along the Seine, intended for inland goods transport vessels.

[12] The IEC/ISO/IEEE 80005-1 standard now lays down the technical specifications for the shore-side electricity supply of vessels.
[13] Marseilles, Le Havre, Dunkirk, Nantes, Rouen, La Rochelle, Bordeaux and Calais.
[14] A distinction should be made between motor boats with power requirements of around 50 kW and river cruise ships with power requirements in excess of 250 kW that need to be connected to the MV or ‘medium voltage’ system.

2.2.3. Electricity supply for use by stationary airplanes

Numerous airports belonging to the TEN-T core network are subject to regulations or recommendations on the maximum periods auxiliary power units (APUs) can be used. These rules are intended to encourage airport operators to provide alternative means to the use of APUs.

Irrespective of these rules, it is clear that airports are firmly committed to a policy of gradually providing alternative means to the use of APUs. As a result, the main French airports are already equipped with fixed or mobile alternative means to the use of APUs.

The current level of provision of such alternative means varies by airport included in the core network list. The vast majority of airports have 400 Hertz connections for aircraft stands forming part of the terminals, mainly:

- Paris-Charles de Gaulle: 275 stands equipped out of 364;
- Paris-Orly: 91 out of 127;
- Lyon: 70 out of 112;
- Nice: 26 out of 66;
- Lille: 6 out of 12;
- Toulouse: 17 out of 31;
- Marseille: 19 out of 35.

However, for various reasons, air-conditioning facilities are less developed (for example, air conditioning is available at 16 aircraft stands out of the 364 at Paris-Charles de Gaulle).

Many airports have also chosen to provide mobile alternative means, a choice which may have been guided by technical and/or operational constraints preventing the installation of 400 Hertz connections at all stands.

The use of mobile alternative means, although fuelled by diesel, is still less polluting than using APUs. They also have the advantage of not blocking up stands, and can be used at different stands as necessary. The use of electric mobile alternative means is currently being considered at certain airports.

Overall, the sector is aware of the importance of reducing greenhouse gas emissions linked to its activities. For several years, and in liaison with the authorities, it has been working to protect the environment by deploying effective and viable solutions to limit emissions. Some of these solutions are increasingly based on alternative fuels, such as the air-side electricity supply of aircraft to reduce their emissions on stand or the use of electric vehicles to limit emissions linked to the on-site movement of staff and/or passengers.

2.3. Natural gas for vehicles

2.3.1. Development of NGV

Natural gas has, for many years, been used as a fuel for road transport (known, in this case, as natural gas for vehicles or NGV), in its compressed (CNG) or liquefied (LNG) form, in both France and abroad.

In France, there is long-standing interest in developing NGV, which involves mature technologies and offers ranges similar to those permitted by traditional fuels. Moreover, it enables road vehicles to meet the most stringent air pollutant emission standards and helps reduce the noise pollution of vehicles. In its biomass version, it is known as bio-NGV (see paragraph 2.7 on biofuels).

The development of NGV in France was initially focused on the public transport market, and numerous local authorities currently have a bus fleet fuelled by NGV. It has since been extended to street cleaning vehicles and captive fleets of light-duty vehicles. In 2005, the authorities and several operators in the sector signed an agreement aimed at ensuring wider use of NGV in the light-duty vehicle segment and by private individuals[15]. Thanks to this initiative, NGV use by heavy-duty vehicles was further developed in market segments in which it was already present. However, its use in light-duty vehicles remains well below the targets set by the agreement. Possible reasons for these mixed results include a steady improvement in the performance of passenger cars powered by traditional fuels, the nascent growth in electric vehicles, and limited development of the NGV refuelling network, hindered at the time by regulatory problems with regard to integrating an NGV supply lane at traditional stations, which have now been solved.

The use of NGV in transport currently remains limited, accounting for less than 0.02% of the final energy consumption of the transport sector in 2014. At the end of 2015, there were just over 12 000 NGV vehicles in France, mainly consisting of captive fleet vehicles with access to dedicated refuelling stations[16].

It is difficult to compare this number with the situation in neighbouring countries. Several factors have influenced and continue to have an impact on the development of NGV vehicles in the various Member States. These involve, for example, previous policy guidelines, direct investments by operators in the sector, ease of access to the resource and geographic or demographic criteria. However, European ambitions regarding the development of alternative fuels, to which France is firmly committed, continue to boost their prospects.

Table 3 - Number of NGV vehicles in France as at 31 December 2015

NGV passenger cars	2 549
NGV light-duty commercial vehicles	7 114
NGV heavy-duty vehicles	364
NGV buses	2 172
Total	**12 199**

(Source: SOeS)

The prospects for the further development of NGV are promising. In Europe, the number of NGV vehicles has tripled in the past 10 years, meaning that, if this upward trend continues, there may be over 10 million NGV vehicles on the road in Europe by 2020[17].

In France, NGV consumption in transport is steadily increasing (+1.5% from 2013 to 2014, +1.7% from 2012 to 2013). This trend is driven by the growing number of NGV buses and refuse lorries and, more recently, by the development of NGV heavy-duty vehicles used for road haulage. It is in this last segment that the growth in NGV has been most striking. In 2011 a coordination taskforce on the use of marine LNG was set up, and in October 2013 its mandate was extended to road transport. This has helped structure the action of the ministries involved, in close collaboration with the relevant economic operators. It has also helped operators in their attempts to obtain funding for their projects, in particular from the EU.

NGV and bio-NGV, particularly in their compressed form, are now recognised by many operators in France as the main alternative fuel to diesel for road haulage, as it is available in the short term and technologically mature. It costs more to purchase an NGV heavy-duty

[15] Agreement to ensure the success of NGV, signed in 2010 between the Ministry of the Economy, Finance and Industry, Gaz de France, Carrefour, Total, PSA Peugeot Citroën, Renault and Renault Trucks.
[16] Source: SOeS for the number of French vehicles.
[17] Source: State of the Art on Alternative Fuels Transport Systems in the European Union, Final Report, European Commission, DG MOVE, Expert group on future transport fuels, July 2015.

vehicle compared to a diesel vehicle, but the current price difference between the fuels, in NGV's favour, allow this additional cost to be offset in just a few years. NGV allows growing environmental constraints to be met and its energy density (even greater in liquefied form) allows heavy loads to be carried over long distances.

Several French transport operators and their representative organisations are developing the use of NGV and bio-NGV, as are major clients, particularly large retail shippers. Several energy companies established in France are also working to develop a public refuelling network accessible to heavy-duty vehicles, which is an essential prerequisite for the efficient development of NGV.

2.3.2. Development of refuelling infrastructure

In Europe, the situation in terms of NGV refuelling stations accessible to the public differs from Member State to Member State, for the reasons indicated above. The same applies to their level of use. For example, some countries already have a well-developed network of CNG refuelling stations accessible to the public, while the LNG refuelling network is less well-developed. In France, at the end of 2015, the NGV refuelling network consisted of 43 NGV stations (42 CNG stations, with several also distributing bio-CNG, and 1 LNG station), with only 13 being accessible to heavy-duty vehicles.

Table 4 - Number of NGV stations accessible to the public in France as at 31 December 2015

CNG refuelling stations	42
of which CNG stations accessible to heavy-duty vehicles	*12*
LNG refuelling stations	1
of which LNG stations accessible to heavy-duty vehicles	*1*
Total number of NGV stations	**43**
of which NGV stations accessible to heavy-duty vehicles	**13**

(Source: AFGNV [French association for natural gas for vehicles])

In Europe, the network of NGV stations is growing, mainly for the refuelling of heavy-duty vehicles in line with the market dynamic. In France, several projects involving stations accessible to heavy-duty vehicles are being implemented or have been announced, initiated by local public stakeholders and/or private operators. Some of these new stations may be integrated into the existing network of service stations. For example, in April 2016 the intercommunal association for gas and electricity in Ile-de-France awarded the operating contract for a new NGV station due to open in the autumn, setting itself the objective of building another 10 or so in the region. Energy companies have also chosen to invest in the development of NGV stations. Lastly, several European projects, benefiting from subsidies under the CEF-T programme (Connecting Europe Facility - Transport), aim to develop LNG and CNG stations across France between 2016 and 2018. The size and availability of the gas grid in France is an asset when it comes to connecting new CNG stations and developing bio-CNG.

There is real momentum, therefore, to develop a refuelling network accessible to heavy-duty vehicles (and consequently also to light-duty vehicles), as also the case in other European countries. In 2016, six CNG/LNG stations and one CNG station officially entered into service in France. Lastly, this momentum should be sustained and amplified by a recent call for projects under the 'Investing for the Future' programme, by the entry into force of several standards at European level[18], and by a growing demand for NGV, driven by stricter climate

[18] The EN standards that are currently being finalised on LNG and CNG stations and also on the quality of LNG for road transport and biomethane for transport will contribute to the market dynamic.

and air quality policies in France and EU-wide. It is worth noting that accessibility to stations (mainly access time) is a decisive factor for the use of NGV by road transport operators.

2.4. LNG for marine and inland transport

Given the extent of maritime transport, which accounts for 90% of the world's shipping of goods and continues to rely mainly on heavy fuel oil (a highly polluting by-product of oil), international and European regulations are imposing more and more restrictions on polluting discharges from vessels, and on sulphur emissions in particular.

The use of liquefied natural gas (LNG) as a marine fuel is one of the main technological solutions allowing current and future environmental requirements to be met, and its development is currently a European[19] and national[20] priority. It represents a new opportunity in the vessel bunkering market and, for French ports engaged in international competition, a challenge with respect to competitiveness. LNG as a fuel for inland transport also has proven environmental advantages, but is expected to develop less rapidly than marine LNG.

2.4.1. Development of LNG as a marine and inland waterway fuel

There is real interest in developing marine LNG among both private and public players, and numerous steps have been taken in recent years, both in France and abroad. Among other things, port authorities, shipowners, gas suppliers and LNG terminal operators have been working on projects to adapt or construct LNG-fuelled vessels, design LNG bunkering barges and create refuelling stations.

In France, a task force was set up in 2011 to coordinate ministerial actions concerning the use of LNG as a marine fuel. Its mandate was subsequently extended to include alternative fuels to diesel for road haulage and inland waterway transport of goods. A platform was set up, consisting of eight professional organisations in the maritime, port, gas and industrial sectors, for the development of LNG as a fuel for maritime and inland waterway transport.

Despite all this, the marine LNG market is still an emerging market. Globally, LNG accounts for only a marginal proportion of bunkered products[21], even though, over the past 10 years, the global fleet of LNG-fuelled vessels has increased considerably[22]. Marine LNG has been slower to take off than anticipated by players in the sector, and the various steps taken at national and EU level have taken time to produce significant results, due to weak demand[23].

In fact, when it comes to meeting environmental constraints, marine LNG is in competition with other solutions: use of marine diesel or fume scrubbers. These solutions are currently competitive due to free-on-board prices, lower investment costs compared to LNG and speed of installation. Moreover, the fuels traditionally used for maritime transport have benefited from the fall in oil prices since the summer of 2014. Likewise, low prices of NRD (non-road diesel), which is the fuel used by inland waterway transport, mean there is little incentive to develop LNG as a fuel for inland waterway vessels.

Nevertheless, the prospects for marine LNG development remain promising with respect to maritime transport, both globally and nationally, as a long-term alternative solution allowing

[19] Recently reaffirmed in the Communication on an EU strategy for liquefied natural gas and gas storage.
[20] The development of marine LNG was one of the ten measures announced by the Minister for the Environment, Energy and Sea following the National Conference on the energy transition, sea and ocean of 31 August 2015.
[21] In 2013, the share of LNG was estimated at 2% of bunkered products, with the total bunkering of vessels globally estimated at between 220 mt and 300 mt in 2015. Heavy fuel oils account for some 80% and distillates for 20% of the fuel consumed worldwide. In France, the quantity of marine fuels bunkered annually is around 2.5 mt.
[22] In 2015, there were 73 merchant vessels fuelled by LNG, compared to 3 in 2005 (source: DNV GL, LNG fuelled vessels, October 2015, cited by 'Le GNL dans le transport : quel potentiel pour la filière?', IFPEN, 2016).
[23] See 'Les émissions de gaz pour les navires – L'alternative GNL, mais à quelle condition?', Isemar, 2015.

current and future environmental standards to be met. By 2035, most of the projection scenarios currently available place global annual demand for marine LNG at between 20 mt and 80 mt[24].

In France, annual demand for marine LNG could reach between 150 kt and 500 kt by 2025, according to a recent projection exercise[25]. The initial main users of marine LNG are expected to be cruise ships, which is the most promising market following recent announcements of orders for LNG ships by the biggest cruise companies[26], whose decisions are strongly motivated by the improved environmental quality of their vessels. Cruise ships also represent an interesting opportunity for the LNG refuelling market in terms of cold ironing operations, which, for vessels, involve using only LNG-fuelled auxiliary engines when in port to reduce pollutant emissions.

Container ships also have significant potential for the LNG market due to their large bunkers, and also because operators often adopt a single operating strategy for all the vessels owned by the same company[27]. The prospects for the use of marine LNG also apply to support vessels (interesting in terms of developing an offer because they remain within the same port waters and have small bunkers) and to ferries, which in France mainly operate within Europe.

As regards the inland waterway sector, boats operate on networks where there are already considerable environmental concerns, particularly in the Rhine basin. However, unlike maritime transport, inland waterway transport already uses a fuel with a very low sulphur content (non-road diesel covered by standard NF EN 590), and the rate of fleet renewal is very slow. LNG is not, therefore, an immediate priority in terms of meeting the standards applicable to inland waterway transport, and the development of LNG for this purpose is expected to take longer than that of marine LNG, except on the Rhine. The Rhine network (and, by extension, the Main and the Danube) may in fact be regarded as a pioneer in the use of LNG for inland transport in Europe[28].

In France, annual LNG demand for inland waterway transport could reach between 20 kt and 50 kt by 2030 (according to the recent projection exercise referred to above). The Rhine basin is expected to account for a large proportion of this figure (over 70% of the demand). The development of LNG on the French inland waterways, except for the Rhine, will depend on the investment costs required and on operators' capacities. Opening up the French inland waterway network to the European wide-gauge network, through major medium and long-term projects[29], is expected to encourage the arrival of larger boats (of the type used on the Rhine) that are more suitable for conversion to LNG propulsion.

Lastly, the inland waterway network could be used to transport LNG and to supply industrial operators and retail LNG service stations. Although the European agreement known as the ADN[30] currently allows the transport of LNG in pressurised tanks, an amendment to this agreement would be required to allow the use of membrane technology and increase the LNG payload capacity of inland barges.

[24] Source: 'Le GNL dans le transport : quel potentiel pour la filière?', IFPEN, 2016.
[25] 'Rôle du GNL carburant marin et fluvial dans la transition énergétique pour la croissance verte - Contribution au cadre d'action national sur le déploiement d'une infrastructure pour carburants alternatifs', AFG, June 2016. A more detailed description of this exercise is annexed hereto.
[26] In particular MSC, Costa and Aida.
[27] A container ship company (with 10 to 12 vessels) operates vessels with similar technical characteristics using the same fuel and often has only a single bunkering port.
[28] The collaborative project entitled 'LNG Masterplan for Rhine-Main-Danube', funded by the TEN-T programme and bringing together numerous Rhine stakeholders, including the port of Strasbourg, has enabled technical and strategic studies as well as pilot projects on the development of inland waterway LNG to be carried out. Furthermore, the CCNR has already amended the Rhine regulations to take account of LNR use and refuelling.
[29] Construction of the Seine-Nord Europe canal by 2023, and the Saône-Moselle / Saône-Rhine canal by 2030.
[30] European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways.

2.4.2. Development of vessel refuelling infrastructure

The growing use of LNG as a marine fuel goes hand in hand with improvements in vessel refuelling. In Europe, many ports already offer such services. In France, the supply of vessels with marine LNG is at an early stage, with the first operation having taken place in May 2016 at the port of Le Havre[31], but all ports are demonstrating a collective ambition to develop marine LNG refuelling capacity.

There are four LNG terminals in France[32] that can be used for this purpose, which are situated on its three seaboards: the English Channel/North Sea, the Atlantic and the Mediterranean. The operators of these LNG terminals are diversifying their activities and are now offering, or will soon be offering, a retail LNG distribution service for road tankers. These road tankers can then refuel LNG-powered vessels, and eventually bunkering vessels or barges. In addition to having a LNG terminal on the seaboard, other factors favour the development of marine LNG refuelling infrastructure, such as geographical location[33], density of short-distance maritime transport, a port being part of the core network of the Trans-European Transport Network (TEN-T) and access to European funding.

Accordingly, several projects are under way in the French ports and may result in effective refuelling solutions. The European Gainn4Mos project involves boosting the refuelling offer for road tankers and constructing a maritime refuelling station at the Fos Tonkin terminal or at the Fos Cavaou terminal. The port of Dunkirk, in conjunction with a business consortium, also wants to carry out a pilot project to create a land and maritime refuelling station. Other discussions are ongoing in North Finistère at Brest and Roscoff, and between the Seine bay ports, which have together studied the value and feasibility of developing LNG for maritime and inland waterway transport in the English Channel and along the Seine. The port of Strasbourg is continuing a study involving a LNG refuelling station. A project studying a possible refuelling station at the port of Lille may also come to fruition[34]. Finally, over the next two years, the 'LNG Logistic' project, which was selected in July 2016 to benefit from a subsidy under the EIM-T programme, will study the possibilities of developing LNG on the Rhône, including the development of LNG for inland waterway transport and the deployment of refuelling points at inland ports in the Rhône-Saône basin. This will in all likelihood help to better define the conditions for developing LNG on the French inland waterways.

2.5. LPG

Liquefied Petroleum Gas (LPG) is a liquid fuel that mainly derives from the exploitation of gas fields (currently 70%). When not used due to its high energy density, LPG was burnt following extraction. The rest of the LPG produced comes from oil refineries.

Due to its environmental characteristics, LPG is regarded as one of the currently available alternative fuels, and its use has already been developed in several countries, including France. At the moment, LPG is mainly distributed by service stations connected to the petrol network or by supermarkets and hypermarkets having made the necessary choice and investments to be able to offer this fuel at their stations. Across France, around one out of seven service stations distributes LPG, which amounts to a network of approximately 1 760 service stations. The distribution is detailed in the following table:

[31] This involved an operation to supply LNG, via road tanker, to the generators on the cruise ship AIDAprima used to generate shore-side electricity.
[32] These are the two Fos-sur-Mer terminals, the Montoir-de-Bretagne terminal, and the Dunkirk terminal, which will start operating in early 2017.
[33] In the English Channel and North Sea, sulphur levels were reduced to 0.1% on 1 January 2015. By 2020, the legislation requires a sulphur level of 0.5% throughout European waters (excluding low sulphur emission areas).
[34] Source: 'Le transport fluvial, un atout pour le développement de l'utilisation du GNL dans le cadre de la transition énergétique', CGEDD, October 2016.

Table 5 - Number of LPG stations as at 31 December 2015

	2015
Refuelling stations accessible to the public	1 690
Refuelling stations not accessible to the public	71

(Source: Comité français du Butane et du Propane)

This alternative fuel distribution network developed at national level therefore has the capacity to supply and distribute fuel to meet the needs of one million vehicles, i.e. five times more than the 210 000 LPG vehicles on the road in 2016[35]. Despite a much larger number of vehicles than for the other alternative energies, LPG vehicles use the distribution network only for 6% of its opening time.

Table 6 - Number of LPG vehicles as at 31 December 2015

LPG (or petrol-LPG) passenger cars	162 141
LPG (or petrol-LPG) light-duty vehicles	19 370
LPG (or petrol-LPG) heavy-duty vehicles	32
LPG (or petrol-LPG) buses or coaches	163
LPG (or petrol-LPG) two-wheel vehicles	3
Total	**181 709**

(Source: SOeS)

In addition, LPG consumption, which accounts for around 4% of total road fuel consumption, has gradually decreased, by an average of around 5% per year, since 2004[36] (although there was a resurgence between 2009 and 2011). However, the imminent arrival on the market of bio-LPG could boost the share of LPG among alternative fuels, although this is currently difficult to quantify.

Unlike other alternative fuels, there is therefore no issue surrounding the development of LPG refuelling infrastructure, as the network is sufficiently mature to meet rising demand.

2.6. Hydrogen

Hydrogen is one of the newest alternative fuels: its use in vehicles and the development of an associated refilling network are still very limited, both in France and internationally. France favours a ‘cluster’ or ‘captive fleet’ approach for the development of hydrogen on its territory. This ‘start-up’ strategy means that needs in terms of range and refuelling speed can be met at an early stage, unlike for electric vehicles, while reducing the risks associated with developing new infrastructure. Vehicles and stations are deployed where there is demand to ensure that a station is sufficiently used from its opening, thus reducing the need for investment and the traffic risk (underused point).

In terms of mobility, tests have been conducted on hydrogen mixed with natural gas[37], in a mixture called Hythane®, to power an internal combustion engine. Studies have shown that this fuel delivers good technical performance (more efficient and flexible) and better environmental performance (a reduction in greenhouse gases of up to 8% for a bus on an urban cycle, although the combustion emits nitrogen oxides), while maintaining a high level of safety. This is a relevant approach where the use of hydrogen is coupled with injection into the gas system.

[35] Source: CFBP - AAA & roadworthiness test data for 2012, 2013, 2014 & 2015.
[36] Source: CFBP and authors’ calculation.
[37] Hythane, which consists of 80% natural gas and 20% hydrogen, can in particular be used as a vehicle fuel.

Use of hydrogen as an alternative fuel is currently developing fastest in electric vehicles where the motor is driven by electricity generated by a fuel cell.

At filling stations, two filling pressures are currently available: one at 700 bar (international standard) and the other at 350 bar as a start-up offer (particularly in France). The 350-bar offer is temporary until all stations are upgraded to 700 bar, but is enabling the filling station offer to be developed while keeping costs down. Vehicles using a pressure of 700 bar can also be filled at these stations (in which case the tank fill level is 60-70%). The pressures available at stations need to be analysed in terms of the stations' costs and the customers' range needs: in the case of professional fleets, refuelling at 350 bar is sufficient to extend the range of the batteries for most uses.

A 700-bar station costs around €1 million, whilst a 350-bar station comes in at around €300 000[38]. The cost of stations varies according to a function increasing with pressure (350 or 700 bar), storage volume, and also safety and regulatory requirements (in Japan, 700-bar stations cost €2-3 million[39]).

As at 31 December 2015, there were 17 passenger cars, 11 light-duty commercial vehicles and 2 heavy-duty vehicles powered by hydrogen[40]. These vehicles obtain hydrogen from one of the 11 stations that currently exist in France, the details of which are given below[41]. It needs to be identified more precisely, with operators in the sector, which of those stations are accessible to the public.

Table 7 - Hydrogen filling stations in the national territory

	2015 (350 bar)	2015 (700 bar)
Number of stations	8	3

(Source: AFHYPAC/H2 Mobility France)

Figure 2 - Location of existing hydrogen filling stations

In order to deploy hydrogen as a fuel more widely, further developments are needed to optimise the necessary technological building blocks and improve their reliability. The industrialisation process that has already begun must be continued to reduce the costs of certain components and develop innovative goods and services. Development of hydrogen-electric mobility is complementary to battery-electric mobility. Hydrogen also possesses interesting characteristics as an energy vector with several possible uses: conversion of

[38] 'Nouvelle France Industrielle' hydrogen roadmap.
[39] CGIET/CGEDD report on the hydrogen-energy sector.
[40] Source: SOeS.
[41] The 11 stations are: Paris-Ivry (Paris City Hall) and Pont de l'Alma (Air Liquide); Saint-Lô (CG 50); Lyon HyWay (CNR/GNVert); Grenoble HyWay (Air Liquide/Cofely/GEG) & Sassenage (Air Liquide); Dole (Solvay/Air Liquide); Luxeuil (La Poste); Albi (Circuit); Valence – Romans TGV (Agglo) & La Motte Fanjas (McPhy).

excess renewable electricity production, supply of services to the electricity grid, replacement of industrial processes and recovery of co-product hydrogen, etc.

2.7. Biofuels

2.7.1. Biofuels market

Biofuels are an alternative and renewable energy resource. The market for such fuels is relatively young, but is gradually becoming more established as energy policies, regulations, advances in research and other aspects are developed.

Biofuels encompass all liquid, solid or gaseous fuels produced from biomass. They represent one of the solutions for reducing oil consumption in the transport sector, and are generally used as an additive or supplement to fossil fuels[42].

The two main types of biofuel produced on an industrial scale are biodiesel (incorporated in diesel) and bioethanol (incorporated in petrol). These are part of the composition of virtually all liquid fuels currently used in France, the difference being the percentage by volume of bioethanol or biodiesel contained in each one: from 5% for SP95 and SP98 to 85% for E85 with regard to fuels sold to the general public. In some captive fleets equipped with adapted engines, the biofuel percentage can reach 95% for ED95 and even 100% for certain biodiesels.

These biofuels accounted for 6% of final consumption in the French transport sector in 2014, compared to less than 1% in 2004, with an increase of 10% recorded between 2013 and 2014. This growth can be explained, in particular, by higher targets for incorporating biofuels in the French biofuel plan, which went from 7.0% to 7.7%[43] in the diesel sector, and the fact that the tax on polluting activities (*taxe sur les activités polluantes* – TGAP) for premium petrol and diesel decreases the higher the volumes of biofuel incorporated.

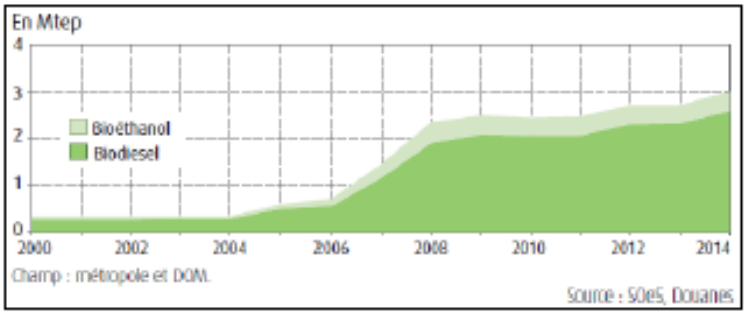


Figure 3 - Trend in French consumption of biofuels by type
Extracted from the CGDD [General Commission for Sustainable Development] 'Repères - Chiffres clés de l'Energie - Editions 2015' publication

[Key to figure:]	
En Mtep	In Mtoe
Bioéthanol	Bioethanol
Biodiesel	Biodiesel
Champ : métropole et DOM	Scope: metropolitan France and overseas departments
Source : SOeS, Douanes	Source: SOeS, Customs

Gaseous biofuels have developed in parallel, with the emergence of bio-NGV (biomethane produced from refined biogas) and bio-LPG (produced from biopropane), which can be used entirely on their own by vehicles, whether or not they have dedicated engines. The

[42] For further information, see the national biomass mobilisation strategy (*stratégie nationale de mobilisation de la biomasse* – SNMB) and regional biomass schemes (*schémas régionaux biomasse* – SRB), which must set optimum financial and environmental conditions for the development of biomass energy and the supply of energy installations.
[43] Panorama énergies-climat, 2015 edition - Fiches No 22.

advantage of these biofuels is that they can be used like their non-biosourced version and therefore do not require major adaptations to the distribution network.

Bio-LPG is still in its infancy: biopropane is a synthetic gas produced from renewable raw materials, mainly vegetable waste and oils. It involves an innovative production process and is expected to be on the market by the end of 2016, with the opening in the Netherlands of the first bio-LPG production plant in the world.

Bio-NGV is more advanced: the biogas used to produce biomethane is a renewable energy obtained by collecting and methanising agricultural or non-hazardous waste. Once refined, it can then be injected into natural gas grids or used as a fuel (bio-NGV). At the end of 2013, three biomethane injection installations were in operation and had produced 20 GWh of biomethane, compared to 6 GWh at the end of 2012 produced by a single installation. By March 2016, this figure had increased to 18 biomethane injection installations delivering 280 GWh of annual injection capacity, i.e. equivalent to the consumption of 1 250 buses or lorries powered by bio-NGV[44].

The expected publication of standard EN 16732-2 – specifications of biomethane for use in transport – will encourage the development of bio-NGV.

2.7.2. Prospects for development

Biofuels are currently the main means to achieve the targets for incorporating renewable energies in transport by 2020 and 2030. A considerable market potential in many Member States can be expected to drive growth in the European market.

France has the benefit of a strong and well-structured sector which, nevertheless, is facing a number of challenges:

- the issue concerning the impact of biofuel production on the direct and indirect use of arable land;
- constraints in terms of fuel quality and compatibility with current and future engines, which are holding back rapid development of the market;
- lastly, the need to develop advanced biofuels, produced from raw materials that do not impact on the use of arable land (waste and residues in particular).

There are many technological challenges, particularly in the production of biofuels from straw and forestry residues, but these could be tackled soon. Biofuels produced from algae are also under development, but are not expected to come to market before 2030. Some sectors also enable the production of biosourced molecules known as ‘drop-ins’, which can be added to fossil fuels without any constraints.

The production of bio-NGV involves an upgrading process that allows high energy performance to be obtained while reducing organic waste volumes and methane emissions into the atmosphere. It also allows better management of releases, in particular with regard to nitrogen. There is therefore a clear interest in this type of process and solutions are being developed to tackle the challenges facing this sector, including as regards the presence of a gas grid close to the project and its capacity to absorb the volumes of reinjected products, high investment costs, installation size and biomass supply. The potential recoverable resources and the involvement of various stakeholders mean that the future of this sector can be viewed with optimism in the medium term. In particular, in June 2014 the public authorities announced a call for projects, with the aim of supporting the launch over three years of projects involving 1 500 biogas plants generating electricity or heat or to be connected to the gas grid. The multiannual energy programming includes plans to develop bio-NGV to reach consumption levels of 0.7 TWh in 2018 and 2 TWh in 2023. The target is

[44] Panorama énergies-climat, 2016 edition - Fiches No 18.

for bio-NGV to account for 20% of NGV consumption in 2023 in segments complementing those of electric vehicles and plug-in hybrid electric vehicles.

As regards bio-LPG, France is one of eight European countries selected for distribution of this innovative biofuel over the next four years, although this will only be available from early 2017. This development has sparked interest among other businesses, which have also expressed a desire to produce this type of fuel in the short term. With its environmental advantages, bio-LPG offers an additional opportunity for renewable energy in transport. It could enable a sustainable and competitive LPG sector to develop further and thus help achieve European and national environmental objectives.

The public authorities are therefore supporting these biofuel initiatives in relation to petrol, gas and diesel consumption in France, with a target of 10% of the energy consumed by all modes of transport coming from renewable sources in 2020[45]. Various programmes have been set up to support research into new energy technologies and the production and use of biofuels, which must meet European land-related 'sustainability' and greenhouse gas emission requirements[46].

2.8. Other alternative fuels

Synthetic and paraffinic fuels are obtained either from a synthetic gas (derived from natural gas, coal or biomass) by means of a Fischer-Tropsch type process[47], or from hydrotreatment[48] of vegetable oils, waste oils or animal fats. The former are therefore referred to as synthetic diesel and petrol, and the latter as diesel and petrol obtained from hydrotreatment (or HVO for Hydrotreated Vegetable Oil). The type of source used to produce these fuels will therefore determine whether or not they are regarded as biofuels.

The processes for producing these fuels can be adjusted according to the ratio of diesel/petrol demand, but a production involving over 90% middle distillates (diesel) is commonly observed.

Whether diesel or petrol, these fuels can be easily mixed into 'standard' diesel or petrol and their incorporation can therefore make a significant contribution to achieving the targets set for incorporating biofuels in fuels for transport.

Moreover, synthetic diesel or diesel obtained from hydrotreatment can be regarded as a very good quality diesel. With a very high cetane number[49] compared to 'standard' diesel, it can be used 'pure' as an alternative fuel in diesel engines in order to reduce regulated pollutant emissions.

To achieve these levels of emission reduction, engines in vehicle fleets may need to be specially tuned, but it should be noted that replacing the engines is not required to achieve such pollutant emission savings. This position of this alternative fuel is therefore very interesting in that it can be used in bus/coach and heavy-duty vehicle fleets with EURO3, EURO4 or even EURO5 approval, from which pollutant emissions are significantly higher than from EURO6 vehicles. Local authorities and stakeholders that own such vehicle fleets do not always have the funds needed to rapidly renew their fleet(s). They can therefore access significant pollutant emission reductions by simply replacing standard diesel with synthetic diesel or diesel obtained from hydrotreatment.

[45] Article 43 of Law No 2015-992 of 17 August 2015 on the energy transition for green growth.
[46] European Directives 2009/28/EC and 2009/30/EC.
[47] This involves a chemical reaction that synthesises hydrocarbons from carbon monoxide and hydrogen. This chemical reaction uses a catalyst, which accelerates the reaction.
[48] Process used in oil refining to remove the constituent sulphur. The sulphur is removed in the presence of hydrogen.
[49] The cetane number determines the capacity of a fuel to ignite on a scale of 0 to 100. It is particularly important for diesel engines in which the fuel must self-ignite under the effect of compression.

Synthetic diesel or diesel obtained from hydrotreatment will be authorised as a fuel in France in the next few months, for use in captive fleets benefiting from dedicated supply and distribution logistics. It is therefore one of the newest alternative fuels and its future rollout is currently hard to define.

2.9. Uncertainties surrounding the development of alternative fuels

When the national policy framework was drawn up, through stakeholder consultation and various studies, a number of uncertainties associated with the development of alternative fuels came to light. These uncertainties are of various types and have been taken into account in defining the national objectives.

2.9.1. Uncertainties associated with changing energy prices

The development of alternative fuels is, in particular, intended to reduce the dependence on oil. However, in the past few years, growing volatility in all these markets has increased the risk for investors and weakened the signals needed for medium- and long-term investment. This is especially the case with regard to maritime LNG projects.

Crude oil prices have fallen considerably since 2014, reflecting a slowdown in the growth of global demand combined with a significant rise in production in North America due to the exploitation of non-conventional hydrocarbons. It is very uncertain where oil prices will go in the next few years. As a result, in the IEA's 'World Energy Outlook 2015' report, the oil price varies between USD 50/barrel and USD 80/barrel in 2020 depending on the scenario. In the short term, excess supply and uncertainties about the rate of global growth have caused a sharp drop in oil prices. This fall in prices should eventually reduce supply (reduction in the number of wells, observed for example in North America) and therefore stabilise the markets.

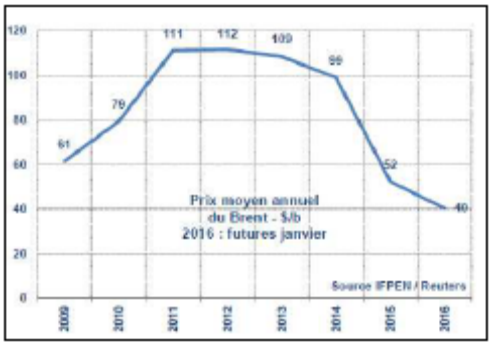


Figure 4 - Price of Brent: situation in 2015 and trends for 2016

[Key to figure:]	
Prix moyen annuel du Brent - $/b 2016 : futures janvier	Annual average price of Brent - USD/barrel 2016: January futures
Source : IFPEN / Reuters	Source: IFPEN / Reuters

After having fallen sharply in 2009, pulled down by the oil prices, gas prices recovered on the European wholesale markets from 2011, rising by €20/MWh-€30/MWh. Since mid-2014, prices have fallen again in a context of reduced demand for gas for electricity generation, energy efficiency programmes and a persistently unfavourable economic environment.

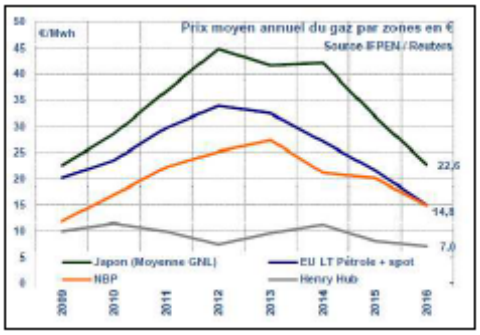


Figure 5 - Price of gas: situation in 2015 and trends for 2016

[Key to figure:]	
€/Mwh	EUR/MWh
Prix moyen annuel du gaz par zones en €	Annual average price of gas in EUR
Source : IFPEN / Reuters	Source: IFPEN / Reuters
Japon (Moyenne GNL)	Japan (Average for LNG)
NBP	NBP
EU LT Pétrole + spot	EU LT Oil + spot
Henry Hub	Henry Hub

It is still very uncertain where European gas prices will go, as they are influenced, among other things, by developments in European production, demand management measures and demand for gas for electricity generation (linked to the relative competitiveness of gas and coal and therefore to the price of CO_2).

2.9.2. Uncertainties associated with changing vehicle fleets and competition between fuels for vehicle segments

Different alternative fuels can meet the needs of the same vehicle segment. In addition to mapping how the various vehicle segments and fuels match up, account must be taken of the uncertainty faced by these various segments, as the objective is to avoid developing infrastructure with no economic value. This applies to buses, which can be powered by NGV, hydrogen or electricity, as well as to light-duty commercial vehicles. Similarly, with regard to hydrogen, the increasing range of batteries for electric vehicles may eventually put pressure on the market segments of certain vehicles. This needs to be taken into account, therefore, when objectives are defined and developed.

2.9.3. Uncertainties associated with behaviour

In addition to the uncertainties associated with purchasing an alternative fuel vehicle, the recharging infrastructure for alternative fuels, particularly in terms of electricity, is characterised by a very different refuelling model from the traditional model (historically organised around and centralised at the service station). To date, recharging has mainly taken place at home, at the office or factory or in retail areas, with the remainder occurring in public places. However, this recharging model is directly linked to the current range of vehicles, and therefore to battery performance. The future confirmation, or rejection, of this model, particularly given the uncertainties surrounding the development of batteries, is not inconsequential when it comes to setting targets. Likewise, in terms of location, in France recharging infrastructure is being deployed not only in dense urban areas, but also in rural areas to meet commuting needs.

3. Measures taken to develop recharging infrastructure for alternative fuels

France has already taken a number of measures to develop recharging infrastructure and refuelling stations for alternative fuels. Other measures, particularly regulatory measures, are under preparation or are about to be published.

These are measures aiming to support and accompany the development of infrastructure. This objective can be achieved either through a direct approach, by supporting deployment projects implemented by operators in the sector without imposing additional obligations on transport infrastructure managers, or indirectly, by supporting the development of demand for alternative fuels or even by restricting use of the most polluting vehicles.

The development of recharging and/or refuelling infrastructure, depending on the type of alternative fuel in question, does not depend solely on a financial or legal criterion, but rather on several combined factors. Different types of measure are therefore required, such as implementing an appropriate legal framework, supporting national and/or local investment in infrastructure deployment, or structuring the segments and assisting operators by publishing guidelines and creating appropriate tools.

The same is true for an indirect approach to develop demand for alternative fuels, either through actions geared towards alternative fuel vehicles or through measures encouraging the production or consumption of alternative fuels. In this approach, increased demand may in particular be encouraged through tax incentives or local facilities (such as parking), coercive measures, better communication with users or support for research to develop tomorrow's fuels and vehicles.

The measures taken therefore vary in type and may also have different timescales. To aid presentation and readability, current and future actions have been grouped by category in an annex, where a distinction is also made between existing and future measures:

- legislative framework and regulatory measures;
- information, support and awareness measures;
- incentive measures;
- research, development and innovation measures;
- coordinated cross-border measures.

Detailed descriptions of each measure are provided in an annex to this document (see Section 6.6), set out in exactly the same way: title of the measure, nature of the measure, description, main objectives, type of infrastructure involved, means of transport, party responsible and state of implementation where data or other information are available.

4. Objectives

4.1. Methodology

Objectives are determined on the basis of an analysis of the existing situation and steps taken by economic operators and, for electric recharging and natural gas refuelling on road networks, an approach involving criteria of minimum physical accessibility to the recharging and refuelling networks (particularly taking into account the range of vehicles). This last approach therefore aims to define objectives based on the requirement that an appropriate number of recharging or refuelling points must be provided to ensure that vehicles can circulate in specific areas or networks, in line with the relevant provisions of the Directive. Combining these two approaches meant that the national policy framework could be developed in response to the objectives of the Directive and to the expectations or ambitions of French operators in these sectors.

Account has been taken of the uncertainties surrounding the development of alternative fuels, the prospects for development of recharging and refuelling points according to current or planned projects, and the projections of market operators.

The information on the location of these points is intended as a guide to aid discussions about appropriate installation sites, which should be conducted in consultation with the relevant players in the regions, in particular the local authorities.

It should be noted that cost-effectiveness analyses for recharging or refuelling points (private and socioeconomic) could not be completed in the context of this document.

The future report on the achievement of the objectives, to be drawn up three years after this national policy framework is submitted, will be the occasion to adapt, where applicable, the objectives, prospects for development and measures taken, according to the observed dynamics and further investigations conducted, particularly those relating to the cost-effectiveness analyses.

4.2. Recharging and refuelling points

4.2.1. Electric recharging points

Background

The Law on the energy transition for green growth of 17 August 2015 sets a target of 7 million recharging points in 2030.

The number of public recharging points has been constantly growing (from 1 800 in July 2012 to 9 100 in April 2015, with a total of 14 360 as at 16 September 2016[50]).

Many projects, developed by local authorities (and partly financed by the State through the 'Investing for the Future' programme) or by private initiative, are in the process of being implemented or are planned in the regions. Based on the estimates available in the summer of 2016, these projects will provide, with varying timescales, 36 000 recharging points[51] accessible to the public.

On 1 October 2016 the Minister for Energy, the Environment and the Sea indicated that France is now ahead of schedule and should soon reach one million recharging points, with:

- 900 000 recharging points on private premises: these recharging points can be financed by the energy transition tax credit, which has been renewed for 2017. In addition, the Law on the energy transition for green growth requires new buildings to be pre-fitted with recharging points;

- 100 000 recharging points accessible to the public, thanks, in particular, to the extension of support for the deployment of recharging terminals under the 'Investing for the Future' programme.

For this last estimate it is assumed that the past growth rate (of more than 60% annually) will continue, reflecting the dynamism created through the energy transition, with France crossing the threshold of 100 000 electric vehicles as early as 2016.

Appropriate number of recharging points for the circulation of vehicles

The Directive requires that 'an appropriate number of recharging points accessible to the public are put in place by 31 December 2020, in order to ensure that electric vehicles can

[50] Source: Gireve.
[51] The figure of 36 000 has been calculated so as to avoid double counting of projects developed by different players.

circulate at least in urban/suburban agglomerations and other densely populated areas, and, where appropriate, within networks determined by the Member States'.

Several goals can be met by developing a network of recharging points[52] accessible to the public. Particularly in urban areas, it will help overcome the difficulties faced by households and businesses in obtaining a private parking space where they can install their own recharging points. Offering a recharging service to supplement private recharging at home or at work will boost users' confidence in the recharging network by providing them with additional recharging points.

In order to meet the requirement in Article 4 of the Directive, which refers to ensuring that electric vehicles can circulate, work has been carried out to estimate the minimum number of recharging points accessible to the public that will be required to allow the circulation and recharging of electric vehicles in metropolitan areas. This work, which is presented in Annex 6.2, is based on criteria of physical accessibility to recharging points, measured either in terms of access time on foot in urban areas (density in excess of 450 inhabitants/km^2) or in terms of access time by vehicle in the rest of the country.

The appropriate network of recharging points accessible to the public, within the meaning of Article 4(1) of the Directive (to ensure that electric vehicles can circulate), has thus been estimated, at the end of 2020, at around 21 000 recharging points (assuming two recharging points per station) or 35 000 (assuming four recharging points per station, which is closer to the average number of recharging points at existing stations). These estimates take account of the 14 360 recharging points accessible to the public as at 16 September 2016.

Feedback on the use of recharging points, and an analysis of the behaviour resulting from the arrival of vehicles with longer ranges, will allow the appropriate number of recharging points accessible to the public in 2020 onwards to be refined in relation to the criterion laid down in Article 4 of the Directive regarding the circulation of electric vehicles.

4.2.2. NGV refuelling points

Background

There is real momentum for the development of an NGV refuelling network accessible to heavy-duty vehicles. Several station projects are being implemented or have been announced. Measures encouraging the development of NGV refuelling points have already been taken and numerous local areas are taking action. Based on the number of known projects, operators in the NGV sector estimate that 180 NGV refuelling points will be available by the end of 2018 (128 CNG points and 46 LNG points). However, whether this can actually be achieved over this timescale is partly dependent on economic operators obtaining the land and/or financing needed to deploy refuelling points.

Operators in the sector have also carried out work to estimate the network of refuelling points needed to cover the whole country (beyond the TEN-T core network) and ensure the refuelling of the future fleet of NGV vehicles[53]. Population densities in French urban areas was used as the main criterion for calculating the size of the network and its density, resulting in a network of refuelling points accessible to the public consisting of 150 'market' points by 2020 (stations self-financed by economic operators), to which a further 100 'publicly funded' points (achievable with additional public financing) should be added. In total, by 2020, operators in the sector estimate that the network should stand at 250 NGV refuelling points (40 LNG points and 210 CNG points). In 2025, it should consist of at least 300 NGV refuelling points (an additional 50 CNG refuelling points compared to 2020).

[52] A recharging station is defined as one or more recharging points in the same place.
[53] For more information, see: Infrastructure GNV France 2020-2025, AFGNV, March 2016.

The appropriate refuelling point numbers indicated below correspond to the criterion in Article 6 of the Directive according to which vehicles must be able to circulate within networks and corresponding areas, which is a different approach from that adopted by the market operators in their estimations presented above.

Appropriate number of refuelling points for the circulation of vehicles

For the NGV refuelling network, the Directive requires:

- 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';
- 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';
- that an 'appropriate number of LNG refuelling points accessible to the public are put in place by 31 December 2025, at least along the existing TEN-T Core Network'.

In terms of the objective in Article 6 of the Directive, which is to allow vehicles to circulate, the development of an NGV refuelling network accessible to the public is dependent on support for the development of NGV for goods vehicles, which is the segment of demand with the most dynamic growth in NGV. This means developing LNG refuelling points mainly for use by heavy-duty vehicles, which are heavy users. It also means developing CNG refuelling points, mainly for heavy-duty vehicles covering short and medium distances, with these points remaining accessible to light-duty vehicles.

In this respect, work has been carried out to estimate the appropriate number of NGV refuelling points accessible to the public. The initial focus has been on the major axes and nodes of the French road network, where potential demand for NGV is likely to be highest, namely a base consisting of the TEN-T core network and the nine largest urban areas in France. This work is based on criteria of physical accessibility to refuelling points, measured either in terms of access time by vehicle (within the urban areas in question) or in terms of distances between stations (along the axes of the TEN-T core network), and has resulted in the figures presented in Annex 6.2 and summarised in a footnote[54].

The factors taken into account include:

- a given densification within urban areas;
- stations within urban areas of over 100 000 inhabitants supplementing the TEN-T core network;
- stations within urban areas of over 100 000 inhabitants along the TEN-T comprehensive network and not just the core network.

The results obtained have been used to determine the appropriate number of CNG and LNG refuelling points.

The appropriate number of refuelling points is estimated at:

- approximately 80 CNG refuelling points accessible to the public by 31 December 2020, taking account of existing stations;
- approximately 115 CNG refuelling points by 31 December 2025, of which around 70 along the axes or within the urban areas of the TEN-T core network;

[54] 'Base' scenario: 35 CNG stations by 2020, 72 CNG stations by 2025 and 25 LNG stations by 2025.

- 25 LNG refuelling points along the TEN-T core network by 31 December 2025[55].

Overall, in 2025, the appropriate number of CNG and LNG refuelling points, i.e. those strictly required pursuant to the Directive, is estimated at 140. It should be stressed that this number covers all the agglomerations that are required to prepare and implement an air quality plan (*plan de protection de l'atmosphère* – PPA), as defined by the Order of 28 June 2016 listing agglomerations with over 100 000 and 250 000 inhabitants under Article R.221-2 of the Environment Code, and most of the agglomerations successful in the 'clean air towns and cities' (*villes respirables*) call for projects.

4.2.3. Hydrogen recharging points

France has taken measures to encourage the deployment of hydrogen recharging infrastructure, which is still an emerging sector.

This deployment is based on a bottom-up approach within specific networks. It consists of an initial stage (currently ongoing), which involves establishing clusters of captive fleets. A captive fleet is defined as a fleet of vehicles with relatively predictable routes and consumption, which regularly return to the same vehicle park or depot. A cluster is defined as 'multi-client' captive fleets around a given area with one or more hydrogen stations. Given the low penetration rate of hydrogen vehicles and uncertainty about competition between segments, a top-down approach to a national network would seem inappropriate at this stage.

However, various projects are in hand and there is a keen appetite locally for this new form of mobility. The map below indicates their estimated location and the used and/or intended financing methods (Source: AFHYPAC/Mobilité Hydrogène France).

France has set itself the target of implementing these projects by 2025, meaning that around 30 stations would be accessible to the public. This figure could reach 50 depending on the extent to which these projects have been achieved, the maturity of the sector and the penetration of hydrogen vehicles. The targets may be raised in the event of significant developments in the supply of available vehicles and market conditions.

[55] LNG refuelling points may also be developed outside the TEN-T core network.

Figure 6 - Estimated location of the various hydrogen stations (existing and future)

11 existing stations:
- Paris-Ivry (Paris City Hall) and Pont de l'Alma (Air Liquide)
- Saint-Lô (CG 50)
- Lyon HyWay (CNR/GNVert)
- Grenoble HyWay (Air Liquide/Cofely/GEG) & Sassenage (Air Liquide)
- Dole (Solvay/Air Liquide)
- Luxeuil (La Poste)
- Albi (Circuit)
- Valence-Romans TGV (Agglo) & La Motte Fanjas (McPhy)

3 stations in the European FCH JU 2014 project (opening 2016-2017):
- Rodez
- Paris South
- Sarreguemines

9 stations in the European FCH JU 2015 project (opening 2017-2018):
- Lyon
- Valencia
- Montélimar
- Bordeaux
- Nantes
- Paris - North
- Paris - West
- Rouen
- Nancy

15 stations in the European CEF-T project (opening 2016-2017):
- Territory = Lower Normandy + Immediately Surrounding Departments
- Principle = plan a dense network at regional level
- Installation sites = being defined

Other territories involved in H2 mobility projects

4.2.4. Refuelling points for LNG at maritime and inland ports

In terms of targets, Directive 2014/94/EU on the deployment of alternative fuels infrastructure requires:

- for maritime ports, 'that an appropriate number of refuelling points for LNG[56] are put in place […] to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2025';
- for inland ports, 'that an appropriate number of refuelling points for LNG are put in place […] to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network by 31 December 2030'.

The Directive also requires the national policy framework to designate the ports where access to refuelling points is provided, also taking account of market needs. The ports subject to the provisions of Directive 2014/94/EU are the maritime ports (Marseille-Fos, Bordeaux, Nantes Saint-Nazaire, Le Havre, Rouen, Dunkirk and Calais) and the inland ports (Paris, Strasbourg, Mulhouse, Lille, Metz, Lyon and Chalon-sur-Saône) in the TEN-T core network[57]. However, the major maritime port of La Rochelle, which is part of the TEN-T comprehensive network, is also fully included in this approach, in the same way as the other ports listed above.

Developing an LNG refuelling offer at French ports is not simply a question of determining vessel range and accessibility to refuelling stations. In fact, marine fuel bunkering is a global market mainly concentrated around a few strongholds such as Singapore and the ARA zone (Antwerp, Rotterdam, Amsterdam). As an example, container ships on the Europe-Asia routes have a 10-week rotation and bunker only once at one of their loading/unloading ports.

In order to correctly calculate the size of the future LNG supply required within the Directive's timescales, future demand for maritime and inland waterway LNG at French ports

[56] Directive 2014/94/EU defines a refuelling point for LNG as 'a refuelling facility for the provision of LNG, consisting of either a fixed or mobile facility, offshore facility, or other system'.
[57] The ports of Le Havre, Rouen, Fos and Dunkirk are also identified as inland ports in the TEN-T core network.

had to be estimated. Two growth scenarios for LNG demand, one more gradual (base) and the other more optimistic, have therefore been developed[58]. In any event, all the projections involve the deployment of LNG on the three seaboards and on the five river corridors. They indicate that there will be a need for LNG at all ports within the TEN-T core network, from 2020 for the maritime ports and from 2025 for the inland ports.

However, the recent loss of attractiveness of LNG, due to the fall in oil prices to the benefit of other alternative solutions, and the uncertainties surrounding changing energy prices, operators' development strategies and the refuelling offer abroad make this forward-looking exercise complicated and hypothetical. For example, in terms of potential demand for LNG, a container ship route can require 0 kt or 130 kt of LNG at a given port depending on the shipowner's bunkering strategy, with the possible estimates varying widely. Growth in demand and the refuelling offer will also depend on any support for launching marine LNG projects that require major initial investment without offering immediate return.

Given these uncertainties, France has initially committed to deploying a refuelling offer gradually, with solutions tailored to the growth in demand corresponding to the 2025 base scenario referred to above. This first basic stage in the development of LNG by 2025 aims to establish, at least at one port on each seaboard, the regulatory and operational conditions needed for the bunkering of LNG and also possibly for the development of a retail LNG refuelling offer. Nevertheless, recent signs suggest that a growth in demand in line with the optimistic scenario is entirely plausible (toughening of international and European regulations on maritime transport emissions, additional orders for LNG-powered vessels, etc.). In that event, a more substantial offer may be developed at French ports with the support of the national and local authorities, which will adopt the regulatory measures required to create the necessary infrastructure.

More specifically, the 2025 deployment targets focus on the Mediterranean seaboard as the prime area for developing a substantial offer for the distribution of maritime and inland waterway LNG. The port of Marseille it set to increase its LNG refuelling capacity and become one of the main French bunkering ports by 2025, thanks to the opportunities offered by a booming cruise ship refuelling market, the presence of two LNG terminals (Fos Tonkin and Fos Cavaou) as well as a retail LNG distribution offer at Fos Tonkin, and thriving short-distance maritime transport activity. A maritime refuelling infrastructure is planned to ensure the refuelling of cruise ships, which require major bunkering volumes. At the same time, the port will establish the conditions and procedures required to set up refuelling services.

The English Channel-North Sea seaboard, at the entrance to the Northern European range, is also a market with strong potential for marine LNG bunkering, given its strategic geographical position, its membership of the SECA and the presence of the Dunkirk LNG terminal. An LNG refuelling service has been available at the port of Le Havre since May 2016. Demand should also grow at the other main maritime ports on this seaboard, including Rouen and Dunkirk where a road tanker refuelling service may be in place by 2025. Depending on the growth in demand, new road tanker and/or supply vessel loading infrastructure may be constructed next to the Dunkirk terminal.

Lastly, the Atlantic seaboard already offers a retail LNG road tanker loading service at the Montoir LNG terminal. The loading capacity is set to be increased soon, strengthening the LNG distribution service provided for several purposes: service stations for heavy-duty vehicles, industry and bunkering of LNG-powered vessels.

In addition, France will contribute to any initiative that allows LNG fuel to be regarded favourably and helps achieve the optimistic demand scenario. The marine LNG refuelling offer could then be extended to other ports in the TEN-T core network, and even to certain ports in the TEN-T comprehensive network, provided by road tanker or vessel or via land-

[58] The annex 'Estimates of the future annual demand for maritime and inland waterway LNG' gives more details on the development of these scenarios and the results obtained.

based storage (depending on the refuelling method adopted in the main refuelling port on the seaboard in question).

As regards inland ports, uncertainties about future demand are still too great to set a target within the timescale of the Directive. The more small-scale structure of the inland waterway transport sector makes it difficult to convert or order LNG-powered inland waterway vessels, and therefore to increase the demand required for refuelling solutions to be developed. Nevertheless, according to the forecasts of economic operators, mobile 'truck to ship' or small fixed station bunkering offers may develop by 2030 at several inland ports in the TEN-T core network and at least on each waterway axis.

Table 8 - Ports giving access to LNG refuelling points: fixed targets and prospects envisaged by market operators within the Directive's timescales

	Targets	**Prospects envisaged**
Maritime ports (by 2025)	Le Havre, Rouen, Marseille-Fos, Nantes St-Nazaire, Dunkirk, La Rochelle, Bordeaux	Calais, Dieppe, Nice, Brest, Roscoff, Toulon, Caen Ouistreham, Cherbourg
Inland ports (by 2030)	Rouen, Le Havre, Strasbourg	Paris, and on each waterway axis (Seine, Nord-Est, Nord-Pas-de-Calais, Rhône-Saône, Rhine)

4.2.5. Shore-side electricity supply in maritime and inland ports

Directive 2014/94/EU provides that 'Member States shall ensure that the need for shore-side electricity supply for inland waterway vessels and seagoing ships in maritime and inland ports is assessed in their national policy frameworks. Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits'.

The wording in Directive 2014/94/EU reflects the difficult balance between, on the one hand, the sizeable investments needed to develop shore-side electricity supply in response to an as yet relatively unstructured demand and, on the other hand, the expected benefits, particularly environmental benefits.

In order to meet the Directive's requirements, the government has carried out a national socioeconomic assessment weighing the costs and benefits, including the environmental benefits, of shore-side electricity supply in maritime ports as compared to vessels using marine diesel when in port.

This assessment has identified the minimum conditions (quay occupancy rate, density of the surrounding urban environment, etc.) required for a shore-side electricity supply service to be cost-effective in socioeconomic terms, and has ranked the quays that would be best suited to being equipped and connected to the electricity grid by 2025 and that should therefore be a priority target for investment, subject to the results of further studies conducted locally on the ports. These further studies will be vital in order to identify the most appropriate berths for this type of service in terms of environmental benefits and ease of installation, and to assess the project costs.

Only vessels on short commercial stopovers have been taken into account in the assessment. The energy needs of vessels on long stopovers – wintering and ship repair – have not been assessed as they pose very different challenges. However, most ports offer a shore-side electricity connection at their dry docks. Maintaining and developing these systems is also a high priority because, despite the lower energy needs, the pollutant emissions, and therefore the environmental benefits if the auxiliary engines are shut down,

are potentially significant for long stopovers. Similarly, an assessment for inland waterway transport (where the model established for seagoing vessels is not relevant due to the technical characteristics of the boats, engines and fuels used) has been carried out in liaison with the relevant players based on a qualitative analysis of the challenges.

However, there are limits to this socioeconomic assessment. The monetary valuation of air pollutants, which accounts for a large part of the benefits of shore-side electricity, depends very much on the assumptions made with regard to the urban context (dense or not) within which the investment is made. Moreover, the study is based on average data in terms of both energy needs (by type of vessel) and investment cost. However, electricity needs can vary significantly with vessel size, and the necessary investments are closely linked to the distance between the quay and the high-voltage electricity system. The results of this quantitative study have therefore been backed up by a qualitative analysis of the challenges. Ports, which are an essential driving force in launching this type of environmental project, have been asked about their short and long-term development strategies and any technical studies already carried out in this respect. Information has also been supplied by the other players key to these projects, i.e. maritime shipowners and equipment manufacturers, and through feedback on the first operation to connect merchant vessels to shore-side electricity in the port of Marseille.

The assessment shows that discussions on the development of shore-side electricity supply services should primarily focus on ro-ro terminals for RoPax vessels (vehicles and passengers) and on cruise ship terminals situated close to a dense urban area (density in excess of 2 250 inhabitants per km^2), where vessels have considerable energy needs when in port and significant overall stopover times. Based on an occupancy rate (occupation of one berth by one vessel) of approximately 400 hours per year for both ferries/ro-ro vessels and cruise ships, the environmental benefit offsets all the additional costs and investments that arise when opting for electrical technology to supply vessels in port.

However, in addition to this initial prioritisation, all quays and terminals situated in urban areas (density in excess of 750 inhabitants per km^2) should be analysed locally to determine whether it is appropriate to install a shore-side electricity supply service for targeted regular lines. Similarly, ro-ro and cruise ship terminals situated in low-density urban areas or interurban areas[59] may also prove relevant in socioeconomic terms.

Furthermore, ranking priority quays and ports according to environmental benefit is a relevant approach only if the operational and technical constraints involved in installing the necessary electrical equipment are also considered when defining the strategy and choices for developing shore-side connections at the berths of a given port. There is a strong case for supplying cruise ships with shore-side electricity, due to their high energy consumption when in port, but at the same time their high energy needs mean that a power supply of between 10 MW and 20 MW per vessel is required, which is comparable to the current electrical capacity requirements of a commercial port. Demand for additional power from shore-side supply may therefore, at certain ports, necessitate very considerable additional infrastructure investments. In addition to the extra infrastructure and work needed, cruise ships require further specific electrical equipment (frequency converters) because these vessels – constructed and operated internationally – often comply with the most global electrical standards and therefore have an on-board frequency that differs from the European electricity grid[60].

Several French maritime ports have already conducted studies in this respect and have therefore defined, or will shortly define, their strategies for deploying an electricity supply service. Accordingly, the port of Marseille, having already developed a first service for

[59] The densities of a low-density urban area and an interurban area are 250 and 25 inhabitants per km^2, respectively.

[60] An increasing number of vessels operating internationally use a frequency of 60 Hz whereas the European electricity grid is based on 50 Hz.

merchant vessels, intends to extend this offer with the eventual aim of being able to connect cruise ships. Initially, however, due to the technological constraints indicated above, the second stage of this deployment will involve connecting and equipping quays intended for vessels on long stopovers for maintenance, which require a frequency of 60 Hz.

Furthermore, the port of Dunkirk plans to provide shore-side electricity to container ships calling at the Flanders terminal shortly. However, as with most of these projects, the financing issue, in view of the very considerable investments required, will be key when the port operators make their decision. The ports of Nantes and Bordeaux have approached energy suppliers and equipment manufacturers regarding possible solutions and how they can be adapted to the configurations of their ports and quays, whilst the ports of La Rochelle and Calais have conducted local technical studies focusing on specific quays. The HAROPA ports (Le Havre, Rouen and Paris), Ports Normands Associés, the port of Dieppe and the Seine Maritime departmental ports have also conducted a preliminary study on the challenges of shore-side electricity supply, as part of the SAFE SECA project, and are considering launching pre-operational studies on the requirements.

As regards inland waterway transport projects in the short term, the port of Strasbourg plans, as part of the construction of its new river port for passenger cruisers, to connect the new jetties to the shore-side electricity system. In addition, the port of Lille is currently carrying out technical studies into developing an improved shore-side electricity supply service, whilst the port of Lyon is working to extend its electricity supply to other quays.

Based on the results of the socioeconomic assessment and the ports' development strategies, the following ports are likely to be offering shore-side electricity supply by 2025: the port of Marseille for maritime transport – as a priority for RoPax vessels (vehicles and passengers) – and the ports of Paris, Strasbourg, Le Havre, Rouen, Lille and Lyon for inland waterway transport. It should be noted that any shore-side electricity supply concerns a specific type of vessel and quay. The proposed development objectives involve the relevant port or terminal operator offering shore-side electricity at a minimum of one terminal in the port, for one or more berths. Not all the berths in the port will therefore be served.

In addition to the ports most likely to offer this service by 2025, the socioeconomic assessment identified other ports that may provide this type of service by 2025: the ro-ro terminal at Nantes, the cruise ship terminal at Bordeaux Centre, and the container, ferry and ro-ro terminals at the port of Le Havre. However, these potential development prospects depend heavily on demand. In the event of increased traffic and demand from regular lines, the cruise ship terminals at the ports of La Rochelle, Le Havre and Rouen may also be equipped. Furthermore, depending on the market and if operational conditions permit, shore-side-supply for cruise ships may be introduced at the port of Marseille. However, the significant technological constraints, due to the vast power requirements of these vessels, and the high investment costs will be key factors in the decision to launch this type of project.

Regulatory changes in terms of restrictions on pollutant emissions from vessels, the use of alternative fuels to propel vessels and ship-to-shore connection technologies will also condition the future development of shore-side electricity.

5. Monitoring the implementation of and amending the national policy framework

This national policy framework is part of a comprehensive, sequential approach to the deployment of an alternative fuels infrastructure in the transport sector. Key stages of the approach include monitoring the framework's implementation, regularly updating its content and communicating the necessary information to the various stakeholders and the European Commission.

The Commission requires each Member State to submit a report on the implementation of its national policy framework every three years, the first one by 18 November 2019. The report must also indicate the level of attainment of each target and objective and provide the necessary explanations.

To ensure proper monitoring of the national policy framework's implementation, and to be able to provide the required data to the Commission, further preparatory work needs to be carried out upstream. This particularly concerns access to numerical and/or statistical data by type of alternative fuel or by transport sector, which, given the current state of French nomenclatures, is not monitored closely enough. This work should be carried out with the involvement of internal and external stakeholders, by signing agreements or monitoring certain tasks as necessary. At this stage, it seems essential to map the location of recharging and refuelling points accessible to the public, along with their distribution capacities and level of use, and to monitor demand for alternative fuels and gain insights into recharging/refuelling behaviour, in particular electrical recharging.

Maintaining current levels of stakeholder involvement and communication is also important to be able to provide the three-yearly report required by the Commission. An annual meeting will therefore be organised on the monitoring of the policy framework's implementation. This will also allow the various stakeholders to keep sharing their comments and submitting their contributions on this issue. In 2019, and every three years thereafter, the draft three-yearly report will be submitted to the Monitoring Committee, and comments will be collected before the final version is sent to the Commission by the deadlines set.

Further work is currently being launched or continued with the aim of further developing the socioeconomic assessment and analysing the lifecycle and development of alternative fuels and the vehicles using them. This work may be supplemented by discussions on the need for and content of a national masterplan for the installation of recharging infrastructure for electric vehicles.

6. Annexes

6.1. Definitions

Alternative fuel:

The definition in Article 2 of Directive 2014/94/EU, which provides that 'alternative fuels' means fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport, has been adopted for the purposes of this document. They include, inter alia, electricity, hydrogen, biofuels, natural gas in compressed form (CNG) and liquefied form (LNG), and liquefied petroleum gas (LPG).

With regard to the use of hydrogen, this document refers to a vehicle fitted with a fuel cell that directly converts the hydrogen fuel stored in the vehicle's tank into electrical energy. This conversion occurs through the controlled electrochemical combustion of hydrogen and oxygen, which simultaneously produces electricity, water and heat.

Recharging point[61]:

A normal power recharging point means a recharging point that allows for a transfer of electricity to an electric vehicle with a power less than or equal to 22 kW. A rapid or high power recharging point means a recharging point that allows for a transfer of electricity to an electric vehicle with a power of more than 22 kW.

A recharging point accessible to the public means a recharging point, operated by a public or private operator, which provides non-discriminatory access to users. Non-discriminatory access may include different terms of authorisation, authentication, use and payment. The following are particularly regarded as recharging points accessible to the public:

- a recharging point where the parking space is physically accessible to the public, including by means of authorisation or payment of an access fee;
- a recharging point associated with a car-sharing system and accessible to third parties, including by means of payment for the recharging service.

Refuelling point:

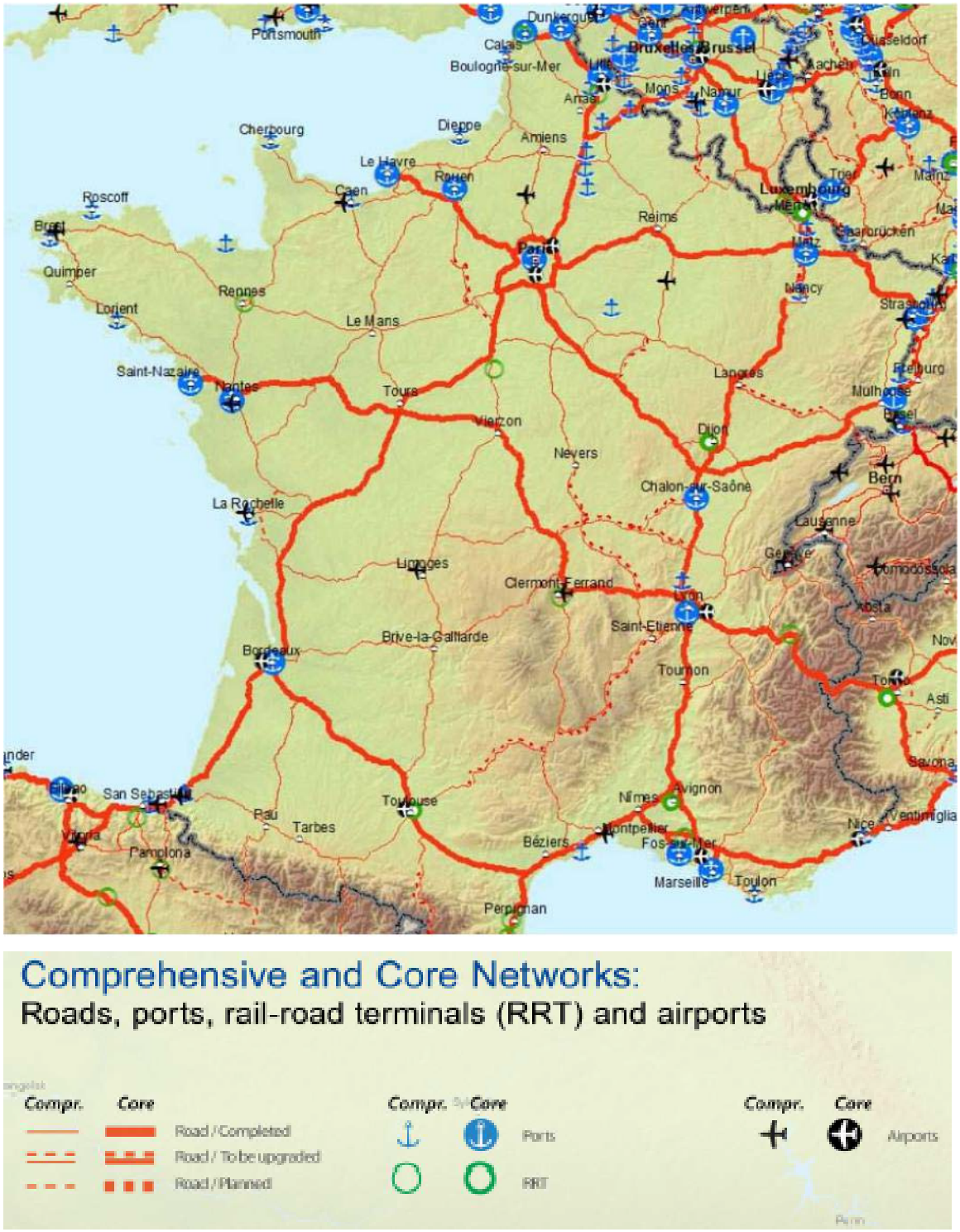
In accordance with Article 2 of Directive 2014/94/EU, a refuelling point means a refuelling facility for the provision of any fuel with the exception of LNG, through a fixed or a mobile installation. A refuelling point for LNG means a refuelling facility for the provision of LNG, consisting of either a fixed or mobile facility, offshore facility, or other system.

TEN-T (Trans-European Network for Transport) core network:

The Trans-European Network for Transport (TEN-T) aims to strengthen the social, economic and territorial cohesion of the EU and contribute to the creation of a single European transport area. It is organised in a two-tier structure, consisting of the comprehensive network and the core network, with the latter being based on the comprehensive network. The TEN-T consists of rail transport, inland waterway transport, road transport, maritime transport, air transport and multimodal transport infrastructure. The core network consists of the main urban nodes, ports and airports, as well as the cross-border junctions[62].

[61] Source: Decree No 2017-26 of 12 January 2017 on recharging infrastructure for electric vehicles and transposing various provisions of Directive 2014/94/EU.

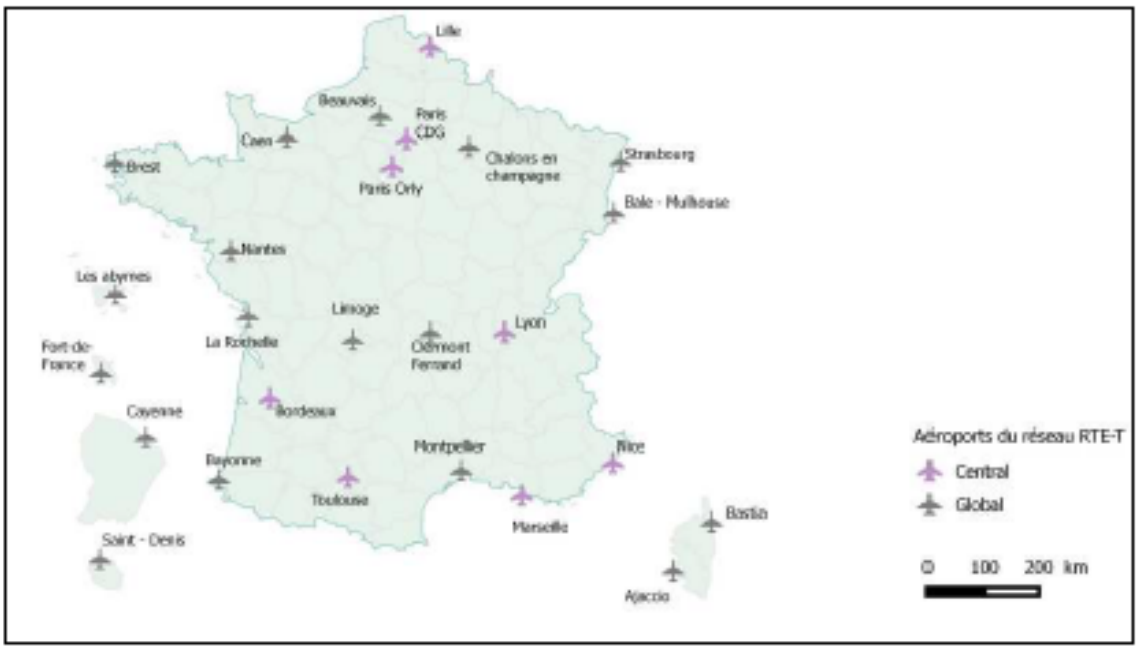
[62] See Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network.



Urban nodes of the TEN-T core network: Bordeaux, Lille, Lyon, Marseille, Nice, Paris, Strasbourg, Toulouse

Maritime ports of the TEN-T core network: Marseille-Fos, Bordeaux, Nantes Saint-Nazaire, Le Havre, Rouen, Dunkirk and Calais.

River ports of the TEN-T core network: Paris, Strasbourg, Lille, Metz, Lyon, Chalon-sur-Saône.



Airports of the TEN-T network (core and comprehensive) - Source: DGAC

[Key to figure:]	
Aéroports du réseau RTE-T	Airports of the TEN-T network
Central	Core
Global	Comprehensive

6.2. Method for the top-down approach to calculating the size of electric recharging and NGV refuelling networks

The aim of the top-down approach is to calculate the size of networks of electric recharging points and NGV refuelling points accessible to the public that allow electric or NGV vehicles to access distribution points for these fuels and circulate within given transport axes or agglomerations. This approach is based solely on criteria of physical accessibility to stations (inter-distance in kilometres between two stations) and is independent of future demand for electricity or natural gas as fuels.

The physical accessibility criteria, which are the inter-distances in kilometres, are based on the following principles:

- Along linear infrastructure (TEN-T core network), the inter-distance is approximately half the current average range of vehicles powered by the fuel in question (in the case of gas).
- In urban environments, the inter-distance between two stations reflects the maximum access time at a refuelling station. This access time varies according to the type of fuel supply: running time is used for electric vehicles (recharging while parked) and access time for natural gas vehicles (similar to hydrocarbons).

The top-down approach allows the size of electric recharging and NGV refuelling networks to be calculated so that they are sufficient for the initial development of these fuels, while minimising the risk of underuse of stations.

However, the results obtained must be refined on a local basis by taking account of the specific characteristics of the territory: they will therefore trigger a process of more accurate definition, involving dialogue with the relevant stakeholders, in particular local authorities. Moreover, densifying or enlarging the network will be required where demand is high enough to saturate the initial distribution network or justify the presence of stations beyond the

transport axes and agglomerations initially taken into account. This phase will subsequently be the subject of private and socioeconomic cost-effectiveness analyses.

The results presented below (section 6.2) do not therefore in any way constitute a commitment on the part of France.

6.2.1. Electric recharging points

As regards electric recharging points accessible to the public, the calculated network must, in dense areas, enable users without a private recharging point to circulate and recharge their vehicles in the area in question. In rural areas, this means offering a recharging service that supplements private recharging in order to reassure users and therefore develop confidence in the recharging network, even though main charging needs may exist.

Electric recharging point installation areas in the national territory

The national territory has been divided into areas based on the following findings and principles:

- Electromobility is primarily based on recharging at home or at work through private recharging terminals (around 90% of recharging, according to operators in the sector).
- The installation of these private recharging terminals requires a private parking space that can be equipped with a power socket (private garage, underground parking, etc.). However, a large number of dwellings and businesses in dense areas do not have private parking spaces. A network of terminals accessible to the public is therefore necessary in these dense areas.
- The key density criterion is assessed in this case based on INSEE data, which indicate the density (in inhabitants per km²) of the national territory per square with 1 km sides.
- In dense areas where vehicles are recharged while parked, the inter-distance in kilometres criterion is based on a walking access time to a recharging terminal (or, which is equivalent, on the length of the walk between a terminal and the final destination).
- Electromobility is also developing in rural areas. Private parking spaces that can accommodate a recharging point are more widespread in these areas than in dense areas.
- The installation of recharging points in rural areas helps to ensure coverage of the territory and reassure users of electric vehicles by increasing recharging opportunities and thus creating confidence in the recharging network.
- To tackle the issue of rural areas without any dense areas, the territory has been broken down into living areas. According to INSEE, ‘The living area is the smallest territory in which inhabitants have access to everyday facilities and services. The everyday facilities and services used to define living areas are divided into six main groups: personal services, trade, education, health, sports, leisure and culture, and transport. The division of the territory into living areas provides additional information through the analysis of the distribution of facilities and access to them. Its main value lies in identifying those areas that are not heavily populated’. Everyday facilities include large supermarkets that account for a large proportion of the network of traditional service stations.
- As a result, electric recharging in rural areas is regarded in this case as a service, and living areas without any dense areas must also be equipped. The station is

accessed by vehicle with a view to recharging while engaged in other activities (shopping, etc.).

The national territory is therefore divided into the following areas:

Dense areas	Only urban units with more than 5 000 inhabitants are equipped. Below this threshold, there is mainly non-dense housing. Within these urban units, to avoid unpopulated areas (parks, industrial areas, etc.), only areas with a density in excess of 450 inhabitants/km^2 are equipped[63].	*968 living areas*
		89% of the population
Rural areas	These are living areas without any urban units that meet the criteria of 5 000 inhabitants and a density > 450 inhabitants/km^2.	*676 living areas*
		11% of the population

Accessibility criteria used

The accessibility criteria used for each area are listed in the following table:

Dense areas	Areas with a density between 450 and 1 500 inhabitants/km²	Inter-distance of 3 km ⇔ 20-minute walk
	Areas with a density of more than 1 500 inhabitants/km²	Inter-distance of 1.5 km ⇔ 10-minute walk
Rural areas	Areas with a density of less than 450 inhabitants/km²	1 station per living area *Access time: on average 20 minutes by car (average for France as a whole)*

Based on the inter-distance chosen, the number of recharging stations needed to cover the dense area in question can be obtained by using a regular hexagon tessellation (see diagram below).

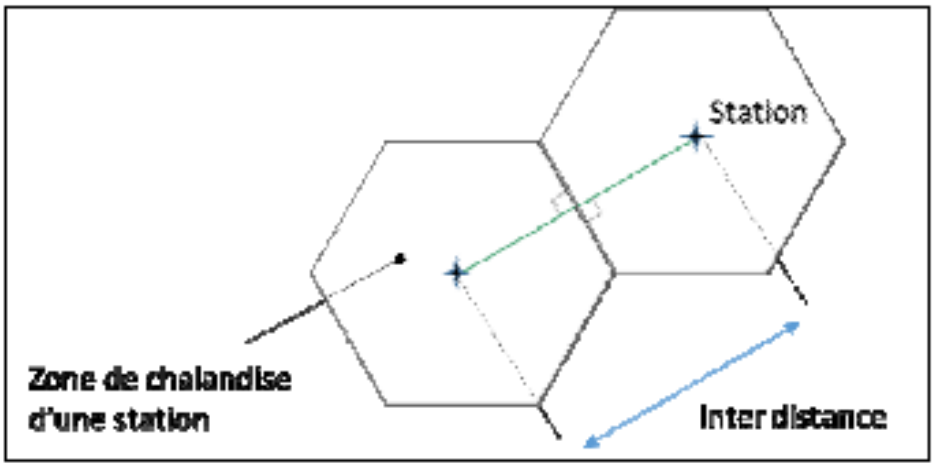


Figure 7 - Inter-distance between two stations and regular hexagon tessellation

[Key to figure:]	
Zone de chalandise d'une station	Catchment area of a station

[63] The threshold of 450 inhabitants/km^2 corresponds to the 'urban' area in the classification of the report on the socioeconomic assessment of public investment, which was published in 2013. Areas below this threshold are classified as non-dense urban areas. The threshold of 1 500 inhabitants/km^2 corresponds to dense urban areas.

Station	Station
Interdistance	Inter-distance

The decision to increase the density of stations in more dense areas (> 1 500 inhabitants/km^2) is explained by the need to take into account that the parking space/dwelling ratio reduces as the population density increases, which therefore means that the number of public stations needs to be higher.

One station (with at least two recharging points) in an area with a density of between [450 - 1 500] inhabitants/km² has a population within its catchment area of between [3 000 - 9 000] inhabitants. The inter-distance of 3 km therefore complies with a ratio of approximately 3 000 inhabitants/recharging point (ratio used in the calls for projects organised by ADEME [French Environment and Energy Management Agency]).

For areas with a density > 1 500 inhabitants/km^2, stations need to be brought closer together with an inter-distance of 1.5 km in order to reduce the number of inhabitants/recharging point so that the ratio of 3 000 inhabitants/recharging point is roughly met.

Results

The top-down approach provides indicative results regarding the number of recharging stations accessible to the public and their distribution within the national territory. As this approach is not based on demand, the number of recharging points per station is regarded as two, which is the minimum found (corresponding to the installation of one recharging terminal per station).

Number of recharging points	Number of stations	Number of recharging points
Dense areas	7 480	14 960
Rural areas	670	1 340
FRANCE TOTAL	8 150	16 300

Comparing these figures with the number of points available as at 16 September 2016 reveals a mixed picture: some territories have a number of recharging points that is already higher than the figure resulting from the top-down approach, whilst other territories have a number of recharging points that is significantly below the figure resulting from this approach.

Taking into account:

- on the one hand, the number of recharging points available in those territories where this figure exceeds that resulting from the top-down approach, and,
- on the other hand, the number of recharging points resulting from the top-down approach for the other territories,

this results in a figure of 21 300 recharging points.

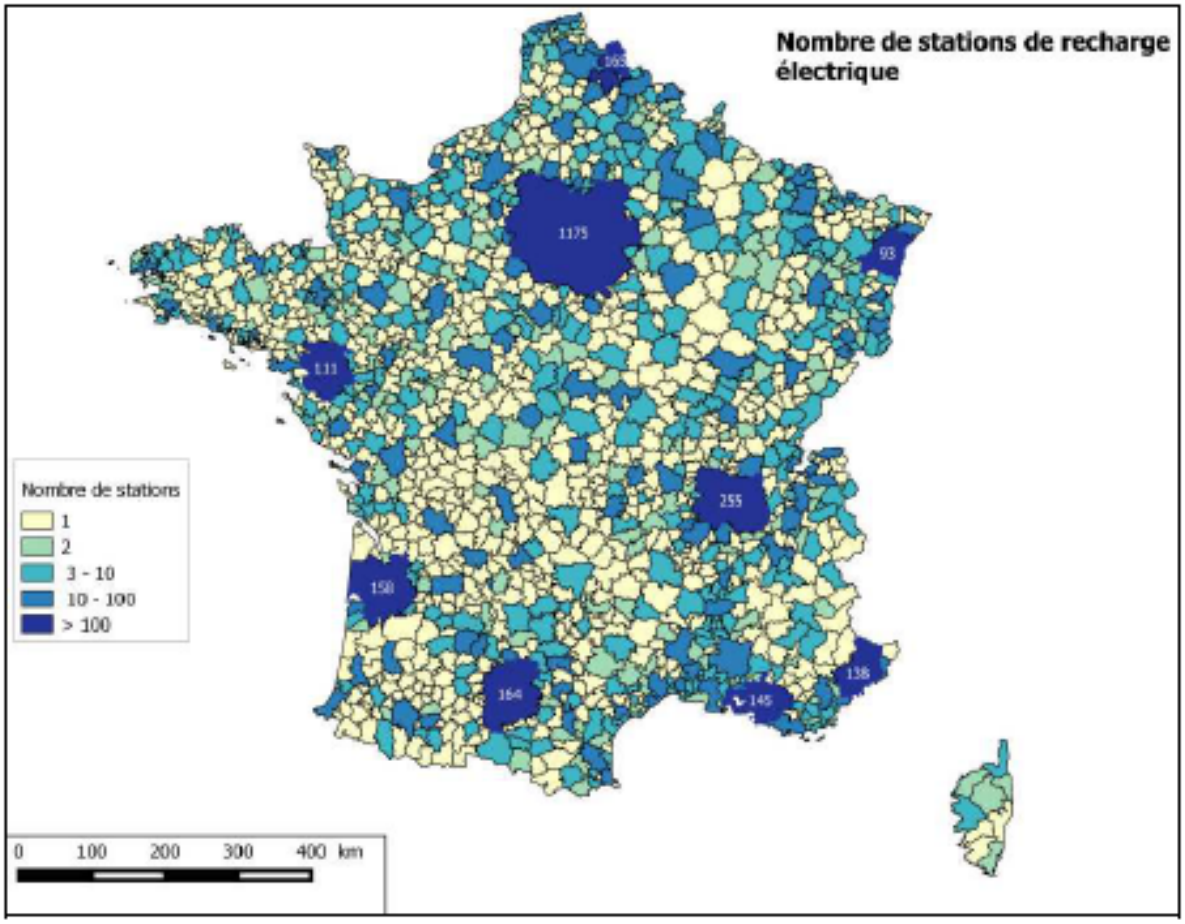


Figure 8 - Results of the top-down approach: indicative distribution of electric recharging stations accessible to the public, per living area

[Key to figure:]	
Nombre de stations de recharge électrique	Number of electric recharging stations
Nombre de stations	Number of stations

6.2.2. NGV refuelling points

NGV refuelling station installation areas

Directive 2014/94/EU aims to develop NGV in agglomerations and populated areas on the one hand (with regard to CNG) and along the TEN-T core network on the other hand (CNG and LNG).

Base scenario

As regards agglomerations and populated areas, to ensure the initial development of NGV, the top-down approach in the base scenario covers the nine main French urban areas: Paris, Lyon, Marseille-Aix-en-Provence, Toulouse, Lille, Bordeaux, Nice, Nantes, and Strasbourg.

Along the TEN-T, while respecting the inter-distance criterion discussed above, the top-down approach involves locating stations along the TEN-T in urban areas wherever possible, but in any case less than 10 km from the TEN-T. As a result, one station meets the needs of both directions of travel, covering not only the needs of the TEN-T but also local needs by making it accessible from outside the TEN-T.

The accessibility criteria used are therefore as follows:

	Large agglomerations	Along the TEN-T core network
CNG	Inter-distance of 30 km between two stations (⇔ maximum journey by vehicle of 30 minutes)	Increased density of stations in large agglomerations along the TEN-T. Inter-distance of 200 km between two stations. Stations located within urban areas of over 100 000 inhabitants, and less than 10 km from the TEN-T wherever possible. Ports in the TEN-T core network are also equipped with a CNG station for road vehicles.
LNG	-	Inter-distance of 400 km between two stations. Stations located within urban areas less than 10 km from the TEN-T. Ports in the core network are also equipped with an LNG station for road vehicles.

The top-down approach in the base scenario provides indicative results regarding the number of CNG or LNG refuelling points accessible to the public, their distribution within the nine largest urban areas in question and the location of points along the TEN-T core network. The figures in the following table take account of existing stations, including those stations that are only accessible to light-duty vehicles (9 CNG stations).

Number of refuelling points	CNG	LNG
In the nine largest urban areas (2020)	35	-
Along the TEN-T core network (2025)	72	25

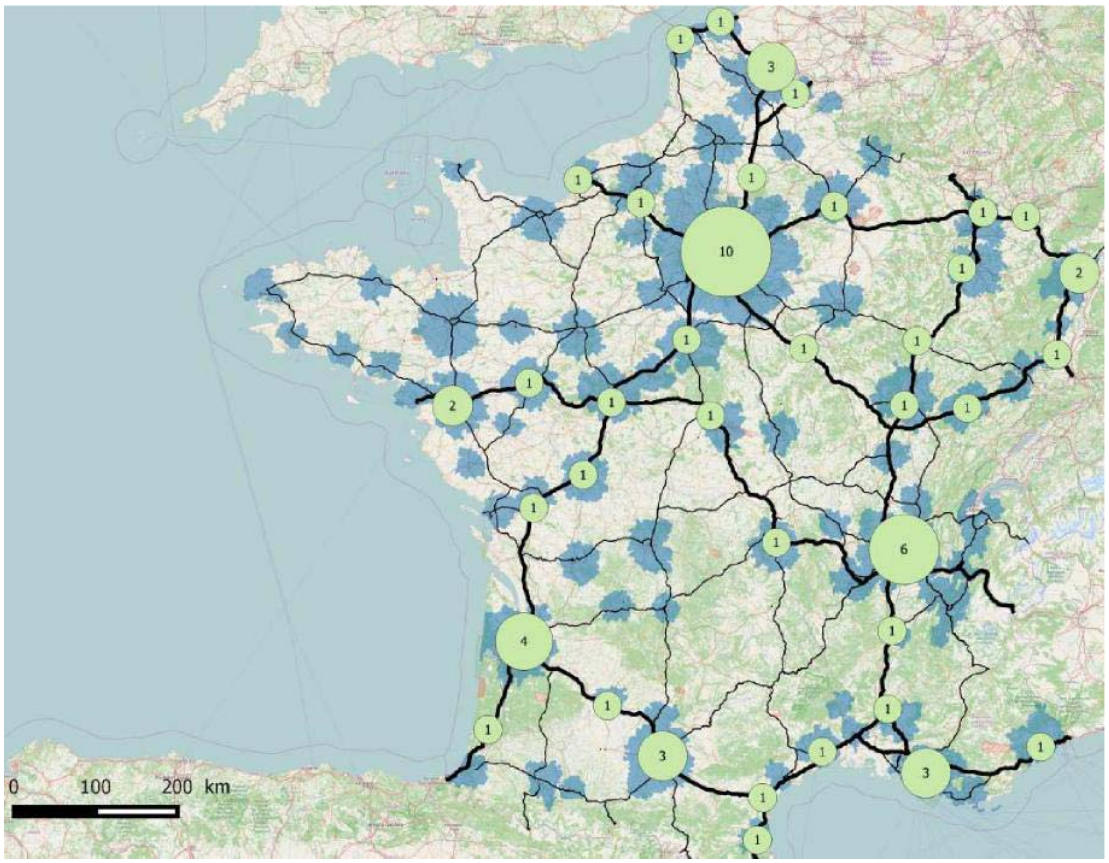


Figure 9 - Results of the top-down approach (base scenario): indicative distribution and location of CNG stations along the axes of the TEN-T core network accessible to heavy-duty vehicles (by 2025)

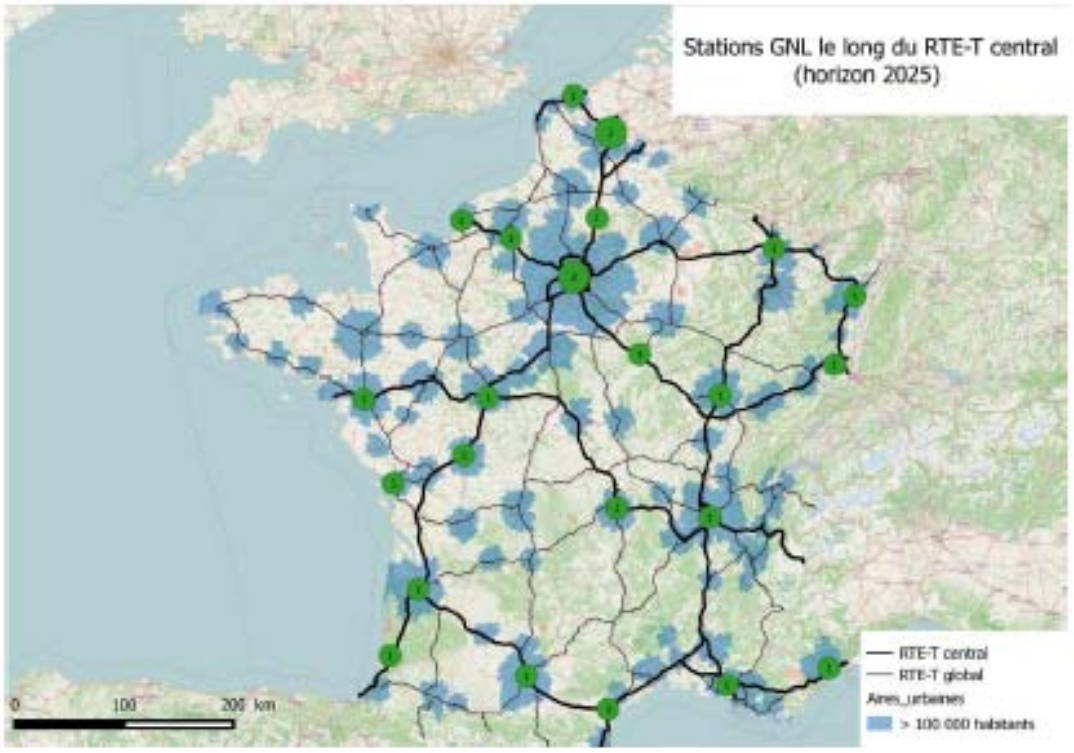


Figure 10 - Results of the top-down approach (base scenario): indicative distribution and location of LNG stations along the axes of the TEN-T core network accessible to heavy-duty vehicles (by 2025)

[Key to figures:]	
Stations GNL le long du RTE-T central (horizon 2025)	LNG stations along the TEN-T core network (by 2025)
RTE-T central	TEN-T core
RTE-T global	TEN-T comprehensive
Aires_urbaines	Urban areas
habitants	inhabitants

Appropriate number of points

Several other factors have been taken into account together with the base scenario:

- stations within urban areas of over 100 000 inhabitants supplementing the TEN-T core network;
- stations within urban areas of over 100 000 inhabitants along the TEN-T comprehensive network and not just the core network.

The results obtained have been used to determine the appropriate number of CNG and LNG refuelling points.

The appropriate number of refuelling points is therefore estimated at:

- 79 CNG refuelling points accessible to the public by 31 December 2020, taking account of existing stations (44);
- 116 CNG refuelling points by 31 December 2025;
- 25 LNG refuelling points by 31 December 2025.

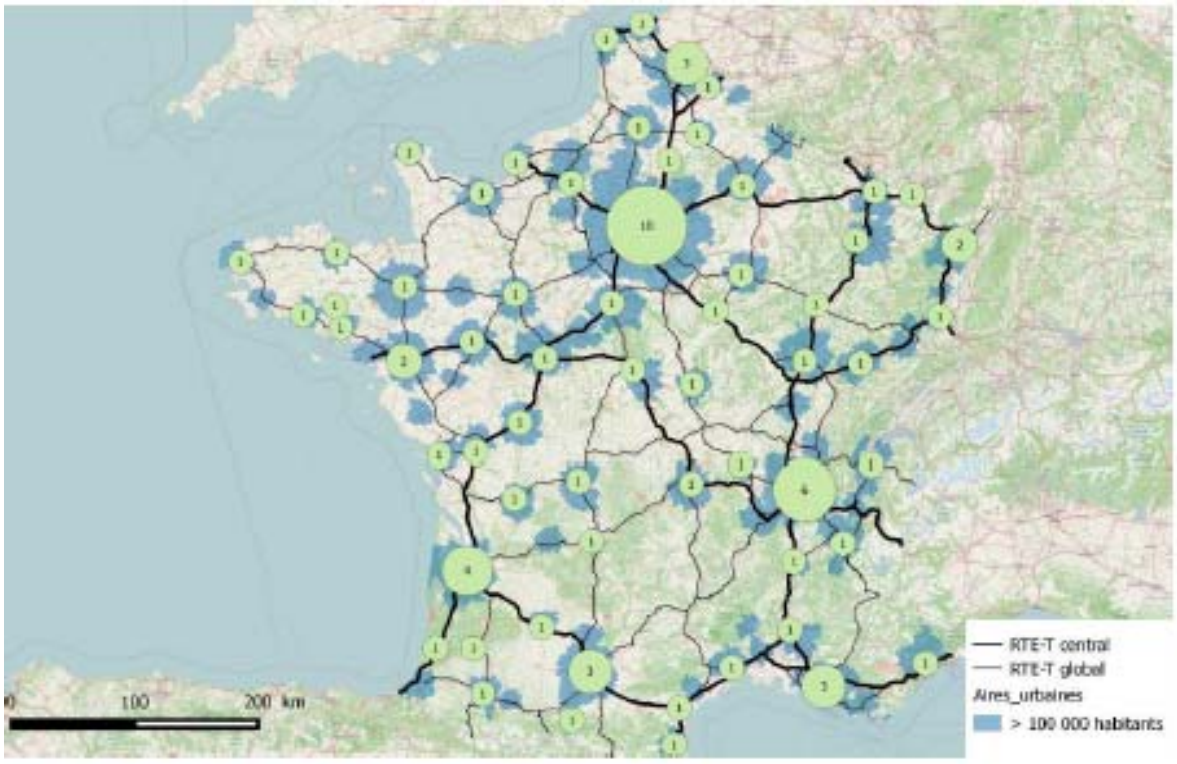


Figure 11 – Estimate of the appropriate number of CNG stations: indicative distribution and location of CNG stations accessible to heavy-duty vehicles (by 2025), given the data known in 2016

[Key to figure:]	
RTE-T central	TEN-T core
RTE-T global	TEN-T comprehensive
Aires_urbaines	Urban areas
habitants	inhabitants

The estimate of the appropriate number of LNG stations is as indicated in Figure 10.

6.3. Estimates of future annual LNG demand (marine and inland waterway) and assessment of the need to install LNG refuelling points in ports outside the TEN-T core network

The French Gas Association (*Association Française du Gaz* – AFG) decided to contribute to the national policy framework to ensure a sufficiently robust estimate of LNG demand by 2025-2030. It therefore turned to operators in the sector (ports, LNG terminal operators, shipowners, gas suppliers, etc.) and state services in order to conduct a forward-looking exercise to assess LNG demand at French ports[64].

Five main parameters were taken into account in this assessment:

- current and predicted traffic at each port;
- current bunkering carried out at each port;
- current annual consumption of fuel by type of vessel and quantities bunkered per refuelling operation;
- operating practices of shipowners (contracts with energy suppliers, filling of bunkers at one or more bunkering points, etc.);
- rate of conversion of vessels to LNG in correlation with fleet renewal by shipowners.

Other factors are key to the development of the LNG market. These include future strategic choices in the development and renewal of fleets by shipowners and incentive measures, implemented through private or public initiative, to support and encourage actions in favour of LNG requiring significant investment. As an example, access to European financing for ports located within the TEN-T core network has a substantial leverage effect on the development of LNG deployment projects.

The presence of LNG sources of supply (LNG terminals) is also a major advantage encouraging the establishment of a refuelling service. France is currently the third largest importer of LNG in Europe, behind Spain and the United Kingdom. LNG is imported by sea and then stored in one of the French LNG terminals detailed in the following table:

Seaboard	Major Maritime Port	LNG terminal	Regasification capacity (Gm^3/year)	Storage capacity (m^3)	Operator
Atlantic	Nantes-Saint Nazaire	Montoir-de-Bretagne	10	360 000	Elengy
Mediterranean	Marseille	Fos-Tonkin	3	80 000	Elengy
		Fos-Cavaou	8.25	330 000	Elengy
English Channel-North Sea	Dunkirk	Dunkirk[65]	13	570 000	Dunkerque LNG

Two scenarios, one more gradual (base) and the other more optimistic, have therefore been developed over three timescales: 2020, 2025 and 2030. These scenarios involve the gradual deployment of LNG at French ports, on the three seaboards and on the five river corridors, and imply a need for LNG at all maritime ports within the TEN-T core network from 2020, which will then extend to certain ports within the comprehensive network, as well as at the

[64] 'Rôle du GNL carburant marin et fluvial dans la transition énergétique pour la croissance verte - Contribution au cadre d'action national sur le déploiement d'une infrastructure pour carburants alternatifs', AFG, June 2016.
[65] Commissioned at the beginning of 2017.

inland ports within the TEN-T core network from 2025. By 2025, the annual LNG bunkering estimates for France vary between around 150 kt (for the base scenario) and 500 kt (for the optimistic scenario). The breakdown of these estimates by seaboard is indicated in the following table.

Table 9 - Estimate of the annual quantity of marine LNG bunkered by seaboard by 2025 (in kt)

Seaboard	Base scenario	Optimistic scenario
English Channel - North Sea	60	220
Atlantic	30	50
Mediterranean	60	220
Total marine LNG	**150**	**490**

As regards demand for inland waterway LNG by 2030, the annual LNG bunkering estimates for France vary between around 20 kt (for the base scenario) and 50 kt (for the optimistic scenario). The breakdown of these estimates by basin is indicated in the table below. Due to greater uncertainty about future demand for inland waterway LNG in this forward-looking exercise, the exact future locations of LNG refuelling infrastructure, and/or services that may be needed by 2030 to meet demand, could not be established.

Table 10 - Estimate of the annual quantity of inland waterway LNG bunkered by basin by 2030 (in kt)

Basin	Base scenario	Optimistic scenario
Nord-Pas-de-Calais	1	2
North-East	2	2
Rhine	12	35
Seine	3	5
Rhône	1	2
Total inland waterway LNG (approximately)	**20**	**50**

These future needs for LNG will determine the extent of the refuelling offer to be provided at each port, also in relation to the various existing supply and refuelling arrangements. Several marine LNG refuelling solutions are technically possible, with different characteristics in terms of refuelling capacity and ease of implementation. Bunkering by road tanker, which is already used at the port of Le Havre, is the easiest solution to implement and has proved suitable when demand for LNG is low. It should be noted that the decision by economic operators to develop a retail LNG distribution offer is also strongly guided by demand for LNG intended for road transport and for businesses not connected to the gas system, which, together with vessels, represent the potential customers of these land-based refuelling stations.

If demand for marine LNG increases, it will become necessary to develop refuelling solutions with greater capacity, involving a bunker vessel (or barge) or pipeline from a land-based storage station. The following table offers a comparison of these refuelling methods.

	Road tankers	**Bunkering vessels or barges**	**Land-based station**
Principle	Transfer of LNG from a road tanker to a moored vessel using a cryogenic loading arm or hose	Transfer of LNG from a bunkering vessel or barge to the vessel to be bunkered	Transfer of LNG from fixed land-based storage to the moored vessel
Supply	From a retail LNG loading station for road tankers, supplied by (and therefore often attached to) an LNG terminal	From a maritime refuelling station constructed at an LNG terminal: need to adapt or construct a jetty and loading arms	From a satellite land-based station supplied by sea, river or land
Bunkering unit capacity	40 to 700 m³ by means of road tankers with a capacity of 40 to 55 m³	150 to 7 000 m^3 by means of barges/vessels with a capacity of 1 000 to 7 000 m^3	40 to 700 m^3 through land-based storage stations with a capacity of 110 to 20 000 m^3
Investment	€350 000	€20 million (barge) €30-€60 million (vessel)	Varies significantly depending on the type of storage tank needed (€400 000-€60 million)
Advantages	- ease and speed of implementation - ease of access to all quays and vessels - small initial investment - can be used for other purposes: deliveries to service stations for heavy-duty vehicles, supplying businesses not connected to the gas system, refuelling inland barges	- allows the bunkering of larger volumes than road tankers - therefore meets the needs of container ships and cruise ships, which may in the short-/medium-term account for the largest proportion of the marine LNG market - speed of transfer	- allows the bunkering of larger volumes than road tankers - less investment than for bunkering vessels/barges - suited to ports that do not have an LNG terminal
Disadvantages	- takes up space on the quay (tanker and mandatory safety perimeter); this could be problematic at terminals where space is already at a premium (due to gantries, cranes, etc.) - vulnerable to goods falling from lo-lo gantries - not suited to vessels with large bunker volumes (container ships and cruise ships) - above 50 000 t of LNG bunkered per year at a given port, this solution becomes unsuitable because it results in too many road tankers accessing the port	- very high initial investment needed to construct a maritime refuelling station and purchase the bunkering vessel/barge - subject to weather and sea conditions for coupling the bunkering vessel to the bunkered vessel - cost difficult to recoup in the current early stage of the market: using the vessel at several ports (not far from each other) would be desirable - constraint linked to the choice of method (vessel or barge): applicable regulations and variable investments	- need to construct land-based storage close to the quay: issue of available space and additional administrative authorisation procedures needed (infrastructure subject to prefectural authorisation involving at least impact and risk studies and possibly a public inquiry) ➔ long procedure - fixed refuelling point forcing vessels to move ➔ additional operation to be included in the stopover time and constraint on the circulation and manoeuvrability of vessels to be taken into account

At this early stage of development as regards the bunkering market at French ports, the road tanker refuelling solution is simplest and quickest to implement, as is currently the case at the port of Le Havre. However, as indicated in the above table, this solution could soon

prove to be too limited to meet the needs of the market, as demand from cruise ships and container ships that need large unit quantities of LNG begin to swell.

In this respect, supplying a large deep-sea container ship requiring around 6 000 m³ per bunkering operation would require around a hundred road tankers. It is estimated that above 700 m³, or 12-14 road tankers, a method of supply by bunkering vessel or pipeline from a land-based station needs to be adopted.

Similarly, for an LNG demand in excess of 110 000 m^3 per year at a given port, the flow of road tankers would become too much within the port and would hinder goods handling and transport activities. Given the above demand projections, the implementation of a refuelling solution with a greater capacity than road tankers could soon prove to be necessary at the ports of Le Havre and Marseille.

With regard to ports it should also be noted that setting up an LNG refuelling service will require a technical study to be drawn up in order to identify the main failure modes of the planned refuelling method as well as operating proposals to prevent such failures. Under the regulations applicable to refuelling operations at ports (national regulation (RPM) and local regulations (RLMD) on the transport and handling of hazardous goods at maritime ports) the use of marine LNG is not ruled out, but nor is it specifically regulated, which may require the RLMD to be adapted. The technical study mentioned above will be able to define the areas in which bunkering operations may be carried out.

The deployment objectives for LNG refuelling infrastructure set out in this national policy framework take account of these technical and operational constraints on establishing a refuelling service as well as demand projections and port development strategies. The map below shows, as a guide only, the objectives set and possible prospects for the development of LNG bunkering.

This illustration concerns only the needs and prospects for deployment of dedicated marine and inland waterway LNG bunkering infrastructure and services and does not therefore take account of any needs of other modes of transport and industry (except for LNG storage infrastructure and road tanker loading stations).

LNG (marine/inland waterway) demand and refuelling points at maritime ports in 2025 and on river corridors in 2030

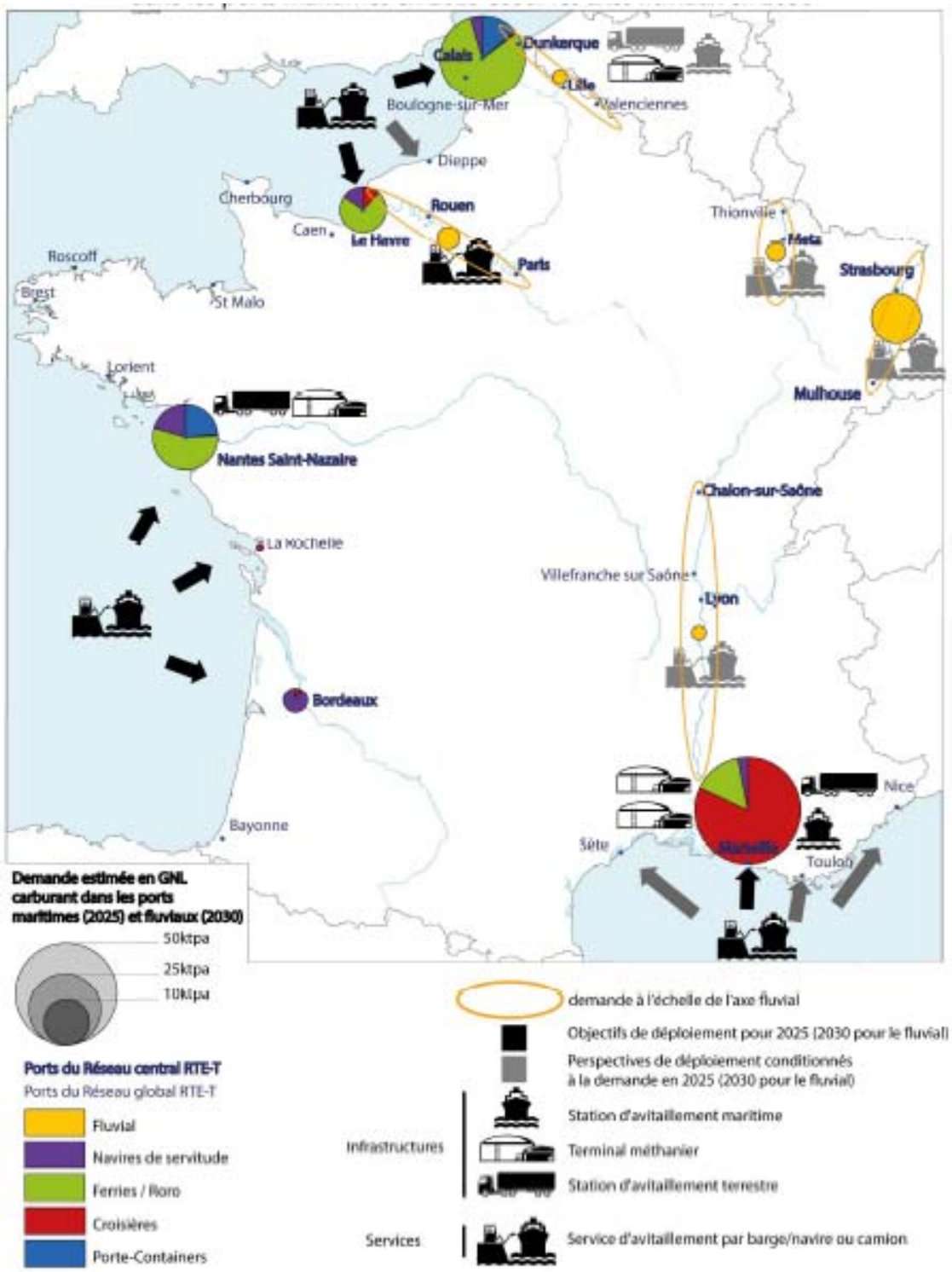


Figure 12 - Indicative map showing, for each port, the potential marine LNG refuelling points within the Directive's timescales, estimated demand projections and possible future infrastructure and services proposed

[Key to figure:]	
Demande estimée en GNL carburant dans les ports maritimes (2025) et fluviaux (2030)	Estimated demand for LNG at maritime ports (2025) and inland ports (2030)
ktpa	ktpa
Ports du Réseau central RTE-T	Ports of the TEN-T core network

Ports du Réseau global RTE-T	Ports of the TEN-T comprehensive network
Fluvial	Inland waterway
Navires de servitude	Service vessels
Ferries/Roro	Ferries/Ro-ro vessels
Croisières	Cruise ships
Porte-Containers	Container ships
Infrastructures	Infrastructure
Services	Services
demande à l'échelle de l'axe fluvial	demand within the river corridor
Objectifs de déploiement pour 2025 (2030 pour le fluvial)	Deployment objectives for 2025 (2030 for inland waterways)
Perspectives de déploiement conditionnés à la demande en 2025 (2030 pour le fluvial)	Deployment prospects depending on demand in 2025 (2030 for inland waterways)
Station d'avitaillement maritime	Maritime refuelling station
Terminal méthanier	LNG terminal
Station d'avitaillement terrestre	Land-based refuelling station
Service d'avitaillement par barge/navire or camion	Refuelling service by barge/vessel or road tanker

6.4. Assessment of the need to install shore-side electricity supply in maritime and inland ports

6.4.1. General configuration of a shore-side electricity system

The following diagram shows the most common configuration, consisting of a system connected to the shore-side electricity system, with the vessel being supplied with a medium-voltage current:

The main components in a shore-side electricity system are:

1- Supply from the national system.

2- Connection to the national system: the main French maritime ports are generally supplied at 20 kV.

3- Shore-based equipment:

- a substation at the terminal with:
  - HV/MV transformer (20 kV ➔ 11 or 6.6 kV) upstream of the frequency converter (where this exists);
  - frequency converter: this equipment is optional and allows vessels to be supplied at 60 Hz, if necessary;
  - control cabinet with the required safety devices (circuit-breaker, etc.);
- medium-voltage buried cables between the substation and the berth(s) served;
- shore-side terminal.

4- ‘Shore-side’ connection system: a cable system for connecting to the vessel (reel, arm, etc.).

5- On-board equipment:

- on-board MV/LV transformer (where necessary);
- connection to the vessel’s electrical switchboard.

One existing technological alternative involves supplying the vessel via a stand-alone, mobile and modular system. This solution has been developed at the port of Hamburg, for example, using an LNG hybrid electricity-generating barge that can deliver electrical power of 7.5 MW. It is currently connected to the cruise ship terminal.

This type of solution may prove an interesting alternative in the following specific contexts:

- ports without a sufficient reserve of available electrical capacity;
- ports whose additional demand generated by the shore-side supply cannot be met by the electricity supplier due to their location in relation to the national electricity distribution system;
- ports with very specific needs for direct connections to the shore;
- ports that do not wish to invest in extensive infrastructure, yet wish to meet the demand from a variety of vessels that make irregular calls at the port;
- ports without the necessary space to install fixed equipment within the port.

However, the economic assessment of this new type of system remains uncertain given the potentially very high investment costs. A comparison, for the quay to be connected, with the solution of connecting to the shore-side electricity system is therefore required. The environmental assessment in terms of pollutant emissions, which differs depending on the power source used, is also a parameter to be taken into account in the socioeconomic assessment of possible solutions.

6.4.2. Socioeconomic assessment: description, perimeter of the study and limits

To meet the Directive’s requirements, the government has conducted a national socioeconomic assessment comparing the costs and benefits, including the environmental benefits, of shore-side electricity supply in maritime ports against the use of marine diesel by vessels when in port.

The model developed for this study enables the comparative analysis of the costs for a quay or berth, which is the level at which shore-side electricity supply services are developed. The study involves four variables:

- annual occupancy rate of the quay, calculated from port traffic data;
- urban environment in which the quay is located: dense urban, urban, low-density urban and interurban;
- number of different vessels studied or mooring at the quay (or berth) in question; and
- type of vessel.

The emerging nature of this market and the limited availability of reliable data for certain types of vessel have restricted the study to those categories of vessel most likely to adopt this technology in the short or medium term, i.e. regular traffic and vessels consuming the

most energy at the quay (therefore emitting large quantities of air pollutants): cruise ships, container ships and RoPax vessels (vehicles and passengers).

Once the parameters listed above have been determined for a given quay, the model calculates, over a 15-year depreciation period, the annual operating costs for each type of energy, the shore-side electricity investment costs and the environmental externality costs.

It has thus been determined that, from a socioeconomic perspective, shore-side electricity is the best option if the annual occupancy rate by a cruise ship or RoPax vessel at a quay located in a dense urban area[66] is more than 4.49%. The Marseille cruise ship terminal has berths fitting this description, provided that shore-side connection technology is adopted by several vessels targeted for the time spent in port. In the medium term this could also apply to the cruise ship terminals at Bordeaux Centre, La Rochelle and Rouen and to the ro-ro, ferry and cruise ship terminals at the port of Le Havre (if the number of stopovers increases). As regards container ships, which consume less energy in port, a positive assessment requires a minimum occupancy rate of 11% for a vessel mooring at a quay located in a dense urban area. The container terminals at Le Havre and Marseille (East basins) could fit with this scenario, again provided that vessels to be retrofitted are targeted.

Quays and terminals located in urban areas[67] are also potential candidates on account of the externality costs. Similarly, a positive case could be made for ro-ro and cruise ship terminals of ports in low-density urban areas or interurban areas[68], such as the ro-ro terminal at Nantes-Saint-Nazaire.

However, in addition to the quantitative analysis, the deployment objectives have also been determined on the basis of qualitative criteria (part 4.2.5) to take account of the specific technical and financial constraints of each shore-side electricity installation project and the development strategy of ports.

6.5. Statistical data on the number of vehicles

The following table indicates the number of vehicles powered by alternative fuels. The data relate to the current number of vehicles on the road, not the registration flow. In terms of registration flow there would be 45 094 new electric cars over the 2010-2015 period.

Table 1 - Number of vehicles powered by alternative fuels

	Number of vehicles as at 31 December 2015 (1)
Electric passenger cars (PC)	42 893
Plug-in hybrid electric vehicles (PHEV) - PC	9 230
Electric light-duty commercial vehicles (LCV) (2) (3)	25 376
PHEV LCV	33
Electric heavy-duty vehicles (HV)	96
PHEV HV	5
Electric buses	354
PHEV buses	101
Electric two-wheeled vehicles (4)	7 372
PHEV two-wheeled vehicles	approx. 90
NGV PC (5)	2 549
NGV LCV	7 114
NGV HV	364
NGV buses	2 172
Hydrogen PC	17

[66] Density of more than 2 250 inhabitants per km².
[67] Density of more than 750 inhabitants per km².
[68] The densities of a low-density urban area and an interurban area are respectively 250 and 25 inhabitants per km^2.

Hydrogen LCV	11
Hydrogen HV	2
Hydrogen buses	0
LPG or Petrol+LPG PC	162 141
LPG or Petrol+LPG LCV	19 370
LPG or Petrol+LPG HV	32
LPG or Petrol+LPG buses and coaches	163
LPG or Petrol+LPG motorcycles	3
Other	

Notes:
(1) These data have been estimated by applying an age threshold (e.g. ≤ 15 years for cars, 20 years for light-duty commercial vehicles). The motorcycle data correspond to vehicles ≤ 15 years and include tricycles and quadricycles.
(2) 100% electric vehicles.
(3) Light-duty commercial vehicles are vans + light-duty specialised motor vehicles.
(4) Electric motorcycles are mainly quadricycles (QM), which may be small commercial vehicles.
(5) For natural gas: the distinction between liquid and compressed does not exist in the energy codes for the registration of vehicles.
(Source: SOeS)

6.6. Measures taken to develop recharging infrastructure for alternative fuels

6.6.1. Legislative framework and regulatory measures

This first category of measures consists of legislative and/or regulatory measures and covers the various fields of road, air and maritime transport.

Existing measures

Title of the measure	***- Law No 2014-877 of 4 August 2014 facilitating the deployment of an electric vehicle recharging infrastructure network in the public space*** ***- Decree No 2014-1313 of 31 October 2014 (adopted pursuant to the above Law)***
Nature of the measure	Legislative and regulatory measures
Description	The Decree defines the conditions under which projects to install recharging infrastructure for electric and hybrid electric vehicles on public property can be regarded as having a national scope pursuant to the Law of 4 August 2014, as well as the procedures for submitting applications. If the project is recognised as having a national scope, the operator developing the project is exempt from paying the public property occupation fee, subject to the project being accepted by the local authorities concerned, which retain full control over their public property. The project has a national scope if it involves at least two regions and contributes to balanced regional development. Under the Law, the terms and conditions for installing recharging terminals must be 'agreed between the project developer, local and regional authorities and the public entities managing the public property in question, the authority or authorities organising the electricity distribution system where they are responsible for managing the work needed to develop public electricity distribution systems, and electricity distribution system operators responsible for their exclusive service area pursuant to Article L.322-8 of the Energy Code'.
Main objectives	Development of recharging infrastructure for electric vehicles
Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	Passenger cars
Party responsible	French State and operators

Implementation	Three projects are currently recognised as having a national scope and can benefit from the public property fee exemption: – The '16K' project developed by the Bolloré group aims to deploy up to 16 000 recharging points spread across all 13 regions. The plan is for these terminals, which will enable semi-fast recharging (7 kVA), to be installed in two equal phases, with the first ending on 31 December 2016 and the second on 30 June 2019. – The project to deploy recharging terminals in a corridor along the Rhône valley, developed by the Compagnie Nationale du Rhône, involves installing 27 rapid recharging stations (and 52 recharging points) distributed so that they are not more than 30 kilometres from each other. This project involves three regions: Auvergne-Rhône-Alpes, Languedoc-Roussillon-Midi-Pyrénées, and Provence-Alpes-Côte d'Azur. – In addition to the coverage provided by these projects recognised as having a national scope, the Corri-Door project, developed by a consortium of operators led by the EDF group, aims to equip French motorways with rapid recharging terminals. This project with a national scope, co-financed by the European Union, involves deploying, by the end of 2015, a further 200 new rapid recharging points 80 kilometres apart, with 216 rapid recharging terminals by the end of 2017.

Title of the measure	***Article 41 of Law No 2015-992 of 17 August 2015 on the energy transition for green growth, which sets the target for developing electric recharging terminals by 2030***
Nature of the measure	Legislative
Description	Article 41 sets a target whereby at least seven million charging points will be installed by 2030 in the parking spaces of residential complexes and other types of building, in publicly accessible parking spaces or in places reserved for professionals.
Main objectives	Development of recharging infrastructure for electric vehicles
Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	All road transport vehicles
Party responsible	French State and local and regional authorities
Implementation	Various incentives can help achieve this target, in particular encouraging local and regional authorities to pursue their development plans, promoting the installation of recharging points in tertiary and residential buildings, and supporting private initiatives aimed at establishing an accessible national network complementing planned deployment by local and regional authorities. The shared use of recharging points by electric and plug-in hybrid electric vehicles, particularly in the context of car-sharing and car-pooling, is encouraged to ensure that best use is made of these recharging points and that electric vehicles are available to a larger number of people.

Title of the measure	***Attributing responsibility for the creation, maintenance and operation of recharging infrastructure for electric vehicles***
Nature of the measure	Legislative and regulatory
Description	Since 2010 and the promulgation of the Grenelle 2 Law (Act No 2010-788 of 12 July 2010 making a national commitment to the environment, referred to as the 'Grenelle 2 Law'), municipalities have been responsible for the creation, maintenance and operation of recharging infrastructure for electric vehicles. This responsibility is defined as a public industrial and commercial service. According to Article L.2224-37 of the General Local and Regional Authorities Code, 'Where the offer in their territory is non-existent, insufficient or inadequate, municipalities may create and maintain the recharging infrastructure needed to use electric or plug-in hybrid electric vehicles or set up a service consisting of the creation, maintenance and operation of the recharging infrastructure needed to use electric or plug-in hybrid electric vehicles. Operation may include purchase of the electricity needed to supply the recharging infrastructure'. This responsibility can be transferred to: (a) public establishments for cooperation between municipalities (EPCI) that are responsible for development, support for energy demand management actions or reduction of pollutant emissions or greenhouse gases. This category includes energy associations; (b) authorities organising a public electricity distribution system; (c) authorities organising mobility; (d) for the Île-de-France, the Syndicat des Transports d'Île-de-France (STIF). A transfer of responsibility is decided by the community council (of the EPCI) and by the municipal councils of the member municipalities. Each municipal council has three months to decide on a transfer. This is then approved by order of the state representative (prefect). Due to the speciality principle, so that a departmental energy association or an EPCI can validly conclude a contract for the creation, installation and operation of recharging terminals, a 'recharging terminals' responsibility must be included in its articles of association. Since 27 January 2014, the Law modernising public regional development measures and consolidating metropolitan areas has provided that the metropolitan area may, as a matter of law and on behalf of the member municipalities, assume responsibility for the creation and maintenance of the recharging infrastructure needed to use electric or plug-in hybrid electric vehicles.
Main objectives	Facilitate the deployment of electric recharging infrastructure
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	Local and regional authorities
Implementation	

Title of the measure	***Regulations on the invoicing of connections for electric recharging infrastructure***
Nature of the measure	Regulatory

Description	The amended Order of 28 August 2007 lays down the principles for calculating the contribution referred to in Article L.341-2 of the Energy Code, and the Order of 17 July 2008 lays down the tariff reduction rates: (s) for connections, (r) for extensions, applied in the calculation of the contribution. The scope of connection and extension work is laid down by Decree No 2007-1280 of 28 August 2007. Article 1 of the amended Order of 28 August 2007, laying down the principles for calculating the contribution referred to in Article L.341-2 of the Energy Code, provides that the reference connection operation is: 'a body of work on the public distribution system and, where applicable, on the public electricity systems to which the latter is interconnected (i) that is necessary and sufficient to allow the evacuation or supply of electrical energy from or to the applicant's installations at the requested connection power; (ii) that takes a technically and administratively feasible approach, in accordance with the provisions of the concession specifications or public service regulations; and (iii) that complies with the technical reference framework published by the public distribution system operator. The reference connection operation shall minimise the total costs of the connection work listed in Articles 1 and 2 of the aforementioned Decree of 28 August 2007, calculated using the ERDF connection scale'. The Order of 17 July 2008 lays down the tariff reduction rates: (s) for connections, (r) for extensions, applied in the calculation of the contribution, according to the terms and conditions set out in the amended Order of 28 August 2007.
Main objectives	Development of recharging infrastructure for electric vehicles
Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	Road transport
Party responsible	Electricity distribution companies
Implementation	

Title of the measure	***Decree No 2016-858 of 29 June 2016 on air quality certificates, adopted pursuant to Article 37 of the LTECV (Act on the energy transition for green growth)*** ***Orders of 29 June 2016 on the procedures for issuing and displaying air quality certificates***
Nature of the measure	Regulatory
Description	The purpose of the air quality certificate is to allow users of the least polluting vehicles to enjoy traffic benefits. A list ranks vehicles according to their air pollutant emissions. These rankings allow vehicles to be differentiated and a progressive approach to be adopted in the measures to be introduced.
Main objectives	Deployment of low-emission vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	French State
Implementation	The Imprimerie Nationale has been appointed as the body responsible for issuing air quality certificates. The associated fee has been set by order at €3.7 plus postage.

Title of the measure	***Decree No 2016-968 of 13 July 2016 allowing the installation of recharging points for electric vehicles in all new buildings, adopted pursuant to Article 41 of the LTECV*** ***Order of 13 July 2016 on the application of Articles R.111-14-2 to R.111-14-8 of the Construction and Housing Code***
Nature of the measure	Regulatory
Description	The French regulatory requirements for the recharging of electric vehicles in buildings (car parks) are laid down in the Construction and Housing Code, in particular in Articles L.111-5-2 to L.111-5-4 and in Articles L.111-6-4 to L.111-6-5. The French regulations require pre-fitting when a residential building with an indoor car park is constructed, and also when an office building, industrial building, shopping complex or cinema is constructed. The Energy Transition Law extends this pre-fitting to the construction of all tertiary buildings and public services. This pre-fitting involves the installation of ducts and the appropriate sizing of electrical installations, ensuring that such work is carried out when it is the least costly.
Main objectives	Development of recharging infrastructure for electric vehicles
Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	Road transport
Party responsible	French State
Implementation	Obligation applicable to any planning permission filed from 1 January 2017

Title of the measure	***Introduction of restricted traffic areas (zones à circulation restreinte – ZCR) pursuant to Article 48 of the LTECV***
Nature of the measure	Legislative and regulatory
Description	Restricted traffic areas may be created within agglomerations and areas for which an air quality plan (*plan de protection de l'atmosphère* – PPA) has been adopted, is being drawn up or is being revised, by the mayor or by the president of an EPCI with traffic policing power. They may apply to all or part of the area (Article 48(I) = Article L.2213-4-1 of the General Local and Regional Authorities Code). On a transitional basis until 1 January 2017, the mayor of a municipality situated in a PPA area may extend, to all roads within the municipality, a ban on access at certain times, laid down in Article L.2213-2 of the General Local and Regional Authorities Code, by vehicles contributing significantly to pollution (Article 49).
Main objectives	Encourage low-emission vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	Local and regional authorities
Implementation	

Title of the measure	***Order of 27 July 2012 regulating the use of means to supply aircraft with power and air-conditioning/heating during stopovers at the aerodromes of Paris-Charles-de-Gaulle, Paris-Orly and Paris-Le Bourget***
Nature of the measure	Regulatory
Description	The aim is to limit pollution caused by use of an auxiliary power unit (APU). On the ground, this unit is used to supply the electrical energy needed by the aircraft during its stopover as well as the air needed by the air-conditioning system. Before leaving the stand, it also provides the power needed to start up the engines. The Order regulating the use of means to supply aircraft with power and air-conditioning/heating during stopovers at the aerodromes of Paris-Charles-de-Gaulle, Paris-Orly and Paris-Le Bourget prioritise the available tools and lays down their conditions of use depending on the type of aircraft and the scheduled departure time from and/or actual arrival time at the stand.
Main objectives	Development of ground infrastructure to replace APUs at airports
Type of infrastructure involved	Infrastructure for electrical connection and PCA (pre-conditioned air) points
Means of transport	These provisions particularly concern aircraft during their stopovers at airports (from their arrival at the stand to their departure).
Party responsible	Airport authorities
Implementation	

Title of the measure	***Decree No 2016-565 of 10 May 2016 adopted pursuant to Article 45 of the LTECV and requiring the operators of the main airports to implement, before 31 December 2016, a programme of actions aimed at reducing greenhouse gas emissions and air pollutants from the direct ground activities of the airport hub.***
Nature of the measure	Legislative and regulatory
Description	The aim is to reduce the greenhouse gas and air pollutant intensity by at least 10% by 2020 and by at least 20% by 2025 compared to 2010 levels. The Decree lists the greenhouse gases and air pollutants concerned. It defines the method used by airport operators to determine the quantity and intensity of greenhouse gases and air pollutants emitted during 2010, and the method for producing a forecast for the quantity and intensity of greenhouse gas and air pollutant emissions in 2020 and 2025.
Main objectives	Development of electric recharging infrastructure at airports
Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	These provisions apply in particular to the taxiing of aircraft and the movement of vehicles around the hub.
Party responsible	Airport authorities
Implementation	The action programmes will be communicated to ADEME, which will prepare a national assessment of these programmes no later than 31 December 2017. Eleven airports are affected by this measure implementing Law No 2015-992 of 17 August 2015 on the energy transition for green growth: Bâle-Mulhouse, Beauvais-Tillé, Bordeaux-Mérignac, Lyon-Saint-Exupéry, Marseille-Provence, Nantes-Atlantique, Nice-Côte d'Azur, Paris-Charles-de-Gaulle, Paris-Le Bourget, Paris-Orly and Toulouse-Blagnac.

Title of the measure	***Article 52 of the LTECV on support for the deployment of marine LNG distribution and shore-side electricity supply facilities***
Nature of the measure	Legislative
Description	Under Article 52, supplemented by Article 86 of Law No 2016-816 of 20 June 2016 on the blue economy, the State is to encourage, in particular by supporting pilot operations, the installation of liquefied natural gas distribution and shore-side electricity supply systems in ports for all vessels, unless there is no demand and the costs are disproportionate to the benefits, including the environmental benefits.
Main objectives	Development of shore-side electricity supply infrastructure and marine LNG refuelling infrastructure
Type of infrastructure involved	Shore-side electricity supply infrastructure / marine LNG refuelling infrastructure
Means of transport	Maritime transport and inland waterway transport
Party responsible	French State
Implementation	In drawing up the national policy framework for alternative fuels, the State will help to identify LNG and shore-side electricity deployment challenges and to establish a coherent territorial network of distribution infrastructure throughout the territory. The State will also work with operators to promote shore-side electricity and marine LNG development initiatives that have already been launched. Mobilising existing or future public funds to support these initiatives is also a priority action for the State.

Title of the measure	***Decrees laying down the criteria defining low-emission vehicles pursuant to Article 37 of the LTECV***
Nature of the measure	Legislative and regulatory
Description	The Decrees lay down the criteria: - defining low-emission vehicles under 3.5 tonnes (passenger cars and vans) (Decree No 2017-24 of 11 January 2017); - defining low-emission vehicles over 3.5 tonnes designed mainly for goods transport (Decree No 2017-22 of 11 January 2017); - defining low-emission vehicles intended for public passenger transport (Decree No 2017-23 of 11 January 2017).
Main objectives	Deployment of low-emission vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Decree No 2017-26 of 12 January 2017 on the obligations of vehicle fleet managers, vehicle rental companies, taxi operators and chauffeur-driven car operators to purchase or use low-emission vehicles pursuant to Article 37 of the LTECV (Articles L.224-7, L.224-8 and L.224-9 of the Environment Code)***
Nature of the measure	Legislative and regulatory

Description	The State, its public institutions, local and regional authorities and their groupings as well as national enterprises and certain sectors of activity must, when renewing their vehicle fleets, purchase or use low-emission vehicles. - Where the State or its public institutions manage a fleet of over 20 vehicles with a GVW of less than 3.5 tonnes, they must purchase or use low-emission vehicles for at least 50% of vehicles renewed, with the same proportion applying for vehicles with a GVW of more than 3.5 tonnes. - Where local and regional authorities and their groupings or national enterprises manage a fleet of over 20 vehicles with a GVW of less than 3.5 tonnes, they must purchase or use low-emission vehicles for at least 20% of vehicles renewed. Where they manage a fleet of over 20 vehicles with a GVW of more than 3.5 tonnes, local and regional authorities and their groupings must conduct a technical and economic study on the advisability of purchasing low-emission vehicles. - Half of new buses and coaches purchased from 2020, and all new buses and coaches purchased from 2025, by the State, its public institutions, local and regional authorities and their groupings, the STIF and the metropolitan area of Lyon for public transport services must be low-emission vehicles. - By 2020, when renewing their fleets, vehicle rental companies must purchase low-emission vehicles for at least 10% of the vehicles renewed. - By 2020, when renewing their fleets, taxi operators and chauffeur-driven car operators managing over 10 vehicles must purchase low-emission vehicles for at least 10% of the vehicles renewed.
Main objectives	Deployment of low-emission vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	French State, local and regional authorities, public institutions
Implementation	

Title of the measure	***Decree No 2017-26 of 12 January 2017 on recharging infrastructure for electric vehicles and transposing various provisions of Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure***
Nature of the measure	Regulatory
Description	The Decree lays down: - requirements for the configuration of normal power and rapid recharging points and relations with the distribution system operator; - provisions on the operation of recharging infrastructure; - information requirements regarding the characteristics of recharging infrastructure, which infrastructure operators must publish on the website of the open platform for French public data (www.data.gouv.fr) and make available on an interoperability platform in accordance with Article 7(7) of the Directive; - provisions on access to the infrastructure and payment for recharging and on installers' qualifications and the installation and maintenance of infrastructure.
Main objectives	Development of recharging infrastructure for electric vehicles
Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	All road transport vehicles
Party responsible	French State
Implementation	

Future measures

Title of the measure	***Article 40 of the LTECV on the formulation of a clean mobility development strategy***
Nature of the measure	Legislative
Description	This strategy is aimed at: 1. developing low-emission vehicles and deploying infrastructure for their refuelling. In particular, it establishes a national policy framework for developing the market in alternative fuels and deploying the corresponding infrastructure; 2. improving the energy efficiency of all vehicles; 3. a modal shift from individual cars to public land transport, bicycles and walking, and from road transport to rail and inland waterway transport; 4. developing collaborative modes of transport, in particular car-sharing or car-pooling; 5. increasing the load factor of goods transport vehicles. This strategy, laid down by regulation, includes an assessment of the existing clean mobility offer, calculated and broken down by type of infrastructure, and sets targets for developing the vehicles and deploying the infrastructure referred to in the article's paragraph 1, intermodality and load factors for goods transport vehicles, within the timescales of the multiannual energy programming referred to in Article L.141-1 of the Energy Code, as amended by paragraph I of Article 176 of this Law to which it forms an annexed section. It identifies the priority areas and road networks for the development of clean mobility, particularly in terms of infrastructure, in line with a targeted deployment strategy for certain types of low-emission vehicle. The government will submit this strategy to the National Council for Ecological Transition for an opinion and then forward it to Parliament.
Main objectives	The strategy establishes the main guidelines for the development of clean mobility by 2023, including for the deployment of recharging infrastructure and refuelling stations for alternative fuels.
Type of infrastructure involved	Infrastructure for electric recharging points and refuelling stations
Means of transport	All modes of land transport
Party responsible	French State
Implementation	

Title of the measure	***[To be published] Pre-fitting allowing electric vehicle recharging points for to be installed in existing buildings, pursuant to Article 41 of the LTECV***
Nature of the measure	Regulatory
Description	The French regulatory requirements for the recharging of electric vehicles in buildings (i.e. in car parks) are laid down in the Construction and Housing Code, in particular in Articles L.111-5-2 to L.111-5-4 and Articles L.111-6-4 to L.111-6-5. The French regulations require existing office buildings to be fitted with recharging points and existing shopping complexes and cinemas to be pre-fitted for recharging points during works. The Energy Transition Act extends this pre-fitting requirement to existing residential buildings, existing tertiary buildings, public services and existing industrial buildings. This pre-fitting involves the installation of ducts and the appropriate sizing of electrical installations so that such work can be carried out when it is the least costly. The obligation created by the Law on the energy transition for green growth will take the form of a decree that is currently being prepared. It will apply from 1 January 2017.
Main objectives	Development of recharging infrastructure for electric vehicles

Type of infrastructure involved	Infrastructure for electric recharging points
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***[To be published] Publication of a plan for the development of renewable energy storage using low-carbon hydrogen, in accordance with Article 121 of the LTECV***
Nature of the measure	Plan
Description	The plan will be aimed, in particular, at: 1. implementing an economic model for the hydrogen storage of electricity generated from renewable energy sources to encourage renewable energy producers to help ensure the availability and use of the reserves needed to operate public energy transmission and distribution systems and the conditions for making use of these services; 2. implementing incentive measures designed to promote technological innovation, with a special focus on fuel cells, in order to develop the electric vehicle market in particular; 3. deploying a hydrogen distribution station infrastructure; 4. adapting regulations to allow the deployment of these new hydrogen uses, such as the conversion of electricity into gas.
Main objectives	Development of renewable energy storage using low-carbon hydrogen
Type of infrastructure involved	Refuelling stations for hydrogen stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Regulatory development of the texts on fuel distribution service stations to take account of the specific aspects of hydrogen gas as a fuel - Headings of the nomenclature of ICPEs (facilities classified for environmental protection)***
Nature of the measure	Regulation
Description	Creation of a heading in the nomenclature of ICPEs specifically for hydrogen gas distribution facilities. A ministerial order will then lay down the general requirements that must be met by these service stations.
Main objectives	Support the development of H_2 service stations. A future order will lay down the technical rules to be observed, which will ensure transparency for project developers.
Type of infrastructure involved	Hydrogen distribution facilities for vehicles
Means of transport	Vehicles
Party responsible	French State
Implementation	Consultation under way on the nomenclature heading. Draft order scheduled for the end of 2016.

Title of the measure	***Safety of liquefied natural gas tank filling facilities supplying motor vehicles***
Nature of the measure	Regulatory development

Description	Liquefied natural gas tank filling facilities supplying motor vehicles are subject to the rules on declaration with periodic inspection under heading 1414-3 of the nomenclature of classified facilities. The ministerial order laying down the general requirements associated with this heading has mainly been developed to ensure the safe distribution of liquefied petroleum gas. It will therefore be revised so that it is better suited to the specific aspects and constraints of liquefied natural gas, particularly in terms of the sizing of safety and authorised flow rate equipment.
Main objectives	To ensure the deployment of liquefied natural gas tank filling infrastructure supplying motor vehicles under satisfactory safety conditions by defining the technical rules to be observed by ICPE operators in order to prevent and reduce the risks of accidents or pollution.
Type of infrastructure involved	Liquefied natural gas tank filling infrastructure supplying motor vehicles
Means of transport	Road transport
Party responsible	French State
Implementation	Work in progress; next meeting of working group in June 2016

Title of the measure	***Development of national and port regulations to ensure the safe and economically viable use of LNG as a marine fuel***
Nature of the measure	Regulatory development
Description	LNG refuelling operations at French ports are covered by the national regulation (RPM) and local regulations (RLMD) on the transport and handling of hazardous goods at maritime ports, neither of which currently prevents this type of refuelling. However, a specific framework for LNG as a fuel is needed in addition to the general provisions on refuelling. A risk study specific to each port will determine the appropriate provisions to be included in each RLMD. The national and local regulations must also be adapted to take account of new provisions of international and European regulations currently being developed on this subject.
Main objectives	Adapting the regulatory framework to take account of the emergence of a safe marine LNG refuelling sector
Type of infrastructure involved	Marine LNG refuelling infrastructure
Means of transport	Maritime transport
Party responsible	French State
Implementation	International standard ISO 20519 on LNG bunkering is currently being developed. At the same time, the European Committee for Standardisation and the ESSF are working to define the European regulatory framework. Once the international and European frameworks have been finalised, it will be necessary to bring the French legislation into line with the international and European rules to ensure a harmonised regulatory context for operators.

Title of the measure	***[To be published] Order on the characteristics of synthetic paraffinic diesel and diesel obtained by hydrotreatment that can be used by professional fleets***
Nature of the measure	Regulation
Description	Regulatory development to authorise the sale of an alternative fuel known as 'XTL diesel', a synthetic paraffinic diesel or diesel obtained from hydrotreatment, and its use by professional fleets with specific supply logistics and their own storage and distribution capacity. This fuel will be used to power traditional compression ignition engines.
Main objectives	Adapting the regulatory framework to take account of the emergence of a synthetic and paraffinic alternative fuel refuelling sector
Type of infrastructure involved	Synthetic and paraffinic fuel refuelling infrastructure

Means of transport	Road transport
Party responsible	French State
Implementation	Consultation completed. Order to be notified to the Commission so that it can be published as scheduled by the end of 2016.

6.6.2. Information - support - knowledge measures

This second category of measures involves information and/or support measures, such as guides intended for operators, local and regional authorities and other stakeholders.

Existing measures

Title of the measure	***Technical guide containing recommendations on fire safety measures in indoor car parks accessible to the public***
Nature of the measure	Technical guide
Description	This guide sets out the expectations and aims of the fire protection regulations for indoor car parks accessible to the public and contains a number of recommendations. It should be noted that it does not replace the applicable texts and does not contain all the obligations in those texts. It is aimed at designers, developers, operators, installers, approved bodies and competent technicians, fire prevention officers and administrative authorities, as well as users. On the subject of recharging facilities for electric vehicles, better information on these technologies is available as a result of feedback on, and improvements made to, batteries by manufacturers. As a result, the provisions of the previous specifications, validated by the Central Safety Commission on 2 February 2012, have all been transposed into the guide with some modifications: – All recharging points must be installed on the ground floor of the car park, on the first floor or on the first basement level. Recharging points may also be installed in another location if the car park is well ventilated (large openings on opposite sides), situated on the roof (distance of 8 m from any neighbouring building) or has an automatic water-based fire-extinguishing system (sprinklers or water spray). – No more than 20 recharging points per compartment and maximum power of 150 kVA simultaneously per compartment. – Rapid recharging points are permitted only under certain conditions: in outdoor locations, on the roof and reference level of car parks that are well-ventilated, or on the reference levels/first floor/first basement level of indoor car parks with an automatic water-based fire-extinguishing system (sprinklers or water spray). – Individual recharging points must be at least 15 m apart and identified. A water-based fire extinguisher and an emergency stop button for the recharging points are mandatory. – Recharging stations may have a maximum of 10 recharging points and must be marked out and separated from other parking slots by a fire wall. Recharging stations must have two water-based fire extinguishers and an emergency stop button for the recharging points. A fire wall is not required if the recharging station is in an outdoor area of the car park or if the station is covered by an automatic water-based fire-extinguishing system. These new provisions are recommended for all indoor car parks to be constructed or redesigned, and where work is carried out to create infrastructure specifically for the recharging of electric or plug-in hybrid electric vehicles. They also apply to indoor car parks that form part of high-rise buildings.

Main objectives	Ensure the deployment of electric recharging infrastructure under satisfactory safety conditions
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***'Natural gas for vehicles – How to implement a project for a station accessible to the public'*** ***Technical guide on the development of NGV stations***
Nature of the measure	Technical guide
Description	The guide is primarily aimed at local authorities, energy associations and operators in the sector to help them with projects to create NGV refuelling stations. Transport accounts for around 30% of the national CO_2 output and is therefore a priority when it comes to achieving the targets set by the Energy Transition Law. In the context of vehicle fleet renewal, public authorities intend to favour car-sharing and clean mobility. In addition to recharging facilities for electric vehicles, the development of NGV and bio-NGV stations will allow the greenhouse gas emissions reduction targets set at European and national level to be achieved. Local and regional authorities face a major challenge in terms of improving air quality, in both urban and interurban environments. This requires significantly reducing air pollutant emissions and a balanced development of alternative mobility solutions such as NGV and bio-NGV. The FNCCR (National federation of licensing authorities and public services) and the GRDF (French gas distribution network) aim to provide local players with the tools needed to create NGV stations accessible to the public. These stations may serve vehicle fleets of businesses or public authorities, road transport operators and eventually private individuals. This guide demonstrates a 'green' ambition for transport which, in the long term, will allow the creation of many local jobs.
Main objectives	Deployment of NGV stations
Type of infrastructure involved	NGV refuelling stations
Means of transport	Road transport
Party responsible	GRDF - FNCCR
Implementation	

Title of the measure	***Information guide on the safety of hydrogen vehicles and hydrogen service stations – Ademe***
Nature of the measure	Information measure
Description	This guide, published in 2015, is aimed at a wide audience of people interested in new hydrogen technologies in the area of mobility and potentially involved in projects to deploy hydrogen vehicles or service stations, such as public or private managers of light-duty vehicle fleets, safety and environment officers of businesses, public bodies and public authorities, transport and infrastructure developers, service station operators, departmental fire and rescue services (SDIS) and regional directorates for the environment, development and housing (DREAL). The guide presents the various technologies involved, from the production of gas, transport and storage through to its use in vehicles. It describes the physical and chemical characteristics of hydrogen, the associated risks and the general principles for using it safely. The guide also covers hydrogen service stations and considers the safety issues at two key stages: construction of a service station and its operation. Hydrogen vehicles are also analysed in terms of design, approval, use and maintenance, accidents and service life of the equipment.
Main objectives	Deployment of hydrogen vehicles Deployment of hydrogen stations

Type of infrastructure involved	Hydrogen stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Green book on electric vehicle recharging infrastructure***
Nature of the measure	Information measure
Description	This guide, which is divided into three parts – on technical matters, economic and legal matters and issues related to state financing – is intended for local and regional authorities implementing a project to deploy recharging infrastructure accessible to the public. The recommendations are aimed not only at local and regional authorities but also at private operators wishing to manage, operate or set up recharging infrastructure accessible to the public. The technical part was updated in 2014 ('Technical guide for the design and development of recharging infrastructure for electric and plug-in hybrid electric vehicles').
Main objectives	Establish a conceptual and organisational framework for recharging infrastructure accessible to the public for 'low-carbon' vehicles
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***CEREMA guide: 'Recharging terminals for electric vehicles: Regulations and recommendations for their installation on public roads' (CEREMA: Centre for the research and expert assessment of risks, environment, mobility and development)***
Nature of the measure	Information measure
Description	Mainly geared towards technicians, this guide aims to concisely inform local authorities of the inputs needed to install a network of recharging terminals, in terms of both regulations and consistency with the overall and local transport policy.
Main objectives	Help technicians deploy recharging terminals for electric vehicles
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Training in the servicing of electric vehicles***
Nature of the measure	Standard
Description	With regard to training in the servicing of electric vehicles, the professions downstream of the automotive sector (maintenance, roadworthiness testing, etc.) are aware of the specific technological features of electric vehicles and are already taking steps to train their employees and to be able to handle electric vehicles. As a result, the Union Technique de l'Electricité (UTE), which is the French electro-technology standardisation body, has introduced standard C 18-550 'Electrical safety instruction manual for work on vehicles and self-propelled machinery with combustion, electric or hybrid engines with on-board electrical energy'. This standard requires repairers of electric or hybrid vehicles to receive specific training.
Main objectives	Ensure the development of electric vehicles
Type of infrastructure involved	Electric recharging infrastructure

Means of transport	Road transport
Party responsible	Repairers of electric or hybrid vehicles
Implementation	

Title of the measure	***User information on conventional and alternative fuels***
Nature of the measure	Information
Description	The Directive highlights that providing all users with information is a key part of the process and that this information must be clear, coherent and relevant. Data must be accessible on an open and non-discriminatory basis. This obligation particularly concerns the following information, if available: - data on the geographic location of refuelling and recharging points for alternative fuels covered by the Directive accessible to the public. Such data may include information on real-time accessibility as well as historical and real-time charging information. - In particular for gas and hydrogen, a comparison, for information purposes, between unit prices where these are displayed at service stations. The display of this information must not mislead or confuse the user. Following work by the European Centre for Standardisation to develop a display standard (sticker with size, font, label for each fuel, etc.), as requested by the European Commission, the orders defining the technical characteristics of fuels will be amended in order to add the provisions of the display standard on vehicle filler flaps and pumps and to better inform consumers about the compatibility of their vehicles with the fuels available on the market. Currently, the www.prix-carburants.gouv.fr website enables users to compare the prices of certain fuels charged by retail distributors and to learn about the energy policy of the French Ministry of the Economy, Industry and Digital Technology. The price indicated is the price of the fuel per litre, including all taxes, and the service station information is provided using a geolocation system. The distributor is responsible for submitting its prices. This system currently covers the following fuels: SP95, SP95-E10, SP98, Diesel, LPG and E85 flex fuel. In 2016, this obligation to submit reliable and constantly updated consumer information will become mandatory for operators of public recharging infrastructure for electric vehicles.
Main objectives	Better information for consumers about all fuels
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	State for the transposition
Implementation	

Title of the measure	***September 2015 hydrogen energy sector report***
Nature of the measure	Information and recommendations report
Description	The hydrogen energy vector is a key instrument in achieving the energy transition. It is a flexible, potentially decarbonised vector with many uses (mobility, housing, energy storage). The hydrogen sector is developing in particular in Japan, the United States, Germany and Korea. In France, infrastructure tailored to niche requirements (for example, for captive fleets such as those of La Poste) is currently being developed in a fragmented manner, and some small successful companies are emerging beside some major players in the chemical and automotive sectors. Long perceived as a technology for the long term, interest in the hydrogen energy sector is growing, which is evident from an increasing number of demonstrators, prototypes and new products. Development of the hydrogen sector is a gamble on the future and the French industry may face some very significant challenges. Mobility seems to be the most promising area, and the most competitive. In addition to a longer range, hydrogen-electric vehicles benefit from faster recharging compared to battery electric vehicles. Their cost, which is still very high, may fall as sales increase. However, ensuring that end consumers can fill up on hydrogen, by deploying distribution stations, is vital. Other uses are also emerging: hydrogen storage may enable the intermittence associated with most renewable energies to be regulated, and the injection of hydrogen produced by excess electricity in the gas network is a potentially important outlet. The report considers that hydrogen energy could develop considerably by 2025-2030, and recommends granting support now to structure the sector, in particular by way of drawing up a detailed roadmap, appropriate governance and support from the *Programme des Investissements d'Avenir* ('Investing for the Future' programme). It recommends creating a French industrial sector producing the technological building blocks specific to hydrogen energy, in the form of support for breakthrough technologies, cutting costs and safeguarding the most mature technologies.
Main objectives	Identify the development possibilities of the hydrogen energy sector and help structure the sector
Type of infrastructure involved	Hydrogen stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Coordinating actions on the use of liquefied natural gas as a fuel***
Nature of the measure	Define how to develop liquefied natural gas (LNG) as a fuel in technical and regulatory terms.
Description	International and European regulations are increasingly imposing restrictions on polluting discharges from vessels, and on sulphur emissions in particular. Maritime transport and its underlying infrastructure must adapt. In this respect, a position for the coordination of ministerial actions on the use of liquefied natural gas (LNG) as a marine fuel was created in 2011. Since then, road transport and inland waterway transport have been added to the LNG officer's field of responsibilities. The main objectives of the coordination are to: • unify the action of all ministerial players, in close collaboration with the economic circles directly involved; • organise an exchange platform bringing together the economic circles and ministerial services involved; • prepare a ministerial position and strategy, to serve in particular as a 'foundation' for negotiations conducted by ministerial services with national, European and international bodies; • provide specific answers in various areas such as the applicable regulations, organisation of an LNG bunkering chain at French ports or feedback on the use of road LNG to identify actions and instruments that could allow LNG to contribute to the energy transition in the road sector; • help project developers. Given the extent of the work to be carried out, the decision was made to concentrate on developing the basics and creating a collective dynamic, as well as informing the minister of the initial findings and recommendations. The position has therefore been renewed every two years since. Three reports have been submitted to the minister and made public. A fourth report on the use of LNG by inland waterway transport is currently being completed.
Main objectives	Encourage coordination between ministerial services and professionals in the various sectors involved, foster pilot projects, develop the expertise of the various administrations involved, set up an LNG platform for operators, etc.
Type of infrastructure involved	LNG (marine and inland waterway) and NGV refuelling stations
Means of transport	Road, maritime and inland waterway transport
Party responsible	French State
Implementation	- Reports on the use of LNG in maritime transport (February 2013 and September 2014) - Report on the use of LNG in road transport (September 2015) - Report on the use of LNG in inland waterway transport (October 2016) - Set-up of an exchange platform between ministerial services and operators (8 professional organisations and over 50 businesses or bodies representing shipowners, ports, shipyards, equipment manufacturers, gas companies, etc.) - Report on LNG and inland waterway transport, currently being finalised - Participation in the 'vessels of the future' industry plan and in the Committee on naval solutions for tomorrow's transport - Representation of France in the ESSF LNG Sub-Group - Participation in standardisation work (BNG – Gas standardisation office) - Participation in the AFG-AFGNV-DGPR working group on regulations. In anticipation the LNG position being abolished, private players plan to create an LNG platform that will be assisted by the State, similar to existing structures in other European countries, in order to continue the facilitation activities needed for the emergence of LNG projects.

Title of the measure	***Provision of training tailored to the handling of marine LNG***
Nature of the measure	Training
Description	All operators agree on the need to provide specific training in marine LNG refuelling operations. Several companies already have experience to share in this respect, such as GTT, ELENGY and Bureau Veritas, which offer LNG-related training. In addition, at the instigation of the AFG and with the support of the LNG officer, a working group has been formed within the AFG with responsibility for identifying all training required in the shore-side handling of LNG and for proposing training where this does not exist. A course intended for drivers delivering LNG has been developed and is offered by the AFG's training centre. Moreover, a matrix identifying the adaptation of European legislation to international rules or standards that have been adopted or are under preparation, and covering everyone involved in the logistics chain, whatever the mode of transport, has also been presented by the LNG coordination officer to the European Sustainable Shipping Forum (ESSF) LNG Sub-Group and to the European Maritime Safety Agency (EMSA). This matrix is used in the LNG Sub-Group's work programme. As part of the SAFE SECA project, the Major Maritime Port of Le Havre has developed specific training courses for port officers and terminal staff required to work in contact with LNG or to supervise refuelling operations.
Main objectives	Provision of specific training on the handling of marine LNG on board vessels and shore-side (multimodal approach)
Type of infrastructure involved	Marine LNG refuelling infrastructure
Means of transport	Maritime transport
Party responsible	French State and private operators involved in refuelling operations (shipowners, ports, infrastructure managers and gas suppliers)
Implementation	It is the responsibility of operators, shipowners, transport operators, ports, infrastructure managers and gas suppliers to train crew and shore-side staff required to handle LNG. However, the Ministry of the Environment, Energy and Sea will ensure, firstly, that training is developed at all ports offering such a service and, secondly, that the LNG training offered in France complies with international and European requirements in this respect so that it does not differ from training in neighbouring countries. Extensive work on this subject has already been carried out at international level, with various bodies (IMO, CCNR, UNECE) having in particular adopted new specific requirements for the training and qualifications of crew on board LNG vessels.

Future measures

Title of the measure	***Dissemination of national guidance plan for the deployment of LNG as a marine fuel (SOGNL)***
Nature of the measure	Public policy plans and programme
Description	In the context of a gradual toughening of emissions regulations applicable to transport, only LNG is proving to be a relevant long-term solution for maritime transport. It meets both current and future environmental requirements in that it totally eliminates sulphur emissions as well as particulate emissions, and reduces carbon dioxide (CO_2) emissions by 25% and nitrogen oxide (NO_x) emissions by 90% compared to traditional marine fuels. Developing and using a new fuel requires the necessary distribution infrastructure to be installed at ports. In order to assist economic operators in the development of such infrastructure, the State has committed to establishing national guidance on the deployment of LNG as a marine fuel. The plan involves conducting an initial survey of the current market for marine LNG and its prospects nationally, identifying the challenges for, and current brakes on, its development and proposing strategic guidelines for the deployment of LNG as an alternative fuel on the French seaboards. The national guidance plan for the deployment of LNG as a marine fuel is also the first stage in efforts to develop a port network of LNG refuelling points. The plan pursues several objectives: - to adopt a coordinated approach, based on strong policy lines, to anticipate future developments, taking into account their inherent economic, social and environmental challenges; - to clarify the public financing available to support LNG projects and to steer project developers towards suitable contacts within the Ministry of the Environment, Energy and Sea; - to target the regulatory changes needed to develop LNG; - to organise the deployment of LNG on all the seaboards, in line with the relevant technical and economic criteria; - to identify the development areas that project developers need to focus on to effectively deploy LNG in France, in particular its multimodal aspect (taking account of the development of inland waterway and road LNG). Lastly, it identifies several strategic actions to be implemented in the short term to support the development of LNG as a marine fuel.
Main objectives	Deployment of LNG as a marine fuel: definition of challenges and coordination of actions at national level
Type of infrastructure involved	Marine LNG refuelling infrastructure
Means of transport	Maritime transport
Party responsible	French State
Implementation	Publication and dissemination of the national guidance plan for the deployment of LNG as a marine fuel scheduled for 2016

6.6.3. Incentive measures

This third category encompasses incentive and economic measures, which may cover both the deployment of infrastructure and incentives to purchase and/or use of vehicles powered by alternative fuels.

Title of the measure	***Support for the purchase of clean vehicles***
Nature of the measure	Budget expenditure
Description	The bonus-surcharge system aims to reward, through a bonus, purchasers of new cars with low CO_2 emissions and to penalise, through a surcharge, those who opt for the most polluting models. The bonus scale changed on 4 January 2016, but the penalty scale has not been altered for 2016. Through financial support for purchases or long-term leases (two years and over), the bonus system aims to reward the purchaser of new cars with low CO_2 emissions. Lower CO_2 emissions result in a higher environmental bonus. Electric vans (emitting 0-20 gCO_2/km) are also entitled to the bonus of €6 300. The scheme provides for a bonus according to a scale applicable from 4 January 2016 set out in Articles D251-7 to D251-13 of the Energy Code. Diesel vehicles can no longer benefit from the bonus. An 'environmental surcharge' adds €150-€8 000 to the purchase price and is imposed if the vehicle purchased emits more than 130 gCO_2/km. The cost of the vehicle's registration certificate will increase according to the amount of CO_2 emitted per km. Higher CO_2 emissions result in a higher surcharge. The surcharge applies to vehicles registered for the first time in France from 1 January 2008.
Main objectives	Promotion of clean vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Passenger cars and certain light-duty commercial vehicles
Party responsible	French State
Implementation	Programme 791 finances the scheme to support purchases of clean vehicles ('bonus-surcharge'). The amounts in terms of commitment appropriations were €192.769 million in 2014 and €214.5 million in 2015, with €236 million budgeted for 2016. These amounts are covered by the surcharge receipts.

Title of the measure	***Conversion bonus for old vehicles***
Nature of the measure	Budget expenditure
Description	The entry into force on 1 April 2015 of the conversion bonus, granted for scrapping old diesel vehicles, should speed up the replacement of the most polluting vehicles with the cleanest ones. Specifically, it allows total support of €10 000 to be granted for the purchase of an electric vehicle (environmental bonus of €6 300 and conversion bonus of €3 700). Plug-in hybrid electric vehicles with CO_2 emissions of 21-60 gCO_2/km are entitled to a conversion bonus of €2 500, which is added to the environmental bonus of €1 000 fixed by the draft 2016 Finance Law. The conversion bonus was extended on 1 January 2016, meaning that the support is now payable for the scrapping of diesel vehicles registered before 1 January 2006 (1 January 2001 in the initial version of the scheme).
Main objectives	Speed up replacement of the most polluting vehicles with the cleanest ones
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Light-duty vehicles
Party responsible	French State
Implementation	Programme 792 finances the support scheme for scrapping polluting vehicles ('conversion bonus'). The amounts, in terms of commitment appropriations, were €0.9 million in 2014 and €28 million in 2015, with €60 million budgeted for 2016.

Title of the measure	***Financing support for the conversion and construction of LNG-powered vessels***
Nature of the measure	Budget expenditure
Description	Investing in LNG propulsion technology represents a very significant equipment expenditure. The State is therefore providing public support towards the financing of investments in LNG propulsion technology, particularly through the 'Investing for the Future' programme. Two schemes have been introduced: o the 'Vessels of the future' call for projects, under which research and development projects in the shipbuilding industry leading to products with applied industrial uses can be funded; o the 'Investments for clean ferries' call for projects, to specifically support shipowners in their industrial policy of adapting vessels to the Sulphur Directive.
Main objectives	Development of the fleet of LNG-powered vessels
Type of infrastructure involved	Marine LNG refuelling infrastructure
Means of transport	Maritime transport
Party responsible	French State and ADEME
Implementation	The 'Vessels of the future' and 'Investments for clean ferries' calls for projects are respectively open until 1 October 2016 and 31 December 2016.

Title of the measure	***Inland waterway transport: 2013-2017 modernisation and innovation support plan***
Nature of the measure	Subsidy
Description	The 2013-2017 plan, which has a total budget of €16.5 million, consists of 10 different types of aid: A1 - Technical adaptations to make inland waterway transport more environmentally friendly A2 - Technical adaptations to improve fleet productivity A3 - Purchase of handling equipment installed on an existing slipway and loading assistance tools B1 - Entry into service of new vessels responding to structural changes and the need to rejuvenate the fleet B2 - Renewal of the fleet in order to handle specific traffic B3 - Entry into service of boats able to serve maritime ports C1 - Purchase of a first boat as part of an inland waterway transport enterprise start-up C1a - Development of inland waterway transport enterprises C2 - Creation of housing for apprentice boatmen D - Measures designed to promote innovation. Projects involving conversion of the fleet to LNG propulsion or shore-side electricity supply may benefit from this support plan. A new plan for the 2018-2022 period will take over from the 2013-2017 plan. This will include measures aimed at curbing consumption and pollutant emissions from inland waterway vessels and bringing engines up to standard, enabling transport operators to expand into new markets and supporting innovation.
Main objectives	Environmental excellence of the fleet; Adaptation of boats to the expectations of shippers; Increased attractiveness of the profession; Preservation and renewal of the fleet; Adaptation of boats to the infrastructure.
Type of infrastructure involved	Inland waterway LNG and shore-side electricity refuelling infrastructure

Means of transport	Inland waterway transport
Party responsible	Voies Navigables de France (French inland waterways authority)
Implementation	From 1 January 2013 to 31 December 2018

Title of the measure	***'Vehicles and transport of the future' action ('Investing for the Future' programme managed by ADEME): support measure for the deployment of recharging infrastructure for hybrid and electric vehicles***
Nature of the measure	Subsidy
Description	The measure targets towns and cities, agglomerations or groups of agglomerations and metropolitan areas. Projects meeting the following conditions are eligible: - the infrastructure funded by the measure allows at least one recharging point per 3 000 inhabitants to be made available in the areas where the infrastructure funded by the measure is installed; - the infrastructure costs (costs of equipment, civil engineering, installation engineering and connection to the electricity distribution system) must be at least €200 000.
Main objectives	Aid measure aimed at supporting the deployment of recharging infrastructure on public and private roads, on the initiative of local and regional authorities
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	ADEME
Implementation (in terms of financing)	77 projects, with a subsidy of €61 million and 20 533 recharging points, decided under 'Investing for the Future' programme financing but not yet installed

Title of the measure	***'Development support for electric vehicles through new recharging infrastructure' programme - Energy saving certificates - Order of 14 March 2016 validating the 'ADVENIR' programme under the energy saving certificates measure***
Nature of the measure	Economic measure
Description	This programme aims, by 2018, to facilitate the installation and part-financing of new smart recharging points for electric and plug-in hybrid electric vehicles not located on public roads or in single-unit dwellings. These private recharging points in France will be funded by energy providers through energy saving certificates. The following recharging points are eligible: - shared terminals in car parks of businesses and public authorities, accessible to employees and fleets; - shared terminals accessible to the public in private places, such as car parks of shops and public services or underground car parks; - private terminals in collective dwellings, which are owned and managed by private individuals, social housing providers, property managers or private owners.
Main objectives	Enable the funding of new recharging points for electric and plug-in hybrid electric vehicles in collective dwellings and on business premises
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	Avere-France
Implementation	The ADVENIR programme, managed by Avere-France, supported by EcoCO2 and with EDF funding of €9.75 million, should make electric mobility accessible to all by facilitating the installation of over 12 000 recharging points (6 300 for businesses and 5 700 for collective dwellings).

Title of the measure	***Energy transition tax credit for the deployment of recharging points under Article 200 quater of the General Tax Code, laid down by the 2015 Finance Law***
Nature of the measure	Tax expenditure
Description	The energy transition tax credit is a tax break for private individuals allowing 30% of the expenditure (subject to a cap) on certain energy performance improvement work to be deducted from income tax. Owner-occupiers, lessees and non-paying occupants can benefit from this aid. This measure has evolved over the years and the list of eligible work now includes new equipment, such as recharging terminals for electric vehicles (as of 1 September 2014).
Main objectives	Deployment of private electric recharging infrastructure
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	French State
Implementation	This support applies until 31 December 2016. It should be renewed for 2017, once the Minister for the Environment, Energy and Sea, who is responsible for international relations on the climate, and the Minister for Housing and Sustainable Homes have presented their guidelines for the deployment of positive energy and low-carbon buildings and new measures to speed up energy efficient renovation on 1 July 2016.

Title of the measure	***'GNVolontaire' action in Rhône-Alpes***
Nature of the measure	Subsidy
Description	The 'GNVolontaire' action aims to develop stations by supporting purchases. The principle is to help with the purchase of NGV heavy-duty vehicles in return for the deployment of a station. The conditions to be met to benefit from the aid are public accessibility to stations; connection to the CNG system (through biomethane); public/private coordination with the local authority to help make the land available and with transport operators to choose the land, location, etc.
Main objectives	Develop NGV stations through purchase support
Type of infrastructure involved	Refuelling stations
Means of transport	Road transport
Party responsible	ADEME GRDF
Implementation	By mid-2017, six public stations for heavy-duty vehicles should be operational in this region, with 100 heavy-duty vehicles purchased (19-44 tonnes, refuse collection lorries, coaches), situated in Saint-Etienne, Lyon, Annecy, Chambéry, Montélimar and Grenoble.

Title of the measure	***'Circular economy' action ('Investing for the Future' programme managed by ADEME)***
Nature of the measure	Subsidy and repayable advances
Description	The BIOGNVAL project (Suez – Cryopur – Iveco) aims to make use of biogas produced by sludge at waste water treatment plants by treating the waste water to make liquid biofuel (bio-LNG), which is an easily storable renewable energy. The biogas mainly consists of methane and CO_2. This is the first such project of this scale in France. The conversion involves two stages: purification to separate the two components and obtain a biogas consisting solely of methane, and liquefaction of this gas to obtain liquid biomethane (bio-LNG) for use as a fuel in vehicle fleets (as stations are often too far from networks to envisage injection). The separated CO_2 is also liquefied for commercial use. This project has required the development of an innovative methane and CO_2 separation process involving cryogenics. The anticipated results include, for example: validation of the process chosen; evidence of the technical and economic feasibility of large-scale LNG production from biogas; confirmation that bio-LNG production ensures better environmental performance than the use of fossil energy (within the project perimeter, carbon savings are estimated at 1 500 TEQ CO_2 per year if bio-LNG replaces diesel); contribution to the energy independence of the districts by making available a local, renewable and sustainable energy; and production of a fuel from local and renewable resources allowing the creation of jobs that are safe from relocalisation.
Main objectives	Development of bio-LNG production
Type of infrastructure involved	LNG infrastructure
Means of transport	Road transport
Party responsible	ADEME
Implementation (in terms of financing)	1 project with €3 million of support (€6.6 million of the total budget)

Title of the measure	***Fuel taxes***
Nature of the measure	Tax expenditure
Description	The taxation of oil products, and in particular fuels, is regulated by EU law, particularly Directive 2003/96/EC of 27 October 2003. The amounts of the internal consumption tax on energy products (*taxe intérieure de consommation sur les produits énergétiques* – TICPE) are indicated in a table in Article 265 of the Customs Code.

	unit	2014	2015	2016	2017
SP95-E5	EUR/hl	60.69	62.41	64.12	65.07
SP95-E10	EUR/hl	60.69	62.41	62.12	63.07
Diesel	EUR/hl	42.84	46.82	49.81	53.07
LPG	EUR/10	10.76	13	13.97	16.5
NGV	EUR/10	1.49	3.09	3.99	6.5

Certain sectors benefit from TICPE reductions and exemptions, in particular:
- road transport operators with a lorry of over 7.5 tonnes can obtain reimbursement of the amount between the applicable rate for diesel and €43.19/hl (€39.19/hl before 2015) (Article 265 septies of the Customs Code);
- operators of public road passenger transport can also obtain reimbursement of the amount between the applicable rate for diesel and €39.19/hl (Article 265 octies of the Customs Code);
- goods transport on inland waterways is fully exempted from the TICPE, as are sea transport and fishing (Article 265 bis of the Customs Code).

Under the initial 2014 Finance Law a carbon component was taken into account in the TICPE. A gradual increase in the TICPE was thus applied based

	on CO_2 emissions, i.e. €7/tonne CO_2 in 2014, €14.5/tonne CO_2 in 2015, and €22/tonne CO_2 in 2016. However, the 2015 Amending Finance Law revised the rates for 2016: for LPG, €13.97/100 kg instead of €15.24/100 kg, and for NGV, €3.99/100 m³ instead of €4.69/100 m³. The taxation of these two fuels is therefore even more 'preferential' than the previously existing arrangements. Furthermore, the 2015 Amending Finance Law provided for the carbon component approach to be extended in order to achieve the target of €56/tonne CO_2 in 2020 set by the Energy Transition Law. The rate per tonne of CO_2 is therefore set at €30.5 for 2017, €39 for 2018 and €47.5 for 2019. The 2015 Amending Finance Law also reduced the difference in TICPE rates between diesel and petrol as from 2016 by increasing the diesel rate by €0.01/l and by reducing the petrol rate by €0.01/l. A similar adjustment will take place through the 2017 rates.
Main objectives	Development of alternative fuels Transparency for operators by adopting a carbon approach
Type of infrastructure involved	Refuelling stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Company vehicle tax***
Nature of the measure	Tax expenditure
Description	The Company Vehicle Tax (*Taxe sur les Véhicules des Sociétés* – TVS), as defined in Article 1010 of the General Tax Code, is a tax instrument encouraging businesses to use vehicles that have the least possible impact on the climate and, since 2014, on ambient air quality. Its calculation is based on two components: a rate based on the level of CO_2 emissions (or fiscal power depending on the year of entry into service), and a second rate based on air pollutant emissions, determined according to the type of fuel. This modulation of the TVS by taking account of air pollutants favours the least polluting vehicles, with electric vehicles being exempt from the tax. Hybrid vehicles are exempted from the component of the tax based on CO_2 emissions for eight quarters if their CO_2 emissions are less than 100 grams per kilometre.
Main objectives	Encourage businesses to purchase vehicles that use alternative fuels so as to curb greenhouse gas and air pollutant emissions
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Accelerated depreciation for vehicles over 3.5 tonnes that exclusively use NGV***
Nature of the measure	Tax expenditure
Description	Article 39 decies of the General Tax Code provides that businesses subject to corporation tax or income tax under an actual taxation regime can deduct, from their taxable result, a sum equal to 40% of the original value of assets, excluding financing costs, assigned to their activity and purchased or leased (lease with or without option to purchase) from 1 January 2016 to 31 December 2017, where these assets belong to the category of vehicles over 3.5 tonnes exclusively powered by natural gas and biomethane, whatever their use (lorry, bus, coach, etc.). This deduction is spread, in a linear manner, over the normal service life of the assets.
Main objectives	Encourage the deployment of vehicles over 3.5 tonnes fuelled by NGV

Type of infrastructure involved	Refuelling stations
Means of transport	Road transport
Party responsible	French State
Implementation	

Title of the measure	***Article 38 of the LTECV on differential charging by motorway operating companies for the use of infrastructure***
Nature of the measure	Incentive measure
Description	Motorway operating companies may apply differences in the subscription fees charged to encourage ultra-low-emission vehicles with a gross vehicle weight of less than 3.5 tonnes and car-pooled vehicles, without altering the pace of change of toll rates and without increasing the term of motorway concessions.
Main objectives	Encourage low-emission vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	Motorway operating companies
Implementation	

Title of the measure	***Exemption from the regional tax on vehicle registration certificates***
Nature of the measure	Incentive measure
Description	A vehicle registration certificate is issued against payment of several taxes and one fee. Its total cost is the sum of the following taxes and/or fee: regional tax, tax for the development of vocational training (for vans), CO_2 tax and environmental surcharge (if the vehicle is polluting), management tax and certificate delivery fee. The regional tax is set by the regional council, which therefore decides whether to set this tax regardless of the vehicle's power or whether to grant a partial or total exemption. The decision is made every year on 1 January and is applied in the prefectures concerned.
Main objectives	Encourage low-emission vehicles
Type of infrastructure involved	Recharging and refuelling infrastructure
Means of transport	Road transport
Party responsible	Local and regional authorities
Implementation	In 2016, total exemption (vehicle registration certificate subject only to the delivery fee) was applied in 14 of the 20 regions in metropolitan France, partial exemption (regional tax of 50%) was applied in 5 regions and 1 region did not grant any exemption from the regional tax on vehicle registration certificates.

Title of the measure	***Agreement on the green disc between ADEME and AVE***
Nature of the measure	Incentive measure
Description	The green disc is a free parking incentive measure started in 2008 by the Association for environmentally friendly cars (*Association des Voitures Ecologiques* – AVE), where local authorities grant two hours' free on-road parking for anyone who has chosen an electric, hybrid, LPG, NGV, hydrogen or E85 flex fuel vehicle, a micro-car under 3 metres or a car-sharing vehicle. Where the local authority does not have paid parking, it can also reserve spaces for holders of the green disc. In March 2016, ADEME decided to sign an agreement with AVE to help promote this measure and increase the number of local authorities offering it.
Main objectives	Encourage the development of vehicles using alternative fuels
Type of infrastructure involved	Refuelling infrastructure
Means of transport	Road transport

Party responsible	Local authorities
Implementation	To date, 23 municipalities have decided to adopt the green disc: Bordeaux (33), Alès (30), Puteaux (92), Creil (60), Tassin-la-Demi-Lune (69), Orléans (45), Avignon, (84), Chamalières (63), Angoulême (16), Colombes (92), Saint Omer (62), Hazebrouck (59), Arras (62), Brive (19), Cannes (06), Reims (51), La Motte-Servolex (73), Noisy-le-Sec (93), Vence (06), Nemours (77), Sceaux (92), Vannes (56) and Vienne (38). Many others are studying its feasibility.

6.6.4. Calls for projects

This section lists all calls for projects relating to alternative fuels in France, whether they involve infrastructure or means of transport for the road and maritime sectors.

Existing measures

Title of the measure	***Call for projects for 'Clean air towns and cities in 5 years'***
Nature of the measure	Subsidy
Description	The aim is to find volunteer 'laboratory towns and cities' to implement specific, radical and model actions designed to make them towns and cities with clean air within five years. The project developers therefore commit to reducing their fine particulates (PM10) and nitrogen dioxide (NO_2) levels to below the health advisory levels, and therefore to guaranteeing healthy air for inhabitants by the end of the project. In this way, these areas contribute to implementing the provisions of the draft Law on the energy transition for green growth at a local level. The 'Clean air towns and cities in 5 years' projects are implemented by districts and agglomerations mainly situated in one of the 36 zones covered by an air protection plan. Towns and cities must therefore submit projects that, at inter-municipal level at the very least, aim to create or design areas with restricted traffic and implement two complementary actions involving (at their choice) transport and mobility, industry, agriculture, housing, innovation as a driver of green growth, or urban planning. Successful applicants benefit from financial and logistics support from the state services and ADEME for five years.
Main objectives	Deployment of low-emission vehicles
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Road transport
Party responsible	Local authorities
Implementation	Up to €1 million for the entire project, financed by the energy transition financing fund and distributed as follows: - maximum rate of 50% for studies; - maximum rate of 30% for investments (excluding transport infrastructure). Twenty local authorities have already been successful, three others are due to be included (further time granted for refining their project) and, lastly, two others will benefit from a local energy transition contract including an 'air' part.

Title of the measure	***TEPCV (energy transition for green growth) call for projects***
Nature of the measure	Call for projects
Description	Launched in September 2014, this call for projects is aimed at local authorities, which benefit from a subsidy to implement actions in the six areas covered by the Law on the energy transition for green growth: curbing energy consumption, curbing pollution by developing clean transport, developing renewable energies, preserving biodiversity, fighting wastefulness and reducing waste, and environmental education.
Main objectives	- mitigate the effects of climate change, so that France can serve as an example; - encourage lower energy needs and the development of local renewable energies; - facilitate the emergence of green sectors to create 100 000 jobs over three years; - re-establish biodiversity and promote natural heritage.
Type of infrastructure involved	Local authorities, joint associations, electricity associations, etc.
Means of transport	Encourage low-emission/alternative-fuel vehicles in particular
Party responsible	Minister for the Environment, Energy and Sea
Implementation	Subsidy of €500 000-€2 million for each successful district. 528 applications and 305 districts labelled 'Positive energy area for green growth' to date.

Title of the measure	***'Hydrogen district label' call for projects***
Nature of the measure	Creation of a label
Description	This call for projects, launched by Nouvelle France Industrielle, aims to promote large-scale demonstration projects using the hydrogen energy vector in the districts. It opened on 4 May 2016 and closes on 30 September 2016. Suitable projects may cover the innovation, trial or pre-deployment phase and must demonstrate, in a given district, the multiplicity of services offered by this vector and the associated transport and mobility technologies, with optimised integration and exploitation of the renewable electricity potential within local networks. The districts covered by these demonstrations may vary in nature, and a link with local development policies must be demonstrated for each project. The aims of this label are varied: - enable various existing public support programmes to qualify, in particular support for innovation in the context of public/private project co-financing; - speed up the development of structural projects in the hydrogen sector so that, once operational, they become a showcase for industry able to enhance the export value of French technologies and know-how in this sector; - test the viability of economic models based on multiple uses of the hydrogen vector within the same ecosystem; - assess the impact of local deployment of hydrogen solutions and draw lessons from these in order to better prepare for future national deployment. The successful applicants will be designated by the Ministers of the Economy and the Environment no later than 30 October 2016.
Main objectives	Development of hydrogen mobility
Type of infrastructure involved	Hydrogen stations
Means of transport	Hydrogen vehicles
Party responsible	French State

Implementation	This call for projects mobilises existing measures managed by public bodies associated with this approach: - Commissariat Général à l'Investissement (Commissariat-General for Investment), ADEME and BPI France, in particular through the 'Investing for the Future' programme; - Caisse des Dépôts et Consignations (Deposits and Consignments Fund); - CRE (Energy Regulation Commission), in particular through testing of a local flexibility service; - Regional Councils and decentralised services of the State, in particular through the ERDF. Labelled projects may benefit from financing offered by each of these bodies as part of their intervention scheme, whereby applications for support specific to each scheme will be made in parallel with the labelling.

Title of the measure	***'Eco-efficient industry and agriculture' call for projects for the construction of shore-side electricity and marine LNG distribution port facilities in the context of positive energy ports***
Nature of the measure	Subsidy
Description	In July 2016 a section dedicated to port and maritime industries was added to the 'Eco-efficient industry and agriculture' call for projects, launched as part of the 'Investing for the Future' programme. The aim is to help develop model ports in terms of energy efficiency and supply of alternative fuels. Projects under this call for projects are expected to include: - designing and developing an innovative logistics chain for LNG refuelling at a port, from the molecule supply to the adaptation of LNG terminals, where these exist, to be able to load road tankers and/or bunkering vessels or ensure shore-side storage, through to the vessel refuelling service; - designing and developing shore-side electricity supply facilities to meet the energy needs of vessels when in port and allow them to shut down their auxiliary engines; - designing stand-alone shore-side electricity generators powered by LNG; - offering a more general alternative fuel refuelling service.
Main objectives	Develop model ports in terms of energy efficiency and supply of alternative fuels
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations
Means of transport	Maritime transport
Party responsible	French State and ADEME
Implementation	The call for projects closes on 30 November 2016.

Title of the measure	***'Integrated NGV mobility solutions' call for projects***
Nature of the measure	Subsidies and repayable advances
Description	Road transport operators are showing a degree of interest in NGV mobility and several are taking steps to acquire lorries that use this gas as a fuel. However, this approach is being hindered by a lack of refuelling infrastructure nationally, the additional cost of NGV vehicles and a low terminal value. It is therefore essential to develop innovative NGV mobility offers that allow groups of operators to simultaneously deploy NGV stations and fleets of NGV vehicles across France. In order to be eligible for this measure, solutions must be proposed by a single project developer undertaking to establish NGV refuelling stations and purchase NGV-powered road transport vehicles. The project must have the following minimum characteristics: – involve at least 10 refuelling stations located in a minimum of three French regions or in two French regions and one foreign region that adjoin each other; – allow public access to the refuelling stations; – involve a number of vehicles purchased and brought into service 20 times higher than the number of stations established.
Main objectives	Encourage the emergence on the national road transport market of one or more innovative and comprehensive NGV mobility offers
Type of infrastructure involved	NGV refuelling stations and NGV-powered vehicles
Means of transport	Road transport
Party responsible	ADEME
Implementation	The financial support granted to each of the selected projects will be calculated on a flat-rate basis of up to €300 000 per complete lot (1 station, 20 vehicles). The subsidy is capped at €100 000 and the repayable advance at €200 000 .

Future measures

Title of the measure	***'Deployment of recharging service for hybrid and electric vehicles in residential parking spaces or business parks' call for projects***
Nature of the measure	Subsidies
Description	Following on from the aid measure managed by ADEME up to 2015 under the 'Investing for the Future' programme, which was aimed at supporting deployment of recharging infrastructure on the initiative of local and regional authorities, it is now proposed to provide financing for recharging infrastructure associated with residential parking or in business parks. These deployment projects must form part of an individual recharging service offer to be fully effective and to optimise use of the infrastructure deployed. The projects must meet certain criteria and ensure that the service offered meets the expectations of a regular and/or occasional, private and/or professional client base. It is important that the infrastructure is interoperable, allowing any user to recharge a vehicle throughout the area in question with a similar service level and customer experience. Moreover, access and payment conditions must allow equivalent recharging access for both regular and occasional customers. The technical characteristics of the recharging infrastructure must be set out in detail, clarifying points such as the contribution to smart recharging, sizing, interoperability, the payment system and user charging. The beneficiaries of this call for projects are towns and cities, agglomerations, groups of agglomerations, inter-municipal associations, departments and regions that meet the eligibility criteria set out in the document. In this new call for projects priority will be given to areas not having already benefited from aid under the 'Investing for the Future' programme in relation to recharging infrastructure for electric and hybrid vehicles. For a project to be eligible, it must have an eligible costs base of at least €50 000, and the work to construct the infrastructure must be carried out no later than 31 December 2019.
Main objectives	Support towns and cities, agglomerations, groups of agglomerations, inter-municipal associations, departments and regions that commit to deploying a service offer for the recharging of electric or plug-in hybrid electric vehicles in residential areas or business parks
Type of infrastructure involved	Recharging stations
Means of transport	Electric and plug-in hybrid electric vehicles
Party responsible	ADEME
Implementation	Depending on the specific situation of each territory, support may be granted at a maximum rate of: - 30-50% of the eligible investment costs per normal power recharging point (up to a limit of €1 800-€3 000); - 20-30% of the eligible investment costs per rapid recharging terminal (up to a limit of €8 000-€12 000); - 30-50% of the engineering costs of the recharging service offer. Infrastructure installed under a concession contract may, depending on the situation of the local and regional authorities, benefit from flat-rate support of: - €1 500-€2 500 per normal power recharging point; - €6 500-€12 000 per rapid recharging terminal. This call for projects should lead to the installation of around 4 800 recharging points accessible to the public.

6.6.5. Research, innovation and development measures

Title of the measure	***Treatment/reuse of batteries***
Nature of the measure	Research and development
Description	There are four main families of battery for electric vehicles, each with their environmental impact: lead, nickel cadmium, nickel metal hydride and lithium. These families are linked to the vehicle type (all electric or hybrid) and date of production. The latest all-electric vehicle models generally have a lithium battery. However, this is the family of batteries whose end-of-life treatment can pose a problem: the current recycling, treatment and disposal process used for this type of battery is not cost-effective. This is mainly due to the low market value of the component materials and their heterogeneity, which impact on the performance of the recycling and treatment process. Ways to improve the treatment of used lithium ion batteries are therefore being explored. There are three main options: increasing the value recovered by recycling, remanufacturing used batteries (replacing used cells) and reuse. The main focus is currently on the reuse solution, i.e. offering batteries a second life by reusing them for purposes other than electric vehicles. The main use is for the stationary storage of energy. Several manufacturers are developing this idea of a second life: - Eco2Charge programme, coordinated by Bouygues Energies & Services and bringing together Actility, Alstom, the CEA, EMBIX, Nexans, Renault and the University of Versailles Saint-Quentin-en-Yvelines with support from the 'Vehicles and transport of the future' action under the 'Investing for the Future' programme managed by ADEME. The aim is to test the use of used batteries from electric vehicles as stationary storage for renewable energy in commercial buildings; - 'Second life batteries' project conducted by Bosch, BMW and Vattenfall, with an experimentation project mainly involving EDF, Forsee Power, Mitsubishi Corporation and PSA Peugeot Citroën; - three projects – PIA CYCLADE (Récupyl), UEX2 (Snam) and Re-B-Live (Véolia SARPI – Renault) – looking into the development of a recycling process for lithium-ion car batteries. These projects are recent, as they were announced or launched in 2014 and 2015.
Main objectives	Improve the functioning of batteries and their environmental treatment
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	ADEME, French State and the manufacturers involved
Implementation	The Eco2Charge project is being implemented at the Challenger site of Bouygues Construction.

Title of the measure	***'Vehicles and transport of the future' action ('Investing for the Future' programme managed by ADEME)***
Nature of the measure	Research and development
Description	This action, managed by ADEME under the 'Investing for the Future' programme (*programme d'investissements d'avenir,* PIA), aims to support research and innovation in the areas of vehicles and mobility of the future, with quantified placing on the market in the short or medium term. Each project often involves investment of tens of thousands of euros. They are mainly conducted by businesses of all sizes. The following calls for projects have been launched since 2011 under the 'Vehicles and transport of the future' action: - mobility: daily journeys of people and final leg of goods transport; - experiments involving recharging infrastructure for electric vehicles and plug-in hybrid electric vehicles; - drive train and auxiliary units of vehicles with combustion engines; - electric drive train; - lightening, aerodynamics and architecture of vehicles; - logistics chains and occasional mobility of people; - heavy-duty road vehicles; - hydrogen road vehicles; - vessels of the future (2011 and 2013 editions); - rail transport (2013 and 2014 editions); - road vehicle of the future: technologies, systems and mobility (open from June 2013 to December 2014). The following have been launched and are currently ongoing in 2016: - road vehicles and mobility of the future (2015 edition); - logistics and intermodality (2015 edition); - vehicles in their environment (2015 edition); - roads of the future (2015 edition); - rail transport (2015 edition, renewal of the previous call for expressions of interest); - vessels of the future (2015 edition). Investment support for clean ferries. Three calls for projects aimed specifically at SMEs, according to the European definition, covering the three sectors Road, Rail and Maritime and known as the SME Initiative for 'Vehicles and transport', were also launched in 2015 and 2016.
Main objectives	Speed up the development of innovative mobility technologies and uses, particularly those allowing a reduction in fossil fuel consumption.
Type of infrastructure involved	Electric recharging infrastructure and refuelling stations for all fuels
Means of transport	Road, Rail, and Maritime and Inland Waterway
Party responsible	ADEME
Implementation	Since 2011, 71 projects have been implemented, followed up or resulted in a financial return (or abandoned in some cases) under different calls for projects. Successful applications under the SME Initiative: 40 (January 2015 edition) and 21 (September 2015 edition). These projects represent around €600 million in aid (subsidy and repayable advance).

Title of the measure	***European call for proposals on hydrogen: FCH JU programme***
Nature of the measure	Subsidy
Description	The European 'Fuel Cells and Hydrogen Joint Undertaking' (FCH JU) programme is a unique public-private partnership between the European Commission, European manufacturers representing the fuel cell and hydrogen sector under the aegis of Hydrogen Europe, and the scientific community, represented by the N.ERGHY research grouping. The aim is for the various stakeholders to join their efforts in order to accelerate the market introduction of these technologies and ensure that they benefit European citizens, all in order to achieve a low-carbon energy system. The FCH JU is the result of long-standing cooperation between manufacturers, the scientific community, public authorities, end users and civil society. Various calls for proposals have therefore been launched. In May 2014, the European Commission formally agreed to continue this initiative under the EU Horizon 2020 Framework Programme. This first phase covers the 2014-2020 period. A second phase is already planned, with the FCH 2 JU programme to cover the years 2020-2024. It will focus on improving performance and reducing the cost of products as well as demonstrating the readiness of hydrogen technology to offer viable solutions to the market in the fields of transport (cars, buses and refuelling stations) and energy (hydrogen production and storage, energy storage). Projects selected under this programme must fall under one of the four pillars identified by FCH JU members: transport, energy, cross-cutting projects and overarching projects. The following projects involve research and development in the area of hydrogen technology applied to hydrogen vehicles or refuelling stations. They were selected under the 2014 and 2015 annual calls for proposals: - H2REF: project involving the use of hydraulics to perfect the process of hydrogen compression at 70 bar and of filling the buffering system of a refuelling station for private vehicles. The aim is to offer a complete, cost-effective and reliable station for around €450 000 (compared to around €900 000 currently). Coordinator: Centre technique des industries mécanique. Period: June 2015-August 2018. Budget of €6.4 million, subsidy of €5.97 million; - Giantleap: project that aims to increase the lifetime and reliability of fuel cells, to increase availability and reduce the total cost of fuel cell ownership. The project includes various experiments and analyses that will help improve understanding of the degradation of fuel-cell systems. Coordinator: SINTEF, assisted by the University of Franche-Comté. Period: May 2016-April 2019. Budget of €3.3 million, subsidy of €3.3 million. - INSPIRE: project that aims to develop and integrate the most advanced components from numerous FCH JU projects to create a proton exchange membrane (PEM) fuel cell for vehicles with the most advanced technical specifications, reducing production costs to €50/kW for 50 000 units. Coordinator: Johnson Matthey PLC, assisted by the CNRS. Period: May 2016-April 2019. Budget of €6.9 million, subsidy of €6.9 million.
Main objectives	Accelerate the development and deployment of fuel cell and hydrogen technologies
Type of infrastructure involved	Hydrogen refuelling infrastructure and hydrogen vehicles
Means of transport	Road transport
Party responsible	European Commission, Hydrogen Europe and N.ERGHY

Implementation	Programme with a total budget of €1.33 billion for the 2014-2020 period, of which 50% provided by the Commission. 2014 call for proposals: €93 million for 15 projects 2015 call for proposals: €123 million for 15 projects 2016 call for proposals: €117.5 million (closed since May 2016).

6.6.6. Cross-border coordinated measures and projects funded by the European FCH JU, TEN-T and EIM-T programmes

This section lists all the European projects, measures and initiatives in which France participates with other Member States to develop cross-border mobility based on alternative fuels for different end users (professionals or consumers).

Title of the measure	***Spain-France-Portugal initiative calling for the development of electric mobility during COP 21***
Nature of the measure	Information – declaration
Description	France, Spain and Portugal wish to create a Franco-Iberian corridor of recharging terminals by developing solutions for interoperability between supervision systems. A consortium of public and private undertakings is to be set up to complete this project, with the prospect of European co-financing. The joint initiative signed by the three countries in November 2015 identifies 10 proposals aimed at developing the market: - conduct information and awareness-raising campaigns to remove psychological barriers; - promote the development of training actions aimed in particular at garages and driving schools; - offer benefits linked to use based on the identification of electric vehicles; - pursue demand support policies; - promote the electric vehicle for business fleets and public procurement; - facilitate the development of new batteries with a greater range at an affordable price; - allow access to recharging points through a service roaming system; - support the development of public recharging infrastructure in towns, cities and agglomerations and on Community axes; - reaffirm, during the COP, the contribution of the electric vehicle to the energy transition; - encourage the deployment of international corridors of recharging terminals.
Main objectives	Collective awareness of the advantages of electric mobility in the participating countries
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	Spain, France and Portugal
Implementation	

Title of the measure	***French-German CROME project: experiment in cross-border electric mobility***
Nature of the measure	Subsidy
Description	Project supported by ADEME under the 'Investing for the Future' programme. The CROME project was a French-German collaborative project implemented by the company EDF for a consortium of several partners from industry and energy supply, French and German research bodies, and French and German ministries. It aimed to encourage the development of cross-border electric mobility in Europe by proving that borders are not a significant obstacle. Interoperability, pricing and safety were considered the key to success. The main objectives were therefore to: - demonstrate cross-border mobility with electric vehicles; - design and test compatible recharging infrastructure on either side of the border (connectors, recharging cables, communication during recharging, access systems, services, etc.); - test innovative concepts for electric mobility (roaming, etc.); - evaluate user behaviour in a cross-border dimension. To this end, the project involved: - developing interoperable recharging infrastructure in Germany and France, where most plug-in vehicles available on the market, with their different socket standards, could be recharged; - introducing a smartphone application giving the position of recharging stations; - collecting data on recharging operations, exchanged between the various operators under a roaming agreement; - testing various economic and charging models; - daily testing by over 100 users of the compatibility of 11 different models of electric vehicle with over 100 recharging points.
Main objectives	Install and test a safe, reliable, easy-to-use and compatible (between France and Germany) electric mobility solution, and make recommendations for the European standardisation process in terms of recharging infrastructure and services.
Type of infrastructure involved	Electric recharging infrastructure
Means of transport	Road transport
Party responsible	EDF, consortium of the CROME project
Implementation	The total project amount was €6 million, of which €2.6 million in support from the 'Investing for the Future' programme. It ran from November 2011 to November 2014. At the end of the project: - 25 recharging stations had been deployed on the German side of the project area, with 16 on the French side; - CROME users had enjoyed benefits such as being able to find the nearest recharging station via a dedicated website, being able to park and recharge up to two cars in parallel at each recharging station, and ease of use with a single identification and payment card for the entire network; - plug-in vehicles from various categories and various car manufacturers had been tested; - 87 000 journeys and 16 000 recharging operations had been logged, together with 300 instances of roaming on the public recharging network throughout the project.

Title of the measure	***European call for proposals on hydrogen: FCH JU programme***
Nature of the measure	Subsidy
Description	The European 'Fuel Cells and Hydrogen Joint Undertaking' (FCH JU) programme is a unique public-private partnership between the European Commission, European manufacturers representing the fuel cell and hydrogen sector under the aegis of Hydrogen Europe, and the scientific community, represented by the N.ERGHY research grouping. The aim is for the various stakeholders to join their efforts to accelerate the market introduction of these technologies and ensure that they benefit European citizens, all in order to achieve a low-carbon energy system. The FCH JU is the result of long-standing cooperation between manufacturers, the scientific community, public authorities, end users and civil society. Various calls for proposals have therefore been launched. In May 2014, the European Commission formally agreed to continue this initiative under the EU Horizon 2020 Framework Programme. This first phase covers the 2014-2020 period. A second phase is already planned, with the FCH 2 JU programme to cover the years 2020-2024. It will focus on improving performance and reducing the cost of products as well as demonstrating the readiness of hydrogen technology to offer viable solutions to the market in the fields of transport (cars, buses and refuelling stations) and energy (hydrogen production and storage, and energy storage). Projects selected under this programme must fall under one of the four pillars identified by the FCH JU members: transport, energy, cross-cutting projects and overarching projects. The following projects aim to develop hydrogen as an alternative fuel across Europe, either directly in terms of developing the recharging point network, or indirectly by supporting the growth of hydrogen vehicles. They were selected under the 2014 and 2015 annual calls for proposals: - H2ME: project bringing together Europe's four most ambitious national initiatives (Germany, Scandinavia, France and the United Kingdom). The aim is to significantly expand the hydrogen refuelling networks being deployed in these countries and increase the number of hydrogen vehicles on Europe's roads, to pave the way for a pan-European hydrogen refuelling station network. The project will also involve deploying 29 state-of-the-art hydrogen stations, testing a fleet of 200 fuel cell cars and 125 fuel cell range-extended vehicles (SymbioFCell and Renault), and conducting a real-world test of four national hydrogen mobility strategies. Coordinator: Element Energy Limited. Period: June 2015-May 2020. Budget of €62.6 million, subsidy of €32 million; - HY4ALL: project conducted by a consortium of experts (manufacturers representing the sector, communication experts, etc.), aiming to create a programme to help drive a step-change in the perception of the public, national policymakers and society at large with regard to fuel cell and hydrogen technologies as viable low-energy solutions for transport. The project will be deployed in at least 11 European countries. Coordinator: Air Liquide Advanced Technologies. Period: September 2015-August 2018. Budget of €2 million, subsidy of €2 million; - H2ME 2: continuing on from the first phase and covering the 2015-2020 period, this second phase launched in June 2016 brings together 37 European partners for a six-year period. Based on the same principle, it aims to expand the European network by a further 20 hydrogen stations to supply another 1 200 hydrogen vehicles. Further objectives include testing the possibility of equipping hydrogen stations with electrolysers to help balance the electricity grid and offering recommendations on the development of the sector and the compilation of results to support future investment. It will also identify any barriers to full commercialisation of its products. Budget of €100 million.

Main objectives	Accelerate the development and deployment of fuel cell and hydrogen technologies
Type of infrastructure involved	Hydrogen refuelling infrastructure and hydrogen vehicles
Means of transport	Road transport
Party responsible	European Commission, Hydrogen Europe and N.ERGHY
Implementation	Programme with a total budget of €1.33 billion for the 2014-2020 period, of which 50% provided by the Commission. 2014 call for proposals: €93 million for 15 projects 2015 call for proposals: €123 million for 15 projects 2016 call for proposals: €117.5 million (closed since May 2016).

Title of the measure	***Projects in France funded by the TEN-T and EIM-T programmes***
Nature of the measure	Subsidy
Description	The programmes TEN-T (Trans-European Networks for Transport) and, since 2014, EIM-T (European Interconnection Mechanism – Transport) are multiannual programmes of the European Commission that specifically finance transport infrastructure projects within the Union or projects helping to implement European transport policy, including innovation projects to improve the environmental performance and energy efficiency of transport. In particular, in France, these programmes have funded both alternative fuel development projects and electricity, natural gas and hydrogen recharging or refuelling infrastructure.
Main objectives	Facilitate goods and passenger mobility in the EU
Type of infrastructure involved	Refuelling stations
Means of transport	Maritime transport and road transport
Party responsible	French State

Implementation	LNG (marine and inland waterway) development projects: - Technical and design studies concerning the implementation of a LNG bunkering station at the port of Dunkirk: feasibility and sizing study for an LNG refuelling station at the port of Dunkirk; - Safe SECA: introduction of alternative fuels for maritime and inland waterway transport, including LNG, in the English Channel and along the Seine; - SEAGAS: feasibility study for a marine LNG refuelling infrastructure at the ports of Roscoff and Santander; - Channel LNG: UK, Belgian and French project concerning the deployment of reliable marine LNG refuelling infrastructure to supply a fleet of vessels sailing in the SECA area; - LNG Masterplan: deployment of LNG as an inland waterway fuel on the Rhine, Main and Danube; - GAINN4MOS: deployment of marine LNG refuelling infrastructure on the Atlantic and Mediterranean seaboards, in particular at the ports of Nantes-Saint Nazaire and Marseille-Fos; - LNG Logistic: development of LNG inland waterway transport and deployment of refuelling points at inland ports in the Rhône-Saône basin; - S/F SamueLNG for a Blue Atlantic Arch: conversion to LNG of a dredger based at the port of Nantes-Saint Nazaire (also operating at the ports of Le Havre and Rouen) and deployment of marine LNG in the Atlantic area and English Channel. NGV refuelling infrastructure development projects: - BioMovLNG: deployment of LNG stations and construction of a biomethane production unit and the necessary storage units; - Bestway: deployment of NGV stations along the Atlantic corridor; - Connect2LNG: deployment of LNG stations; - LNGMotion: deployment of LNG stations. French on-road electric recharging infrastructure projects: - Corri-Door: project developed by a consortium of operators led by the EDF group aiming to equip French motorways with rapid recharging terminals; - Unit-e: deployment of rapid recharging points. Project for the development of hydrogen as a road fuel: - EAS-HyMob: development of hydrogen fuel in Normandy. The most recent projects are detailed below.

Title of the measure	***'BioMovLNG' project under the 2014 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The BioMovLNG project, developed by the company Proviridis in partnership with Lyonnaise des Eaux, plans to deploy, by September 2017, six LNG stations in France specifically for heavy-duty vehicles. The proportion of bio-LNG supplied to these stations must be significant. This project also includes plans to construct a biomethane production unit and the necessary storage units.
Main objectives	Development of LNG as a fuel through an LNG corridor in the French territory
Type of infrastructure involved	LNG production and refuelling infrastructure
Means of transport	Road transport
Party responsible	Proviridis, Lyonnaise des Eaux
Implementation	This €11 million project, which is 20% financed by CEF Transport funds, was launched in January 2015 and will end in 2017.

Title of the measure	***European 'EAS-HyMob' project under the 2015 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The EAS-HyMob project is developed by private entities (the company SymbioFCell and the Serfim group) together with the Normandy region (departments of Calvados, Manche and Orne). It will analyse the cost-effectiveness and the strategy of deploying hydrogen distribution infrastructure to meet the needs of an initial deployment of fuel cell vehicles, mainly in captive fleets. For this purpose, the project will conduct studies on the design of innovative and client-oriented offers and new business models integrating techno-economic fine-tuning and the environmental and social impact. To test these various aspects and components in real-life conditions, including hydrogen logistics and refuelling, it will deploy a pilot network of around 12 stations along the main road axes in the Normandy region. This network and the operational data collected via the captive fleets will provide the information needed for the studies.
Main objectives	Study, optimise and test the conditions for hydrogen to be a competitive alternative solution
Type of infrastructure involved	Hydrogen refuelling infrastructure
Means of transport	Road transport
Party responsible	SymbioFCell, Serfim and the Normandy Region
Implementation	This €8.1 million project is 50% financed by CEF Transport funds. It was launched in January 2016 and will end in December 2018.

Title of the measure	***European 'GAINN4MOS' project under the 2014 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The project 'GAINN4MOS: Sustainable LNG Operations for Ports and Shipping - Innovative Pilot Actions' aims to support the use of marine LNG by vessels and ports on the Atlantic and Mediterranean seaboards. It involves six Member States (Spain, France, Croatia, Italy, Portugal and Slovenia) with a total of 20 institutional and private partners. The French projects concern the development of shore-side and maritime LNG refuelling stations in Nantes (Montoir) and Marseilles (Fos). They were developed by Elengy – the main LNG terminal operator in France – together with the port of Marseille and the Ministry of the Environment, Energy and Sea as stakeholder and beneficiary of a subsidy for conducting a study on the development of LNG and coordinating the French actions.
Main objectives	Development of marine LNG in European waters
Type of infrastructure involved	Marine LNG refuelling infrastructure
Means of transport	Maritime transport
Party responsible	French State, Europe, Spain, Croatia, Italy, Portugal and Slovenia
Implementation	This €41 million project, which is 50% financed by the EIM funds, was launched in January 2015 and will end in 2019.

Title of the measure	***European 'BESTWay' project under the 2014 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The BESTWay project is a French-Spanish project developed by the company Gas Natural Servicios S.D.G. The aim is to analyse the road network along the Atlantic Corridor (rail network connecting northern France and Germany with the south-west of the Iberian Peninsula) with a view to installing new NGV (liquefied and/or compressed gas) stations, initially mainly for heavy-duty vehicles. It is planned to deploy nine stations between Algeciras (Straits of Gibraltar) and Paris, to be equipped with remote management tools and eventually to be made accessible to the public.
Main objectives	Development of LNG along the Atlantic corridor
Type of infrastructure involved	LNG refuelling infrastructure
Means of transport	Road transport
Party responsible	Gas Natural Fenosa
Implementation	This €7.7 million project is 50% financed by CEF Transport funds. It was launched in September 2014 and will end in June 2019. One station (LNG & CNG) opened in France at the end of 2014 for the 11 LNG vehicles of the transport operator Mendy. Since June 2016, this station has been open to all transport operators who have previously concluded a contract with Gas Natural Fenosa.

Title of the measure	***European 'Connect2LNG' project under the 2014 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The Connect2LNG project is a French-German project developed by the company Unilever for an industrial consortium consisting of partners such as Iveco, DHL, Jacky Perrenot and Engie. It aims to conduct a comprehensive study into the potential of LNG as a safe and cleaner alternative fuel for international road haulage (medium and long haul). In parallel, a pilot network of five LNG service stations (three in France and two in Germany) will be developed along three Core Network Corridors. This network will fuel a fleet of 125 new LNG freight lorries, equipped with specific data recorders for monitoring indicators throughout the cross-border journey.

	These deliverables will provide the necessary data, supported by facts, on the relevance and cost of using heavy-duty vehicles for medium- and long-haul road transport.
Main objectives	Encourage the deployment of LNG refuelling infrastructure
Type of infrastructure involved	LNG refuelling infrastructure
Means of transport	Road transport
Party responsible	Unilever and its partners
Implementation	This €9 million project is 50% financed by CEF Transport funds. It was launched in October 2015 and will end in September 2018.

Title of the measure	***European 'Unit-e' project under the 2014 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The Unit-e project is centred on rapid electric recharging points. It is being developed by several European countries together with various industrial and non-industrial partners such as EDF, Renault, Nissan, BMW and the Institut des Sciences et des Technologies de Paris, to name just the French partners. The project aims not only to deploy recharging infrastructure in Belgium and Italy but also to establish an interoperable recharging station link between the United Kingdom and France, prepare an EU-wide interoperable platform and ensure consistent coordination with other initiatives in this area. There are two types of deliverable: - deployment of a pilot network of approximately 38 rapid recharging stations distributed between Belgium (23), Italy (5), France (5) and the United Kingdom (5). The action will lead to a continuous recharging station network between Dublin and Genoa along Core Network Corridors; - study analysing three issues identified as crucial for the establishment of an EU-wide non-proprietary open standard network, namely the coupling of regional infrastructures, enabling electric vehicles to travel long distances and assessing the maturity of the sector at EU level.
Main objectives	Demonstrate that an EU-wide network of interoperable and interconnected electric recharging stations can be viable and identify the necessary conditions for developing it.
Type of infrastructure involved	Recharging infrastructure for electric and plug-in hybrid electric vehicles
Means of transport	Road transport
Party responsible	France, Belgium, Italy, United Kingdom
Implementation	CEF Transport funds will contribute €1.7 million to this €3.5 million project. It was launched in July 2015 and will end in December 2017.

Title of the measure	***European 'S/F SamueLNG' project under the 2015 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The S/F SamueLNG project is a French-Spanish project developed by EIG Dragages Ports. The aim is to kick-start the development of marine LNG along the Atlantic corridor. To accomplish this, the very first dredger retrofitted with dual fuel will be developed and shore-side marine LNG refuelling solutions deployed. The expected results are: - an analysis of the operation of the pilot dredger; - a good understanding of the LNG supply chain; - the establishment of road tanker refuelling solutions; - the study of a floating LNG storage device. The ports of Rouen, Nantes Saint-Nazaire, Le Havre, Gijon and Vigo are involved in this project.

Main objectives	Promote marine LNG as a viable and more environmentally-friendly alternative fuel
Type of infrastructure involved	LNG refuelling infrastructure
Means of transport	Road transport
Party responsible	EIG Dragages Ports
Implementation	This €19.7 million project is 50% financed by CEF Transport funds. It was launched in February 2016 and will end in March 2019.

Title of the measure	***European 'LNG Motion' project under the 2015 EIM Transport call for proposals***
Nature of the measure	Subsidy
Description	The LNG Motion project has been developed by the company Axègaz SAS, in partnership with GCA and involving nine EU Member States. The aim is to trial LNG road fuel under real-life conditions along six pan-European corridors covering the countries in question. A network of 42 public supply stations will be constructed across Europe and around 200 LNG-powered vehicles, distributed throughout Europe, will be purchased in order to collect operational data under this project. This will allow various studies to be delivered once the project is completed: - study evaluating the commercial, operational, technical, regulatory and environmental aspects of the supply of LNG fuel to goods vehicles; - feasibility study on the use of bio-LNG; - study of a standardised payment system for LNG.
Main objectives	Enable the large-scale deployment of LNG fuel supply stations for goods vehicles along the TEN-T Core Network Corridors
Type of infrastructure involved	LNG refuelling infrastructure
Means of transport	Road transport
Party responsible	France, Belgium, Netherlands, Germany, Poland, Spain, Italy, Hungary and Romania
Implementation	CEF Transport funds will contribute €27.8 million to this project. It was launched in February 2016 and will end in December 2020. On 30 May 2016 the first public station in the network was opened at the site of the Lille-Lesquin regional transport centre.

6.7. Methodology adopted by France for preparing its National Policy Framework for Alternative Fuels

To meet the requirements of Directive 2014/94/EU on the deployment of alternative fuels infrastructure, and more specifically to ensure that the national policy framework was prepared in consultation with all the internal and external stakeholders, a project-based approach was adopted.

In addition to the inter-agency work needed to draw up such a document, a Monitoring Committee was set up as a dedicated body bringing together the external stakeholders. This committee, which met on several occasions, allowed consultation and exchange to take place with representatives of the various sectors involved in the issue of deploying recharging/refuelling infrastructure for alternative fuels. Bringing together all the stakeholder representatives in a single body meant that the same communication and exchange could take place with all of them, regardless of their area of activity. Local and regional authorities, manufacturers, energy providers, transport operators, consumer associations, businesses, environmental protection associations and other administrations were therefore invited to join.

For specific and/or more technical issues identified during the Monitoring Committee meetings, more in-depth exchanges were also conducted within restricted working groups. These then reported on their results to the Monitoring Committee.

6.8. List of stakeholders consulted

In addition to the various state agencies involved in drawing up this national policy framework, the following table lists the various stakeholders contacted to participate in the dedicated consultation body.

Plan Nouvelle France Industrielle	Association des ports intérieurs	Réseau Action Climat France - RAC
France Stratégie	Association Française du Gaz - AFG	France Nature Environnement - FNE
Groupe Electromobilité	Association Nationale pour le développement de la mobilité électrique - AVERE France	Groupement des Autorités Responsables des Transports - GART
ADEME	Association Française pour l'Hydrogène et les Piles à Combustible - AFHYPAC	Association des Régions de France - ARF
Voies Navigables de France - VNF	Air Liquide	Assemblée des Départements de France - ADF
Union des Entreprises Transport et Logistique de France - e-TLF	McPhy	Assemblée des Communautés de France - AdCF
Organisation des TPE et PME du transport routier - OTRE	Groupement pour l'Itinérance des Recharges Électriques de Véhicules - GIREVE	Association des Maires de France - AMF
Fédération Nationale des Transports Routiers - FNTR	Association Française du Gaz Naturel pour Véhicules - AFGNV	TOTAL
Armateurs de France	Union Française des Industries Pétrolières - UFIP	ENEDIS
Fédération Nationale des Transports de Voyageurs - FNTV	Union des Importateurs Indépendants Pétroliers - UIP	EDF
Union nationale des organisations syndicales des transporteurs routiers automobiles - Unostra	Union Française de l'Électricité - UFE	ENGIE
Union des ports de France	Institut Français du Pétrole Energies Nouvelles - IFPEN	GRDF
Union des Transports Public et ferroviaires - UTP	Fondation Nicolas Hulot - FNH	GRTgaz
Direct Énergie	Institut français des sciences et technologies des transports, de l'aménagement et des réseaux - IFFSTAR	Comité Français du Butane et du Propane - CFBP
Chambre Syndicale Internationale de l'Automobile et du Motocycle - CSIAM	Fédération générale des transports-équipement - FGDE-CFDT	Fédération nationale des collectivités concédantes et régies - FNCCR
Comité des Constructeurs Français d'Automobiles - CCFA	CFE-CGC	Syndicat National des Producteurs d'Alcool et Agricole - SNPAA

Esterifrance	Elengy	Chambre Nationale de la Batellerie Artisanale - CNBA
Comité des armateurs fluviaux - CAF		