GOBIERNO DE ESPAÑA

Inter-Ministry Group for the
Coordination of the National Policy Framework on
Alternative Fuels in Transport

NATIONAL POLICY FRAMEWORK ON ALTERNATIVE FUELS IN TRANSPORT

DEVELOPING THE MARKET AND ESTABLISHING SUPPLY INFRASTRUCTURE

IN COMPLIANCE WITH DIRECTIVE 2014/94/EU
OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
OF 22 OCTOBER 2014.

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Coordinated by the
Secretariat-General for Industry and SMEs
Chair of the Inter-Ministry Group

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I.1. DIRECTIVE 2014/94/EU

Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure required Member States to adopt a national policy framework developing the market for alternative fuels in the transport sector and deploying the supply infrastructure by 18 November 2016.[1]

This Directive defines alternative fuels as sources that serve, at least partly, as a substitute for fossil oil sources in the energy supply for road, maritime and air transport, including:

- natural gas, including biomethane,[2] in both gaseous (Compressed Natural Gas — CNG) and liquefied (Liquefied Natural Gas — LNG) state
- electricity
- liquid petroleum gas (LPG)
- hydrogen
- and biofuels as defined in Article 2(i) of Directive 2009/28/EC

Each alternative fuel naturally has its own market niche in terms of means of transport and type of journey, meaning that a range of different options are now available to meet our transport needs. This National Policy Framework aims to remain neutral, without favouring any specific technology. Strategies and measures are based on the assumption that the transport sector is continually changing and that, in time, the market will settle on the most rational use for each fuel. Technological progress is also expected for all of the different fuels.

This National Policy Framework on Alternative Fuels in Transport mainly consists of structural initiatives, aiming for long-term continuity. In the next sections we will conduct a detailed analysis of the present circumstances of the different alternative fuels in each mode of transport and the expected market development. We will also identify the areas in which action is most needed to support the use of alternative fuels in the transport sector and the initiatives that could help to achieve the aims in each area.

The objectives have been set following an analysis that took into account the expected degree of penetration of each alternative fuel and the maturity of the market for each means of transport, as well as gauging availability by energy and industry, the pollutant emissions associated with each technology and Spain's territorial and demographic characteristics.

Table I-1. Main uses of alternative fuels by means of transport

FUEL	MODE	ROAD-PASSENGER	ROAD-FREIGHT	AIR	RAIL	WATER

[1] Translator's note: The original in Spanish uses the term *energías alternativas* (literally 'alternative energies'), justifying this choice as follows: *Although the title of Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 refers to the deployment of alternative fuels infrastructure, we are using the term 'alternative energies' as it better reflects the scope of application* [here the term 'alternative fuels' is given here in bracket in English], *since both electricity and hydrogen are energy carriers and not fuels. The term 'fuel' is used for the combustible materials used in propulsion engines.* As this justification seems to equate the Spanish term 'energías alternativas with the English term 'alternative fuels', we have chosen to use the latter, in line with the terminology used in the Directive.

[2] Biogas (natural gas from a renewable source) with a methane content of over 90 % is known as biomethane.

	RANGE	SHORT	MEDIUM	LONG	SHORT	MEDIUM	LONG			INLAND	SHORT-SEA	MARITIME
LPG												
NATURAL GAS	LNG											
	CNG											
ELECTRICITY												
BIOFUELS (LIQUID)												
HYDROGEN												

Source: Communication COM (2013) 17 final

I.2. BACKGROUND

The European Union (EU) is a proponent of diversifying energy sources as a way of increasing competitiveness and ensuring energy security by reducing its Member States' dependency on imported energy. The EU is also working to boost the use of renewable energy sources: Directive 2009/28/EC on the promotion of the use of energy from renewable sources sets a target of at least 10 % of the total energy used in the transport sector being of renewable origin.

The EU's Energy and Climate Package for the 2013-2020 period aims to cut greenhouse gas emissions by 20 % compared to 1990 levels (10 % compared to 2005 levels for sectors not covered by the EU Emissions Trading System [non-ETS sectors] in Spain). In October 2014 the European Council increased this to a 40 % reduction by 2030 (30 % in non-ETS sectors, with the effort shared among the Member States).

This ambitious goal is in line with the Paris Summit commitment to preventing the planet's temperature from increasing by more than 2 degrees Celsius (agreement reached at the XXI Conference of the Parties [COP21] to the United Nations Framework Convention on Climate Change).

This commitment to cutting CO_2 emissions is supported by the introduction of strict rules for vehicle manufacturers: the average CO_2 emissions calculated for their total vehicle sales figure must remain below a maximum limit. The Regulations on reducing CO_2 emissions set very stringent targets for 2020 (95 g/km for passenger cars and 147 g/km for vans), requiring manufacturers to find ways of introducing new vehicles powered by alternative fuels onto the market.

The EU also has a legislative framework for improving air quality in Europe. For example, Directive 2008/50/EC aims to reduce emissions of pollutants that are harmful to health (acidifying substances, ozone precursors and particulates).

The Member States are taking major steps to encourage the use of alternative fuels in road, sea, air and rail transport. In the road transport sector, growing number of vehicles running on alternative fuels must be able to circulate throughout the whole of the EU. All the Member States must therefore make similar efforts to develop the alternative fuel market and ensure that the necessary supply infrastructure is in place. Directive 2014/94/EU sets out the route towards the development of a single market. Spain is joining in with the efforts of its fellow EU members by producing this policy document, which defines the current status of alternative fuels and expected market development, as well as pinpointing feasible measures to help us meet our international commitments.

Spain has other important reasons for firmly committing to developing a market for alternative fuels market the associated infrastructure. Final energy consumption in the Spanish transport sector totals 36 200 ktoe (kilotonnes of oil equivalent), accounting for 40 % of the national total, ahead of the industrial and residential sectors. We are almost solely dependent on oil products to fuel this energy consumption.

Within the transport sector itself, road transport accounts for 80 % of total consumption and is 98 % dependent on oil products, making it a major contributing factor (almost 70 %) to Spain's high dependency on imported energy and high imports of oil products (approximately €50 billion per year). This dependency directly affects the balance of trade: the energy sector has a negative balance of approximately €40 billion, meaning that price fluctuations and developments in international politics are a cause of uncertainty.

Encouraging the use of alternative fuels in transport — charging electric vehicles in off-peak overnight periods and favouring the use of electricity from renewable sources — could help to flatten the electricity demand curve.

There are also opportunities for the Spanish gas system. As the European country with the most regasification plants, coupled with an extensive transmission and distribution network, Spain is in an advantageous position as regards the availability of natural gas as well as in terms of know-how and technology. This can be built upon to develop the use of compressed and liquefied natural gas in road, sea and rail transport. The use of natural gas in transport would make it possible to cut local emissions considerably.

Turning to biofuels, Spain has 36 industrial production plants that would be able to handle an increase in biofuel consumption.

Liquefied petroleum gas (LPG) is being produced as part of our refineries' operations. Using LPG in transport would also help to cut local emissions in cities quite considerably. LPG is therefore considered a useful transition fuel for adapting to future circumstances.

Finally, hydrogen — produced from renewable sources of electricity and used in fuel cells — is emerging as one of the most interesting future prospects.

Alternative fuels also represent a great opportunity for Spain from an environmental perspective. There are some 25 million vehicles on Spain's roads, 73 % passenger vehicles and 17 % commercial vehicles. Every litre of petrol consumed emits 2.35 kg of CO_2 into the atmosphere, and — bearing in mind that diesel engines consume less fuel — every litre of diesel emits around 2.64 kg of CO_2. This means that the transport sector accounts for almost a quarter of all Spanish greenhouse gas emissions. While there is potential for technological improvements to be made to existing diesel and petrol engines that reduce their consumption and emissions, alternative fuels need to be introduced to the transport sector for the reasons given above.

Engine combustion also generates local pollutant emissions with harmful effects on both health and the environment. Due to their high concentration in urban areas, vehicles are the main source of urban pollution. Spain reports air quality data to the European Commission each year as required by Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. Particulate matter and NO2 limits are still being exceeded in major cities. The 2013-2016 National Air Quality and Atmospheric Protection Plan (the 'Air Plan') includes initiatives to cut pollutant emissions, with particular emphasis on urban emissions, which new-energy vehicles (NEVs) can help to cut down.

NEVs offer a solution to the problem of how to reduce local pollutant emissions, assisting local government authorities in their drive to improve air quality. They can also help to cut CO_2 emissions in the transport sector, a non-ETS sector where the issue is complex.

Last but not least, Spanish industry could also benefit significantly from the use of alternative fuels in transport, ensuring that we do not lose the income stream from our automotive industry and helping us to make a place for ourselves among the world's leaders in alternative fuel technology. Six of Spain's 17 automotive plants are currently manufacturing new-energy vehicles. A number of research projects into this technology have also been conducted, as a result of which new industry players have emerged, offering specific solutions for new engine technology or NEV-charging infrastructure. There are also industry initiatives focusing on two-wheeled electric vehicles.

Spain therefore has both know-how and experience in this field of technology and we have the potential capacity to respond to technological and industrial challenges. This should allow us to become a leader in this industry in the years to come. The Spanish automotive and industrial equipment industry needs to set itself up as a leader in a key alternative technology, increasing participation in the value chain of new vehicle components and production modules, as well as charging and smart transport infrastructure. At the same time, Spain needs to position itself as a key market for vehicle manufacturers seeking to meet their CO_2 emission targets by producing new models of cars and light commercial vehicles at Spanish plants.

Over 250 000 people are directly employed in industrial activities within the Spanish automotive sector (including equipment and component producers as well as vehicle manufacturers). In addition, we also have

associated activities such as dealers and repair garages. Spain is second in Europe in terms of car manufacturing, behind only Germany, and we are Europe's leading producer of commercial vehicles, ranked eighth in the world. However, the Spanish industry is not present throughout the manufacturing value chain for these vehicles. We need to position ourselves better in the components and equipment segments that offer higher added value (such as battery packs, fuel cells, electrolysers, specific technological solutions for engines and equipment for charging infrastructure), taking advantage of the manufacturers' own specialised research facilities and technical centres and of an electronics industry that is equipped to develop smart vehicles, transport and charging infrastructure, and communications to ensure network interoperability.

But this is not just a great opportunity for our automotive industry. Natural gas, in particular in liquefied form, represents a great opportunity for cutting emissions in shipping, a sector which is up against a major challenge in complying with increasingly stricter emissions limits. Spain has the necessary know-how and experience in this technology, as evidenced by the fact that several natural-gas-powered ships are being built at our shipyards.

Passenger and goods transport is an economic sector of strategic importance for industry, trade and personal mobility in Spain. In recent decades there has been unprecedented growth resulting from the globalisation of markets for goods and services along with income growth and changes in people's lifestyles, with more trips per person and more far-flung destinations. Transport is a dynamic driver of growth and diversification in economic activity.

For all of the above reasons, Spain is committed to encouraging the use of alternative fuels in transport from a technologically neutral approach. This neutrality should be understood to apply not only to the different alternative fuels but also to conventional fuels (petrol and diesel). Technological developments and their future market success are not entirely predictable. We should not, therefore, prematurely rule out one technology while treating another as a 'winner'. Different technologies can coexist while they are able to adapt to different requirements. If we were to put all our faith in the development of a single technology, potential progress in another technology could be hindered, significantly reducing prospective long-term progress. It is therefore necessary that any policy revolve around the principle of technological neutrality. It should be the market that ultimately pinpoints the best solution for each area of transport.

THE NEW ENERGY VEHICLE (NEV) PROMOTION STRATEGY

On 26 June 2015 the Spanish Cabinet passed a Decision formally acknowledging the New Energy Vehicle Promotion Strategy (the 'NEV Strategy') for the 2014-2020 period. The NEV Strategy forms part of the Agenda for Encouraging Progress in the Spanish Industrial Sector, an action plan containing a set of proposals to improve conditions across all areas of industrial activity in Spain and contribute to the growth of industry, improve competitiveness and increase its share of GDP.

The NEV Strategy extends the 2010-2014 New Energy Vehicle Comprehensive Promotion Strategy (launched by the government on 6 April 2010) to all alternative fuels.

The 2014-2020 NEV Strategy was developed by the Secretariat-General for Industry and SMEs within the Inter-Ministry Working Panel created for this purpose. Particular attention was given to the contributions of the Autonomous Communities, local authorities and main industry associations. The Strategy aims to set Spain up as a leading country in the application of alternative fuels to the road transport industry, providing a boost to the industrial sectors associated with the automotive sector, against the backdrop of the energy-related and environmental challenges we are facing today. To do so, the NEV Strategy analyses the particular characteristics of each of the technologies that present an alternative to conventional fuels (petrol and diesel). It proposes specific initiatives structured into 30 measures that cover three areas, interlinked by a stable regulatory framework that ensures continuity in all the initiatives taken, making it possible to provide the market, investors in infrastructure and the drivers of industrial production with guarantees. These three areas of action are:

1. Industrialisation — encouraging the creation of an industry for NEVs and the associated supply points, with the aim of placing Spain at the forefront of these technologies. This includes measures to establish a

manufacturing industry for vehicles, components and supply infrastructure, as well as measures aimed at boosting research, development and innovation (RDI).

2. Market — designing initiatives to drive demand so that the market can grow large enough to benefit from economies of scale and supply, making it possible to consolidate infrastructure and industrial production in Spain. This includes measures aimed to raise the profile of new fuels and technologies and to encourage the purchase of these vehicles.

3. Infrastructure — including measures to encourage the creation of an infrastructure network capable of meeting users' mobility needs and therefore allowing an alternative fuels market to develop.

I.3. DRAWING UP THIS NATIONAL POLICY FRAMEWORK

To ensure that this national policy framework had a cross-government perspective, drawing it up required coordinated action by the different ministries responsible for the areas it covers. The Autonomous Communities and local authorities were also taken into account, as were the economic sectors involved, giving particular consideration to the needs of SMEs. As it is also necessary to ensure the movement of people and goods throughout the European Union, we also worked with neighbouring countries.

A description of how this National Policy Framework was designed is provided below. The aim was to create synergies between institutions and ensure that they complement one another in coordinating and enhancing initiatives encouraging the use of alternative fuels in transport.

CENTRAL GOVERNMENT

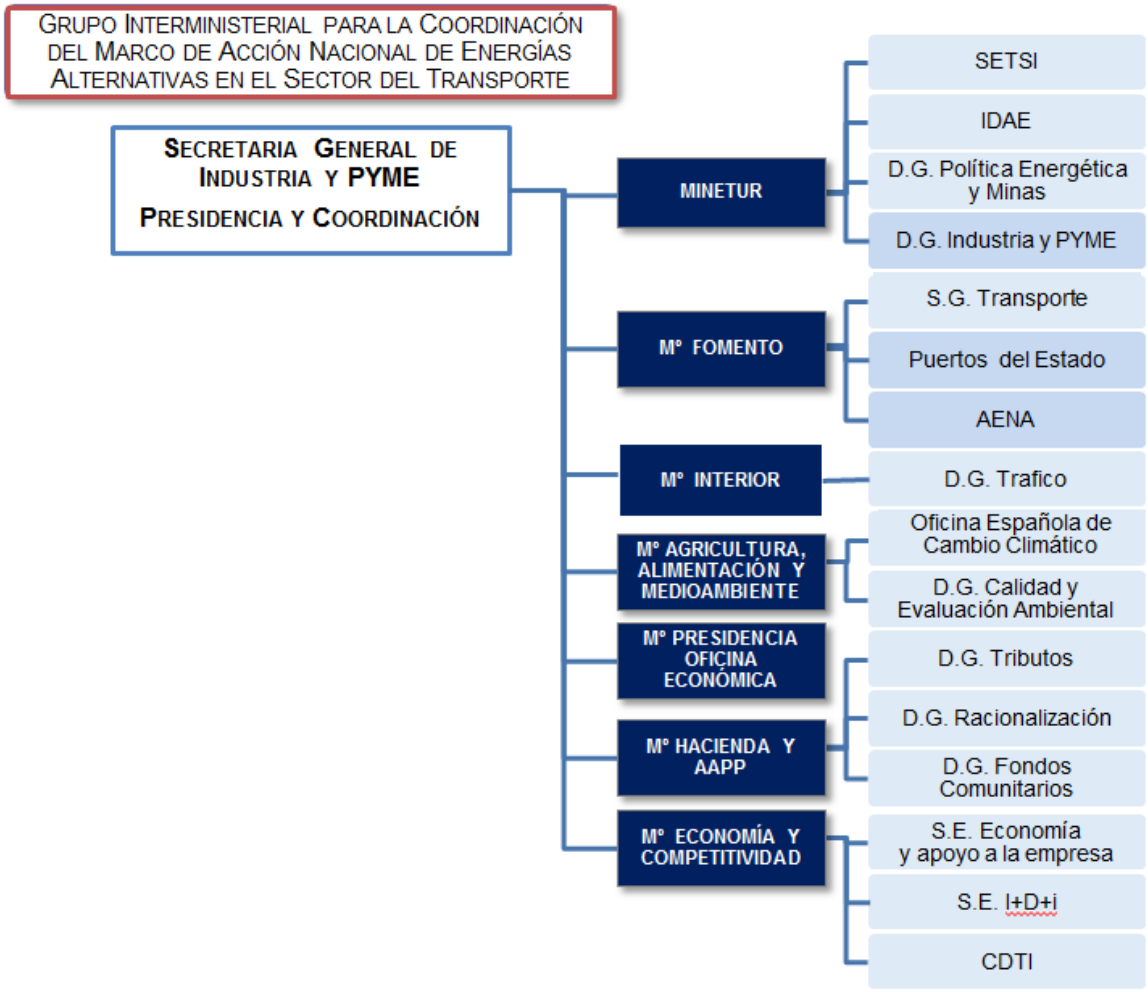
The Inter-ministerial Group Coordinating the National Policy Framework on Alternative Fuels in Transport was created by a decision of the Government Executive Committee for Economic Affairs dated 30 July 2015. This Inter-ministerial Group is covered by the rules on multi-party bodies set up for analysis, proposal, advice and monitoring duties as laid down in the Public Sector Act (Act 40/2015 of 1 October 2015). Its duties are as follows:

a) Aiding and coordinating the central government authorities in drawing up a National Policy Framework for the development of the alternative fuel market in the transport sector and the establishment of the necessary infrastructure.

b) Submitting the final version of the National Policy Framework, triennial reports and any revisions to the Government Executive Committee for Economic Affairs. Article 10(1) of the Directive requires all Member States to provide the Commission with a report on the implementation of their national policy frameworks by 18 November 2019 and every three years thereafter.

c) Monitoring and reviewing the targets, objectives and measures proposed in the National Policy Framework.

Figure I-1. Composition of the Inter-ministerial Group Coordinating the National Policy Framework on Alternative Fuels in Transport



Decision of the Government Executive Committee for Economic Affairs, 30 July 2015.

Smaller working panels involving the various participating departments — the Directorate-General for Industry and SMEs, the Directorate-General for Energy Policy and Mines, the Directorate-General for Road Transport, the Institute for Energy Diversification and Saving, the Ports Authority, the Spanish Climate Change Office and the Secretariat-General for Transport, among others — have been set up within this Inter-ministerial Group in order to study the technical issues arising from the introduction of alternative fuels in the transport sector.

AUTONOMOUS COMMUNITIES

The Market Unity Working Panel (under the Secretariat-General for Industry and SMEs) has helped to coordinate the measures from the National Policy Framework included in the Autonomous Communities' own action plans. Following consultations with the different regions, it has been possible to set objectives that reflect Spain's devolved government structure and establish initiatives that are coordinated between the different regions.

LOCAL AUTHORITIES

Dialogue with local authorities was conducted via the Spanish Federation of Municipalities and Provinces and the Smart Cities Network. In order to facilitate coordination with Spain's 8 114 municipalities, in October 2015 a specific software package[3] was launched for municipalities to use to report on their plans and the measures that they plan to carry out in the field of alternative fuels within the National Policy Framework.

PRIVATE STAKEHOLDERS

By getting private stakeholders involved in drawing up this document, we gained a comprehensive view of the current market, the use of alternative fuels in transport and, specifically, the corresponding infrastructure. This collaboration, which continued throughout the process of drawing up this National Policy Framework in the form of ad hoc meetings and the exchange of information and statistical data, culminated in the formal consultation of economic sectors and agencies[4] in June 2016. Private stakeholders will continue to be involved throughout the monitoring stage of this National Policy Framework.

COOPERATION WITH OTHER MEMBER STATES

In November 2015 the governments of Spain,[5] Portugal and France signed a joint declaration known as the 'Spanish-Portuguese-French Electric Vehicle Promotion Initiative'. This initiative identifies ten initiatives encouraging the use of electric vehicles, as well as setting up a working panel to improve coordination and carry out an infrastructure project involving the installation of public charging stations throughout the Iberian Peninsula.

Additionally, the Ministry of Industry, Energy and Tourism and the Ministry of Infrastructure and Transport have been involved in the establishment of private consortia of Spanish and Portuguese businesses for strategic projects to install electricity, natural gas and LPG supply infrastructure along the Trans-European Transport Corridors (Mediterranean and Atlantic) with the aim of linking the Iberian Peninsula with the rest of the European Union. Furthermore, the border regions of Spain and France, together with Andorra, have launched a joint project to develop a cross-border corridor of refuelling stations for hydrogen vehicles.

[3] http://www.minetur.gob.es/industria/es-ES/Servicios/estrategia-impulso-vehiculo-energias-alternativas/Paginas/cuestionario-municipios.aspx.

[4] A list of the business associations and other organisations involved in drawing up this National Policy Framework can be found in Annex A.

[5] Signed by the Minister for Agriculture, Food and Environment and the Secretary-General for Industry and SMEs.

II. ALTERNATIVE FUELS IN THE TRANSPORT SECTOR

II.1. NATURAL GAS

INTRODUCTION

Natural gas is a fossil fuel that is not obtained from oil but rather formed from a light-hydrocarbon-rich blend whose main component is methane (CH4). The volume of methane in the natural gas consumed in Spain varies between 75 % and 97 % depending on its origin.

Natural gas can be used in transport[6] in two different ways:

- Compressed natural gas (CNG): Natural gas in gaseous form, compressed at pressures of 200-220 bar to reduce its volume. This is the form most commonly used in light vehicles, heavy urban vehicles and short-haul ferries.
- Liquefied natural gas (LNG): Natural gas in liquid form, stored in cryogenic storage tanks at temperatures of around -162° C and 1-bar pressure. This form is chiefly used in heavy intercity vehicles and long-haul shipping.

In both CNG and LNG form, natural gas provides less range per unit of volume than conventional fuels. LNG is the option most commonly used for long distances, as it occupies between 2.5 and 3 times less space than CNG. However, CNG is the ideal option for short journeys and for means of transport with a shorter required range.

Table II-1. Approximate range of CNG and LNG engines running exclusively on gas

CATEGORY	COMPRESSED NATURAL GAS (CNG)	LIQUEFIED NATURAL GAS (LNG)
PASSENGER CAR	400[7] km	Not applicable
HEAVY-DUTY VEHICLE	500[8] km	1 500 km
SHIP	9-10 nautical miles	International routes

Source: authors' own from data provided by vehicle and ship manufacturers

For a ship with a traditional engine powered by heavy fuel oil[9] or marine gas oil[10], one of the major issues in converting to LNG is the need to double the size of the fuel tank in order to achieve the same range. Given the limited space available on ships, where load capacity is the main source of income, this presents an added complication on top of the necessary engine modifications. Nevertheless it is technically possible and economically viable depending on the distances and environmental conditions required. The same issue — restricted space — also rules out the use of CNG in cargo ships. Its use is currently limited, almost

[6] Specific operating protocols are required when natural gas is used for transport purposes, as compressed natural gas (CNG) CNG is stored at high pressure (200-220 bar) and liquefied natural gas (LNG) at very low temperatures (-162 ºC).
[7] Seat León 1.4 CNG
[8] IVECO Stralis CNG
[9] HFO
[10] MGO

exclusively, to short-haul ferries: the space needed for fuel storage is five to six times greater than for marine fuel, reducing the load capacity accordingly.

The adoption of LNG on Spain's railways is still at the testing stage, focusing primarily on the conversion of diesel locomotives. Some 39 % of Spanish railways are not electrified and continue to use diesel locomotives, because these are mostly passenger lines that have been declared mandatory public services and electrifying the lines would not be economically or technically viable. Therefore, there is potential to reduce the environmental impact by converting the existing fleet of diesel locomotives.

In 2013, with the support of the Ministry of Infrastructure and Transport, the State-owned enterprise RENFE signed a collaboration agreement with the companies Cepsa, Enagas and Gas Natural Fenosa to trial the use of LNG on Spain's railways. The aim behind this project is to analyse the technical, legal and economic feasibility of using LNG for railway traction in order to be able to gauge the possibility of extending this new form of traction to the commercial sector. Using LNG for rail transport would cut air pollution (NO_X, PM, CO), greenhouse gas emissions, noise levels and operating costs (fuel, maintenance, etc.), among other advantages. This project is to be piloted in Asturias in the second half of 2016.

Natural gas can also be used as a transition fuel in the switch to non-fossil fuels such as biogas and hydrogen. Landfill gas is currently the main source for large-scale production of biogas (natural gas from renewable sources) for transport in Spain.[11] We have one of the largest gas biogas upgrading plants in the European Union: located in Valdemingómez (Madrid), it supplies the network with sufficient biogas (following a purifying process) to fuel the city of Madrid's entire fleet of refuse collection vehicles. The projects carried out so far have concentrated on injecting biogas into the existing network of gas pipelines, requiring a certain amount of processing (sulphide removal and methane concentration).

Moreover, our gas system infrastructure could potentially be used to carry hydrogen. Among the pilot projects currently being carried out in this field is the HyGrid project,[12] which is looking at using hybrid membrane technology to separate hydrogen from natural gas within the distribution network.

NATURAL GAS PRODUCTION AND CONSUMPTION[13]

In 2015, after a five-year decline, Spanish natural gas consumption increased to 314 210 gigawatt hours (GWh). Domestic production totalled 699 GWh, accounting for 0.22 % of total consumption. To meet demand and ensure strategic reserves and exports, in 2015 Spain imported 364 172 GWh of natural gas; 58 % of this gas was piped in, and the remaining 42 % was supplied by tanker ships in LNG form.

The high degree of diversification that characterised the Spanish system in previous years continued in 2015, with natural gas supplied by eight different countries, led by Algeria (59.7 %), Nigeria (11.9 %), Qatar (9.3 %) and Norway (8.8 %). Ensuring diversity in the countries supplying natural gas to our national grid guarantees sufficient security of supply.

The national grid is used for two forms of consumption according to the gas is used: conventional consumption[14] (77.6 %) and gas demand for power generation[15] (19.4 %). The new use of natural gas for transport purposes is less subject to seasonal fluctuations than other sectors, which helps to make the system more sustainable.

[11] As well as its transport applications, biogas is used to fuel power generators located at the source of the gas.
[12] www.higrid-h2.eu
[13] Unless otherwise stated, the source for all the information in this section is the 2015 Annual Statistical Report of the Strategic Oil Product Stocks Corporation (CORES).
[14] Conventional consumption is the traditional use of gas, i.e. the supply of gas for residential consumption, for the services sector and for production processes in the industrial sector (including cogeneration).
[15] Within the power generation market a distinction is made between conventional and combined-cycle power plants.

Natural gas consumption in the transport sector is not currently significant. Road transport is estimated as having used 1 212 GWh of natural gas in 2015,[16] accounting for 0.4 % of total consumption, and only 1 357 m³ of natural gas was supplied for sea transport between July 2012 and August 2015.[17] However, encouraging the use of natural gas for transport purposes — LNG in heavy-duty road transport and shipping in particular — could lead to significant growth in gas consumption, contributing to the sustainability of the gas system.

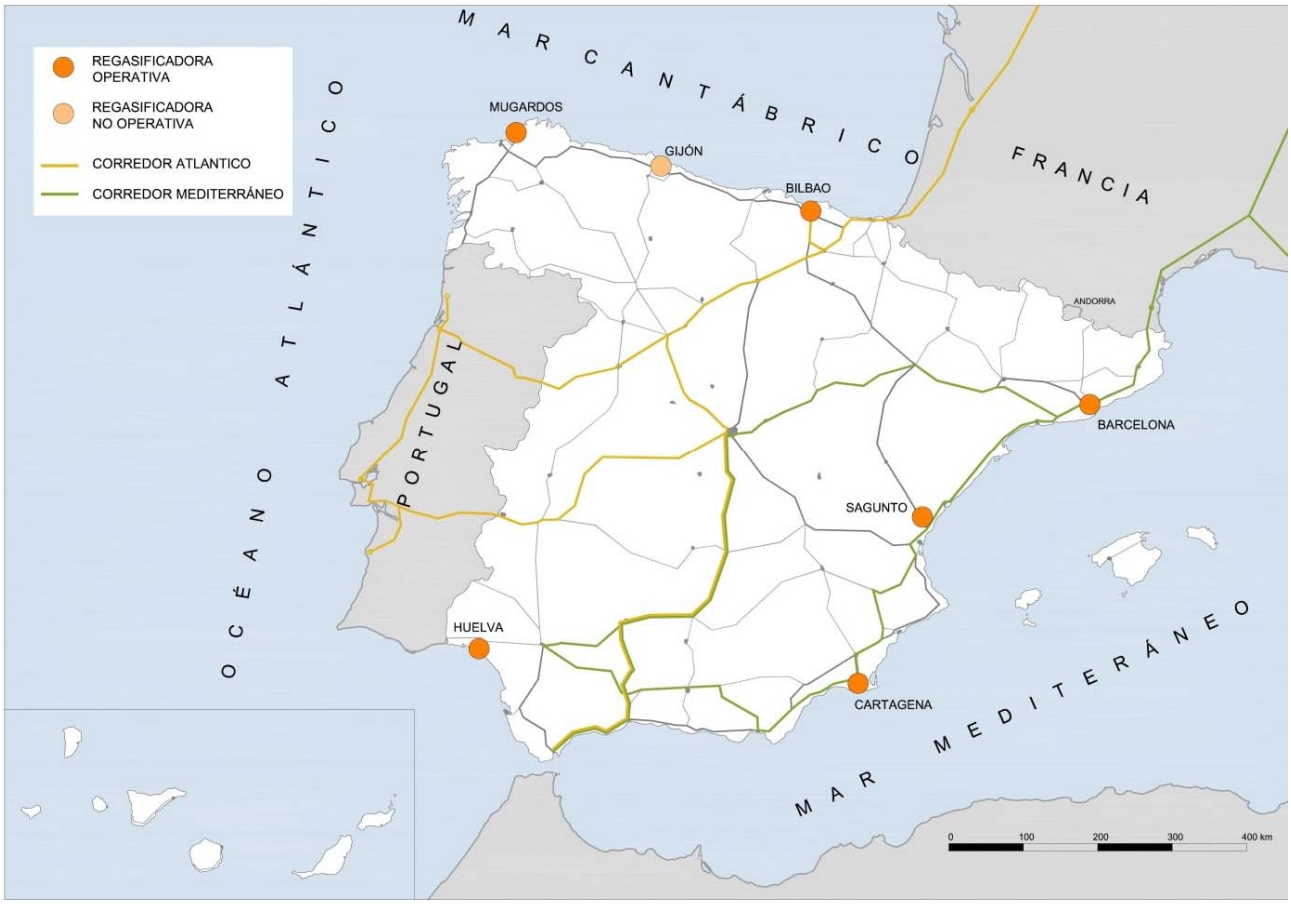
Natural gas is the fuel for which the International Energy Agency (IEA) expects the greatest increase in demand over the coming decades in absolute terms.[18] By 2035 natural gas's contribution to primary energy will be similar to that of oil, with annual worldwide growth of 2 %. While this growth will mainly be due to the use of gas for electricity generation purposes, the transport sector will experience the highest rate of annual growth at 2.9 %.

LIQUEFIED NATURAL GAS

Spain is a world leader in LNG know-how and use, with more than 40 years' experience. We also lead the European Union in LNG storage capacity, accounting for 40 % of total EU capacity in 2016. We have six regasification plants in operation, and another has been built in Gijón and will become operational when demand recovers.[19] In 2015 the utilisation rate of regasification plants was around 25 %.[20]

[16] Estimation of consumption by the Natural Gas for Mobility Association of Spain and Portugal (GASNAM).
[17] Source: Repsol, Cepsa, HAM and Molgas
[18] World Energy Outlook. International Energy Agency, December 2013.
[19] The construction of a new regasification plant in Granadilla (Tenerife) is also in the pipeline.
[20] Source: ENAGAS, Technical System Manager; 25 % is the percentage of nominal capacity represented by contracted capacity. This figure does not therefore reflect seasonal, weekly and daily fluctuations affecting regasification plants (rates are higher at peak hours in winter).

Figure II-1. Map of Spain's natural gas regasification plants, September 2016



Source: ENAGAS, Technical System Manager.

Spain currently has 932[21] active[22] LNG satellite plants located both in mainland Spain and on the islands. Of these plants, 132 are owned by distribution companies and the rest are in the hands of individual consumers. Satellite plants provide the system with enough flexibility to deal with potential increases in demand for natural gas without the need for additional investment in basic gas infrastructure. These satellite plants, which are supplied with LNG by tanker lorry, ensure natural gas supply where there is no pipeline. The LNG storage capacity at satellite plants varies between 5 and 1000 m³ depending on the size and number of tanks per plant. This capacity positions Spain in third place worldwide (behind only China and Turkey) in terms of the number of satellite plants.[23]

This storage infrastructure is complemented by a fleet of more than 250 tanker lorries[24] for transferring LNG between regasification and satellite plants, accounting for 90 % of total European capacity.[25] This fleet of vehicles serves not only domestic satellite plants but also satellite plants in Portugal, France, Switzerland, Italy and Macedonia. Worldwide, Spain has the third-largest fleet of LNG tanker lorries, behind only China (4000) and Japan (600). This tanker lorry fleet also makes it possible to service LNG-powered vessels at ports.

[21] Source: ENAGAS, Technical System Manager.
[22] Satellite plants whose supply destination is an associated regasification plant.
[23] Source: Issue 138 of *Gasactual* (January-March 2016) published by Sedigas.
[24] Source: Data provided by Enagas (March 2016).
[25] Source: Issue 138 of *Gasactual* (January-March 2016) published by Sedigas.

The small-scale network in place makes it possible to supply LNG to any point on the Spanish mainland.

Spain therefore considers its LNG distribution system, including loading facilities for LNG tanker lorries, to be sufficient for the requirements of Article 6(6) of Directive 2014/94/EU.

COMPRESSED NATURAL GAS

CNG can be obtained either from LNG or from the pipelines and distribution grids that supply gas to households for domestic use.[26] Additional compression equipment is required In the latter case as the gas can only be used to fill vehicle tanks once the pressure has been increased to 200-220 bar.

Spain has a well-established natural gas transmission and distribution network that is known for its robust nature. A considerably interconnected network of 83 830 km of pipelines is in place across mainland Spain and the islands, with 70 120 km serving the distribution network and 13 710 km serving the transmission network. Natural gas is available throughout most of Spain, specifically in 1 688 municipalities representing 79 % of the total population.[27] Therefore, expanding the use of natural gas to the transport sector could bring more efficient use of the existing transmission and distribution network, minimising the costs incurred by gas system users.

II.2. ELECTRICITY

INTRODUCTION

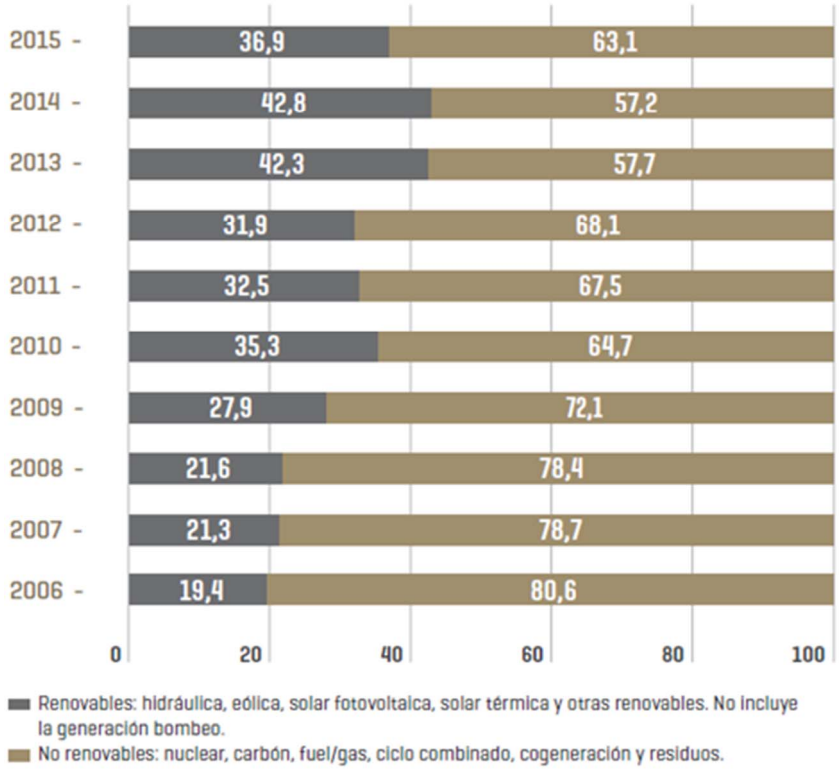
Electric motors are in widespread and varied use. The challenge lies in finding a way of using non-stationary electric motors powered by energy sources that are not carried on board or sources other than combustion engines. This National Policy Framework therefore only includes systems powered by the electricity grid that can offer a partial or full alternative to combustion engines (facilities to supply electricity for road transport vehicles, stationary aircraft and berthed ships).[28]

ELECTRICITY GENERATION AND CONSUMPTION[29]

Spain has surplus power generation capacity, with an expected margin of more than 10 % up to 2020. We are also one of Europe's leaders in terms of creating capacity to generate electricity from renewable sources, which resulted in a 44 % reduction in CO_2 emissions in the electricity sector between 2005 and 2015.

[26] Gas for domestic use is distributed through the distribution network at very low pressures. To use this gas in vehicles, a special facility is needed to compress the gas and increase the pressure up to 200-220 bars.
[27] Secretariat-General for Hydrocarbons, Ministry of Industry, Energy and Tourism.
[28] The National Action Framework includes only battery electric vehicles (BEVs), extended-range electric vehicles (EREVs) and plug-in hybrid electric vehicles (PHEVs). Non-plug-in hybrids (HEVs) are therefore excluded.
[29] Unless otherwise stated, all the data in this section are from Red Eléctrica de España (REE), the Technical System Manager of the Spanish electricity grid.

Graph II-1. Renewable and non-renewable power generation on the Spanish mainland (2006-2015)

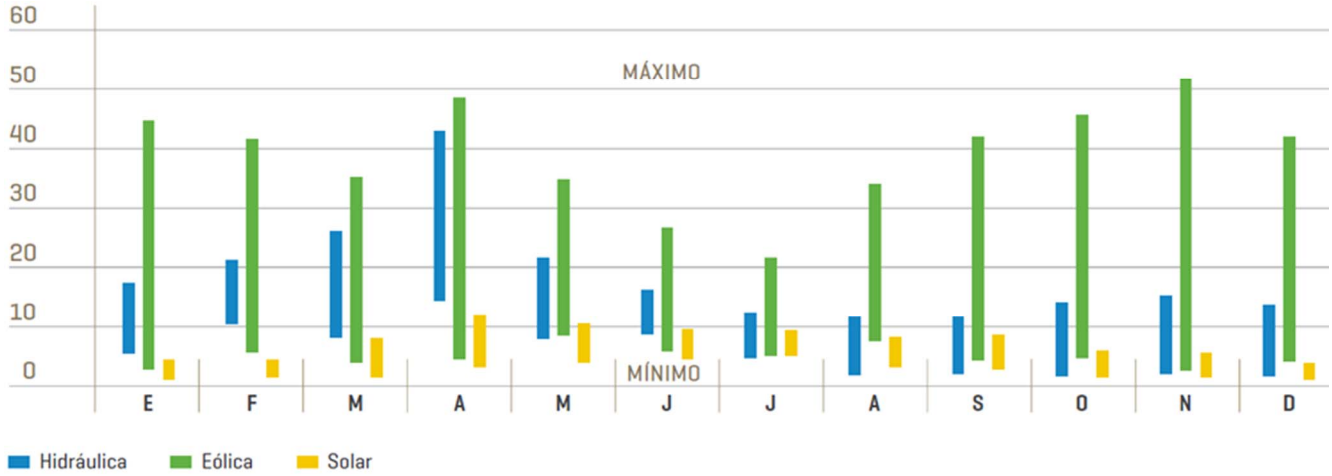


Source: Red Eléctrica de España (REE); in percent (%).

Energy from renewable sources[30] accounted for 36.9 % of total power generated in mainland Spain in 2015 and 42.8 % in 2014. This decrease is due to fluctuations in hydropower and windpower output due to weather conditions. Despite this decline, it should be noted that windpower played a leading role, accounting for 51.4 % of the power generated from renewable sources on mainland Spain. It is our third most used energy source, accounting for 19 % of total mainland generation in 2015. Moreover, all-time highs were reached in instant, hourly and daily mainland windpower generation in 2015. The following graph shows maximum and minimum percentage coverage by the mainland system by hydropower, windpower and solar power.

[30] Includes hydropower (excluding pumped-storage hydropower), windpower, photovoltaic solar power, thermal solar power and renewable thermal energy.

Graph II-2. Maximum and minimum coverage in the mainland system by hydropower, windpower and solar power in 2015.



Source: Red Eléctrica de España (REE); in percent (%).

According to data from Red Electrica de España, demand for electricity in Spain totalled 262 931 GWh in 2015, up 1.9 % on the previous year, and the first annual increase in electricity use since 2010, when demand grew by 2.8 %. Electricity consumption will increase as electric vehicles become more widespread, which might allow us to make use of nighttime surpluses caused by increased windpower and which are not currently needed by the system. For example, electric vehicles could be charged at night, largely in private garages. Moreover, thanks to its speed of response, the use of combined-cycle technology would make it possible to meet expected peaks in demand (beginning and end of holiday periods) or indeed one-off surges.

Electricity supply to berthed ships and stationary aircraft between now and 2020 is expected to be negligible and without any particular impact on the Spanish electricity system.

II.3. LIQUEFIED PETROLEUM GAS

INTRODUCTION

Liquefied Petroleum Gas (LPG), commonly known as autogas, is a blend of propane and butane used in transport among other areas.[31] Some 60 % of the world's LPG is obtained during the extraction of natural gas and oil, with the remaining 40 % produced during the refining of crude oil.

Currently, its use in road transport is limited to light vehicles, primarily passenger cars and, to a lesser extent, commercial vehicles. Its application to heavy-duty vehicles is still under development.

In maritime transport, LPG is being trialled both for fishing vessels up to 12 metres long and for leisure vessels up to 24 metres long. According to data provided by the company Repsol, around 23 LPG-fuelled vessels, used for coastal fisheries, are currently in operation. A pilot project is underway at the Benalmádena Marina (Malaga, Andalusia), where an LPG supply point has been installed.

[31] Other uses of LPG: 1) Petrochemical industry (substitute for naphtha for cost reasons, synthetic fibres, acetone, thermoplastics, manufacture of resins, etc.), 2) Residential (cylinders/pipes for kitchens and heating), 3) Agriculture (pest control, disinfecting henhouses, generating hot air in greenhouses, etc.) and 4) Industrial (casting and welding, food, crematoria, etc.).

LPG PRODUCTION AND CONSUMPTION[32]

Some 1 876 194 tonnes of LPG were consumed in Spain 2015, up 12.8 % on the previous year. Imports totalled 780 000 tonnes, 21.3 % more than in 2014, and 395 000 tonnes were exported, 7.1 % less than in the previous year, resulting in a negative trade balance of 385 000 tonnes. Spain has also 23 LPG bottling and bulk supply plants,[33] four substations[34] and eight marine terminals.[35]

Among the various uses of LPG, the automotive sector consumed 43 000 tonnes, representing 2.3 % of total LPG consumption in Spain. While this percentage is still of little significance, it has doubled from 1 % in 2010.

Although Spain has to import LPG (imports always exceeded exports between 2011 and 2015, with the exception of 2013), the trend is shifting due to a reduction in the use of butane gas cylinders (this market fell by 43 % between 2003 and 2014) and the gradual replacement of piped LPG by natural gas. The reduction in LPG consumption in other areas is expected to open up an opportunity for the automotive sector, which could absorb the future surplus in domestic output. This would improve the trade balance and strengthen the domestic industry.

Table II-2. LPG consumption in Spain (2010-2015)

	TOTAL PER YEAR						CONTRIBUTION (%)	Percentage change 2014-2015
	2010	2011	2012	2013	2014	2015		
BOTTLED	1 100	997	959	928	859	864	46.1 %	0.6 %
BULK	733	636	617	575	510	516	27.5 %	1.3 %
AUTOMOTIVE (bottled and bulk)	19	21	26	31	35	43	2.3 %	21.9 %
OTHER	N/A	N/A	N/A	55	260	453	24.1 %	74.1 %
TOTAL	**1 852**	**1 654**	**1 601**	**1 588**	**1 664**	**1 876**	**100.0 %**	**12.8 %**

Source: 2015 Annual Statistical Report of the Strategic Oil Product Stocks Corporation (CORES); in thousand tonnes.

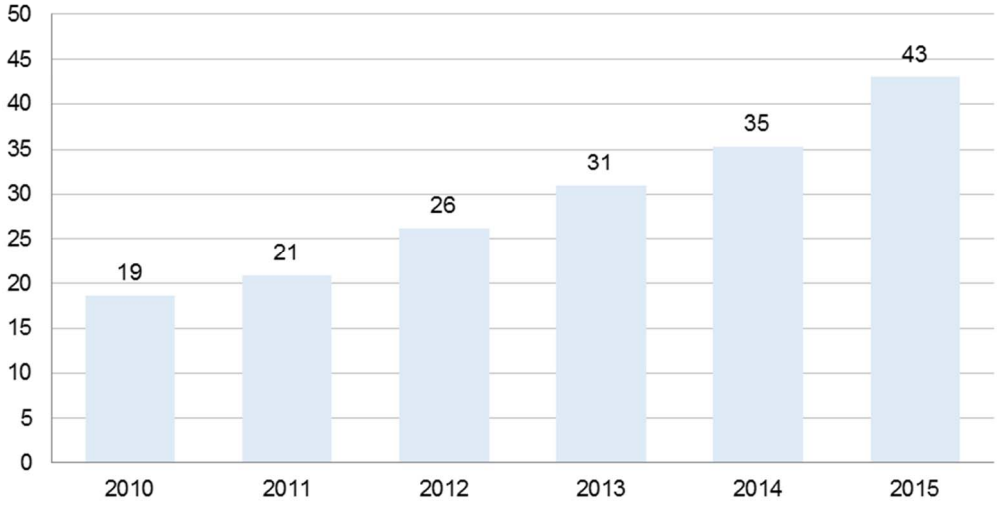
[32] Unless otherwise stated, the source for all the information in this section is the 2015 Annual Statistical Report of the Strategic Oil Product Stocks Corporation (CORES).

[33] Source: Spanish LPG Association (AOGLP). LPG bottling and bulk supply plants are located in: Bens (A Coruña), Gijón (Asturias), Gajano (Cantabria), Santurce (Basque Country), Zuera (Zaragoza), Montornes del Vallés (Barcelona), Tarragona, Castellón, Paterna (Valencia), Escombreras (Murcia), Dos Hermanas (Seville), Campo de Gibraltar (Cádiz), Palos de la Frontera (Huelva), Puertollano (Ciudad Real), Cebolla (Toledo), Mallorca, Pinto (Madrid), Vicálvaro (Madrid), Tenerife, Gran Canaria, Fuerteventura and Lanzarote.

[34] Navalmoral de la Mata, La Seu d'Urgell, Ibiza and Mahon (Source: AOGLP).

[35] Six owned by Repsol (four specifically for LPG in Gijón, Tarragona, Escombreras and Alcudia and two refining plants in Bens and Santurce) and two owned by Cepsa (Palos de la Frontera and Campo de Gibraltar) (Source: AOGLP).

Graph II-3. Automotive LPG use (2010-2015)



Source: CORES; in thousand tonnes.

Table II-3. Gross output (2011-2015) and foreign trade in LPG (2010-2015)

	2011	2012	2013	2014	2015	Percentage of refinery output[36]	Percentage change 2014-2015
OUTPUT	1 439	1 701	1 712	1 575	1 699	2.6	7.9

	TOTAL PER YEAR						CONTRIBUTION (%)	Percentage change 2014-2015
	2010	2011	2012	2013	2014	2015		
IMPORTS	801	569	355	326	643	780	66.4 %	21.3 %
EXPORTS	228	249	300	398	425	395	33.6 %	-7.1 %
BALANCE (EXPORTS-IMPORTS)	**-573**	**-320**	**-55**	**72**	**-218**	**-385**	**100.0 %**	**76.6 %**

Source: CORES 2015 Annual Statistical Report; in thousand tonnes.

II.4. HYDROGEN

INTRODUCTION

With varying approaches, hydrogen has been used experimentally in all means of transport, either as the main propulsion system or in auxiliary power units (APUs).

[36] Gross refinery output in 2015: LPG 2.6 %, petrols 14 %, kerosenes 14.6 %, diesels: 42.3 %; fuel oils 6.1 %; other products (refinery gas, naphtha, coke, etc.) 20.3 %. Total: 64 985 000 tonnes.

In the maritime sector, several pilot projects have been carried out to test the use of hydrogen in small leisure craft and in auxiliary systems for ships and submarines.[37] In the aviation sector, it has been tested as a fuel for unmanned aircraft (drones). In the railway sector, a project funded by the Connecting Europe Facility (CEF) and led by the State-owned enterprise RENFE is studying the rail infrastructure needed for the use of rolling stock powered by hydrogen fuel cells and the technical, economic and regulatory feasibility of this use. The planned trials will allow information to be gathered on issues such as the behaviour of vehicles, maintenance needs, consumption, performance, range, efficiency and points for improvement, in order to optimise the design and operation of future rail infrastructure.

In any case, road transport emerges as having the most potential for the use of hydrogen in the short-to-medium term.[38] Of the various different vehicle propulsion technologies, the one most likely to be competitive is the hydrogen-powered fuel cell for electric vehicles.

HYDROGEN PRODUCTION AND CONSUMPTION

Hydrogen is not an energy source but rather an energy carrier, and can therefore be obtained by various technological processes. The different hydrogen production technologies, ranked according to their current degree of use in Spain, are as follows:

- Steam reforming of hydrocarbons or alcohols: most of the hydrogen used in Spain is produced by reforming natural gas at oil refineries. This process has a high energy yield (70-85 %) but it uses natural gas, a fuel of largely fossil origin, and generates CO_2.
- Water electrolysis: this process involves the decomposition of a water molecule into two gases — oxygen (O_2) and hydrogen (H_2) — using an electric current.
- Gasification of coal or biomass.

However, other production processes, including thermolysis, photocatalysis and biochemical production, are currently in development.

Hydrogen consumption in Spain is generally for industrial use — in the chemicals industry in general and the petrochemicals industry in particular. Hydrogen is also used in the food industry, glassmaking and steel production, for example. In comparison, hydrogen consumption in the transport sector is negligible.

Hydrogen can be stored as compressed gas, in liquid form or within solid materials. The choice of storage technique depends on the intended application. There has been considerable development in tank technology for storing hydrogen in mainly gaseous form, allowing the gas to be stored at significantly reduced volumes. This is therefore the storage system that is becoming prominent in the transport sector.

The great potential of using hydrogen in transport is based on making renewable production viable through electrolysis technology using green electricity. This would contribute to a twofold objective: (1) to reduce local pollutant and greenhouse gas emissions throughout the production cycle and (2) to harness surplus green energy (wind and solar power) generated in the hours of lower electricity consumption by allowing this energy to be stored. A number of research projects have taken place in Spain into this area, including:

- Elygrid[39] (2011-2014) and Elyntegration[40] (2015-2018), using a traditional alkaline electrolysis system for electricity management systems in grids with high penetration by renewable energy.

[37] The State-owned enterprise Navantia is currently developing an on-board hydrogen production system for the S-80 submarine based on bioethanol reforming.
[38] Mainly used in cars and buses and, to some extent, forklifts and small public service vehicles (jet washers).

- Ely4off[41] (2016-2019), improving an electrolysis system for electricity management in grids with high penetration by renewable energy.

- Renovagas ('Renewable Natural Gas Generation'), a project based on the power-to-gas technology aimed at developing a plant producing synthetic natural gas from biogas by the methanation of hydrogen obtained from renewable sources. It is led by ENAGAS and involves the Centro Nacional del Hidrógeno (CNH 2), Abengoa Hidrógeno, Gas Natural Fenosa and FCC AQUALIA, the Tecnalia Research & Innovation Foundation and the Spanish Scientific Research Council (CSIC)'s Institute of Catalysis and Petrochemistry (ICP-CSIS).

- Sotavento, the development of a system for producing hydrogen from wind energy in Galicia.

- Ither, a project to establish infrastructure for producing hydrogen from renewable energy produced by a wind farm and a photovoltaic solar plant, for storage and use in fuel cells. In 2010 this project received an award from the International Energy Agency.

- HYUNDER[42] (2012-2014), a project to study the feasibility and business models associated with the use of mass underground hydrogen storage to balance the network when major renewable generation is added to electricity mix.

- Zerohytechpark,[43] a project to create sustainable science and technology parks with practically zero emissions by using hydrogen produced from renewable sources for use in sustainable mobility, and by applying energy efficiency measures to the park infrastructure.

Spain's central government authorities also have a unique flagship hydrogen facility: the National Centre for Experimentation in Hydrogen and Fuel Cell Technology (CNH2).

Finally, some Autonomous Communities are also involved in regional initiatives in this regard, including:

- A feasibility study into the use of hydrogen in transport conducted as part of the Sustainable Mobility Industries Promotion Programme, which forms part of Catalonia's 2014-2020 Industrial Strategy.

- The Canary Islands Technological Institute (ITC)'s Hydrohibrid project, which uses hydrogen as an energy carrier for the use of photovoltaic and wind energy in mobility.

- A project in Murcia to develop a way of combining the supply of electricity and hydrogen from photovoltaic origin, with smart charging technology, co-funded by the ERDF.

[39] Financed by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) and coordinated by the Foundation for the Development of New Hydrogen Technologies in Aragón with the participation of the Spanish company Ingeteam Power Technology SA; http://www.elygrid.com/

[40] Financed by the Fuel Cells and Hydrogen Joint Undertaking (FCH 2 JU) and coordinated by the Foundation for the Development of New Hydrogen Technologies in Aragón with the participation of Instrumentación y Componentes SA (INYCOM); http://elyntegration.eu/

[41] Financed by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) and coordinated by the Foundation for the Development of New Hydrogen Technologies in Aragón with the participation of nstrumentación y Componentes SA and Epic Power Converters SL

[42] Financed by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) and coordinated by the Foundation for the Development of New Hydrogen Technologies in Aragón

[43] Financed by the LIFE+ programme and coordinated by the Foundation for Development of New Hydrogen Technologies in Aragón with the participation of the Science and Technology Parks of Huesca ('Walqa'), Andalusia and Vizcaya.

II.5. BIOFUELS

INTRODUCTION[44]

Biofuels are fuels of renewable origin used in the transport sector.[45] They may be liquids (bioethanol, biodiesel or HVO) or gases (biomethane). They are produced from biomass, i.e. the biodegradable fraction of energy crops, products, waste and residues of biological origin from farming, forestry and related industries (including fisheries and crops), and from the biodegradable fraction of industrial and municipal waste. In Spain the following five types are currently produced on an industrial scale:

- Biodiesel: an ester produced by reacting vegetable oils or animal fats with an alcohol. Both in Spain and in the rest of the EU, palm,[46] rapeseed, soya and sunflower oil (not previously used for any other purpose) are most commonly used. Used cooking oils and residual animal fats also make a significant contribution. Biodiesel production from algae is currently being studied.

- • HVO (hydrotreated vegetable oil) biodiesel: a fuel produced by hydrogenation, i.e., the direct addition of hydrogen at low pressure and in the presence of a catalyst. It can be manufactured both at oil refineries and at specific plants, using the same raw materials used to produce biodiesel (palm, rapeseed, soya and sunflower oil, etc.).

- Bioethanol: ethyl alcohol produced from the fermentation of sugars found in organic matter. The main raw materials used in its production are sugary or starchy biomass such as sugar cane, beet or cereals. The development of advanced enzymes is also making it possible to produce bioethanol from lignocellulosic material present in farming, forestry, urban and industrial waste.

- BioETBE (ethyl tertiary butyl ether): an oxygenated additive formed from ethanol and isobutanol, which is added to petrol to increase its octane level.[47]

- Biogas/biomethane: biogas is a gas composed mainly of methane (50 to 65 %) formed by the decomposition of organic matter in the normal atmosphere (aerobic digestion) or in the absence of oxygen (anaerobic digestion). Biogas refined to a methane content above 90 % is known as biomethane.

In addition to the above biofuels, there are others with very promising prospects for future applications. Notable among these are the so-called BTL (biomass-to-liquid) biofuels, which are produced from any type of biomass using gasification and subsequent liquefaction via the Fischer-Tropsch process. An alternative method is isomerisation, i.e. rearranging the atoms in the molecules to resemble hydrocarbons.

The biofuels consumed in Spain meet the sustainability criteria laid down in Directive 2009/28/EC on the promotion of the use of energy from renewable sources, which requires a reduction of between 35 % and 60 % of greenhouse gas emissions from diesel and petrol through the use of biofuels. Moreover, the raw materials used for making biofuels must not be obtained from land with a high carbon stock or high biodiversity value, such as forests, wetlands or peatlands.

[44] Unless otherwise stated, the source of the data is the Spanish Markets and Competition Commission (CNMC).
Calculations are based on the following densities (from the Decision published by the State Secretariat for Energy on 27 December 2013): Biodiesel = 0.8919 tonnes/m³; HVO = 0.7727 tonnes/m³; Bioethanol = 0.7778 tonnes/m³.
Consumption in ktoe is calculated based on the energy contents provided in the Annex to Ministerial Order ITC/2877/2008, as amended by the Decision published by the State Secretariat for Energy on 27 December 2013.

[45] Biofuels have two basic uses: transport and heating. They are referred to as 'biofuels' when used in the transport sector, whereas the liquid fuel derived from biomass for energy purposes other than transport is known as 'bioliquids'.

[46] According to the CNMC, in 2015, some 65.4 % of the biodiesel consumed in Spain was obtained from palm oil.

[47] 37 % of its energy content is considered to be biofuel.

Biofuels are currently the main source of renewable energy used in transport. In Spain, biofuels accounted for 3.6 % of final energy consumption by the transport sector in 2014 (5.4 % in the EU as a whole).[48]

Biofuels are mainly used in road transport, where they either completely replace conventional fuels (petrol or diesel) or are blended with them in varying proportions. Pilot projects have also been run to study the use of biofuels in sea, rail and air transport.

The use of biofuels is set to become increasingly important in the decarbonisation of air transport, especially given the absence of other technically feasible short- and medium-term solutions for replacing fossil kerosene with fuel from alternative and/or renewable sources. The quality certification of biofuels for aviation is coordinated by ASTM International, which has developed the ASTM D 7566 standard establishing the quality parameters for aviation turbine fuels containing synthetic hydrocarbons. Since July 2011, this standard has allowed the blending of certain maximum percentages of biofuels into conventional kerosene. Following a review in April 2016, the specific percentages are as follows:

- Biomass-to-liquid (BTL) biofuels produced through the gasification of lignocellulosic biomass with subsequent liquefaction using the Fischer-Tropsch process: up to 50 %;
- Hydro-processed esters and fatty acids (HEFA) or hydrobiodiesel, produced by hydrotreating vegetable oils and animal fats: up to 50 %;
- Synthesised Iso-Paraffinic (SIP) also known as direct-sugar-to-hydrocarbon conversion (DSHC), consisting of isoparaffins synthesised from fermented and hydroprocessed sugars: up to 10 %;
- Alcohol-to-jet (ATJ) biofuels, consisting of synthetic paraffinic kerosene obtained from isobutanol: up to 30 %.

In July 2015 the Spanish National Aviation Safety Agency (AESA), the Ministry of Agriculture, Food and Environment, the Institute for Energy Diversification and Saving and Servicios y Estudios para la Navegación Aérea y Seguridad Aeronáutica (SENASA, a State-owned company) signed a collaboration agreement to work on a 'Spanish initiative for the production and consumption of biokerosene for aviation'. This agreement renews the commitments laid down in a Framework Agreement signed in 2009, which aims to achieve greater energy efficiency in the air transport sector, a more rational use of energy, and the use of renewable energy in facilities and buildings in the sector, all with a view to reducing emissions of greenhouse gases attributable to air transport. This applies both to aircraft in operation and to airports, facilities and infrastructure, as well as to ground support and the access routes to air transport infrastructure.

This agreement aims for the development of an integrated bio-paraffin production chain for use in aviation in Spain. It covers the entire life cycle: from production of sustainable raw materials to commercial use by aircraft. To this end, studies are underway to look into the effects of the production and use of biokerosene in various spheres, including the environmental impact. The possibility of analysing the entire life cycle of the product is also under consideration. In the economic sphere, analysis is being conducted on competitiveness, the associated job creation and economic development in the agricultural, industrial and aerospace sectors.

Finally we must include Spain's participation in the SENASA-led ITAKA project, which commenced in 2011: Repsol and Iberia are conducting pilot tests in Spain, and the first Spanish biofuel-powered flight took place between Madrid and Barcelona in 2011.

Some Spanish initiatives to promote the development of biofuels in transport are as follows:

- Spain's National Renewable Energy Centre (CENER) is a foundation established in 2002. The Ministry of Economy and Competitiveness, Energy, Environment and Technology Research Centre (CIEMAT), the

[48] Source: APPA-Biocarburantes

Ministry of Industry, Energy and Tourism and the Government of Navarre are all represented on its board, and a centre for second-generation biofuels is one of its main facilities. This centre is equipped to produce second-generation biofuels, conduct tests at a semi-industrial scale on raw materials that are not competitive with the food industry, produce biofuels using different processes (thermochemical, biochemical and/or enzymatic), and apply biorefinery techniques.

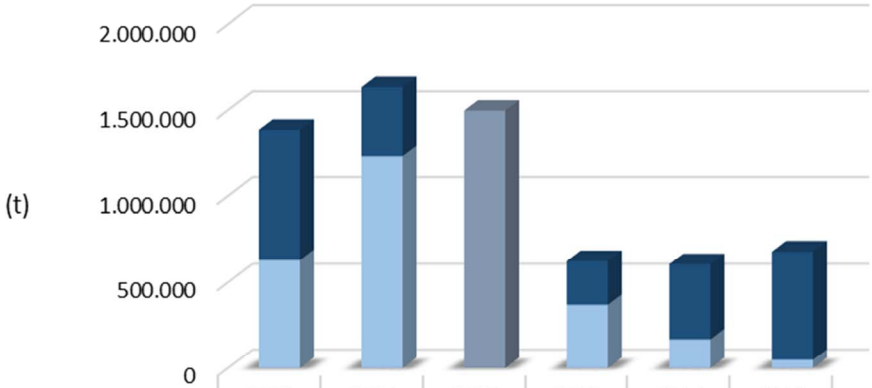
- In a pilot project carried out at the Technological Institute of the Canary Islands, the fossil fuels used to power the fleet of lorries belonging to local councils on the islands of Tenerife and El Hierro are replaced by waste vegetable oil following treatment at a plant.

PRODUCTION AND CONSUMPTION[49]

BIODIESEL

In 2015, 679 810 tonnes of biodiesel were sold.[50] Some 93 % of this biodiesel was manufactured in Spain, representing the largest market share for the domestic industry since 2006. The rest was imported from Germany (2.11 %), the UK (1.51 %), Italy (1.46 %) and the Netherlands (1.19 %). The biodiesel sold in Spain was produced mainly from palm oil (65 %), soyabean oil (15 %), rapeseed oil (2 %) and waste oil from deep-fat frying (12 %). The primary materials necessary to produce biodiesel originated mainly from Indonesia (50 %), Malaysia (13 %), Spain (9.4 %), Brazil (8 %), Paraguay (5 %) and the US (2.3 %).

Graph II-4. Annual biodiesel sales in Spain (2010-2015)

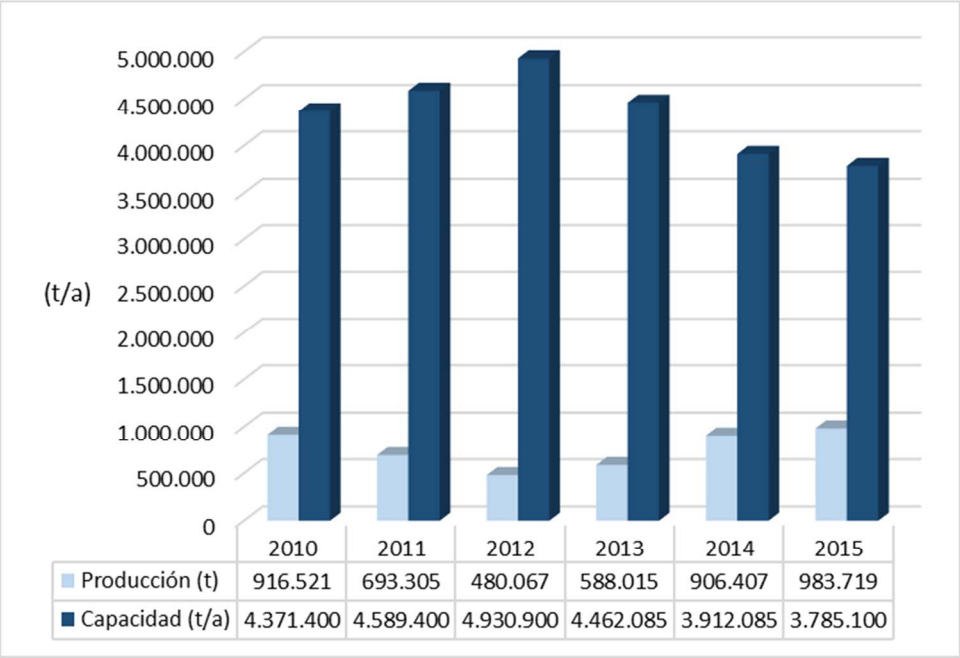


	2010	2011	2012	2013	2014	2015
TOTAL	1.386.154	1.632.900	1.495.932	624.594	605.971	679.810
Origen España (t)	756.286	399.571		256.482	438.111	631.629
Origen Otros (t)	629.868	1.233.329		368.112	167.860	48.182

Source: Spanish Markets and Competition Commission (CNMC). Information on the origin of 2012 sales is not available. In tonnes.

[49] The data in this section have been obtained from statistics and reports produced by the CNMC and by APPA-Biocarburantes (Renewable Energy Association (Biofuel Section)).
[50] Biodiesel density = 0.8919 tonnes/m³, as per the Decision published by the State Secretariat for Energy on 27 December 2013.

Graph II-5. Biodiesel production and installed production capacity in Spain (2010-2015)



	2010	2011	2012	2013	2014	2015
Producción (t)	916.521	693.305	480.067	588.015	906.407	983.719
Capacidad (t/a)	4.371.400	4.589.400	4.930.900	4.462.085	3.912.085	3.785.100

Source: CNMC (production) and APPA-Biocarburantes (capacity); In tonnes ('t') and tonnes per year ('t/a')

Since 2012 Spain has been steadily losing installed capacity and seeing its production plants closed down. In 2015 Spain had 32 plants with a nominal installed capacity of 3.8 million tonnes of biodiesel per year, and only 26 % of this installed capacity was being used.

HVO BIODIESEL

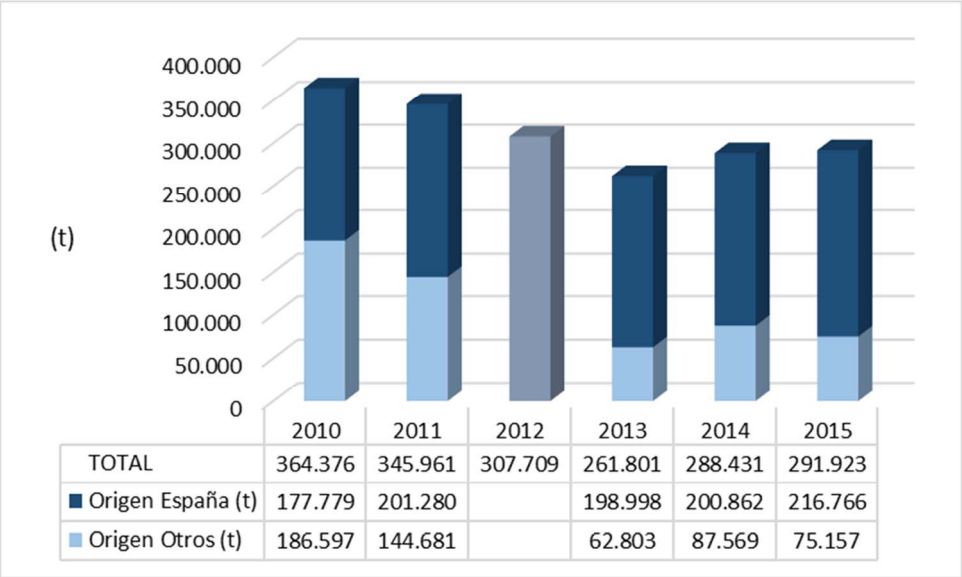
In 2015, 254 904 tonnes of HVO (hydrotreated vegetable oil) biodiesel were sold, down 7.23 % on the figure for the previous year.[51] Spain produced 79 % of the HVO biodiesel sold, with 12.3 % imported from Holland and 8.3 % from Singapore. The HVO biodiesel produced in Spain came from oil refineries.

BIOETHANOL

The 291 923 tonnes of bioethanol sold in Spain in 2015 were produced mainly from maize (74 %), sugar cane (19 %), sugar beet (3 %), wheat (2 %) and vinous alcohol (1 %).[52] Spain was the origin of 74 % of this bioethanol, representing a higher market share for the domestic industry than in 2014, as reflected in the graph below:

[51] HVO biodiesel density = 0.7727 tonnes/m³, as per the Decision published by the State Secretariat for Energy on 27 December 2013.
[52] Bioethanol density = 0.7778 tonnes/m³, as per the Decision published by the State Secretariat for Energy on 27 December 2013.

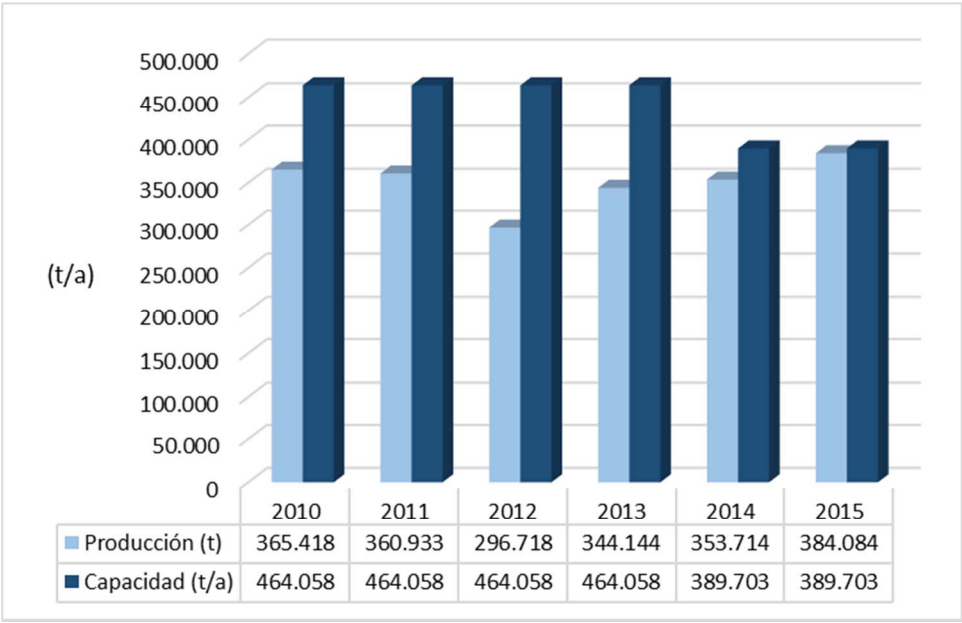
Graph II-6. Annual bioethanol sales in Spain (2010-2015)



	2010	2011	2012	2013	2014	2015
TOTAL	364.376	345.961	307.709	261.801	288.431	291.923
Origen España (t)	177.779	201.280		198.998	200.862	216.766
Origen Otros (t)	186.597	144.681		62.803	87.569	75.157

Source: Spanish Markets and Competition Commission (CNMC). Information on the origin of 2012 sales is not available. In tonnes.

Graph II-7. Bioethanol production and installed production capacity (2010-2015)



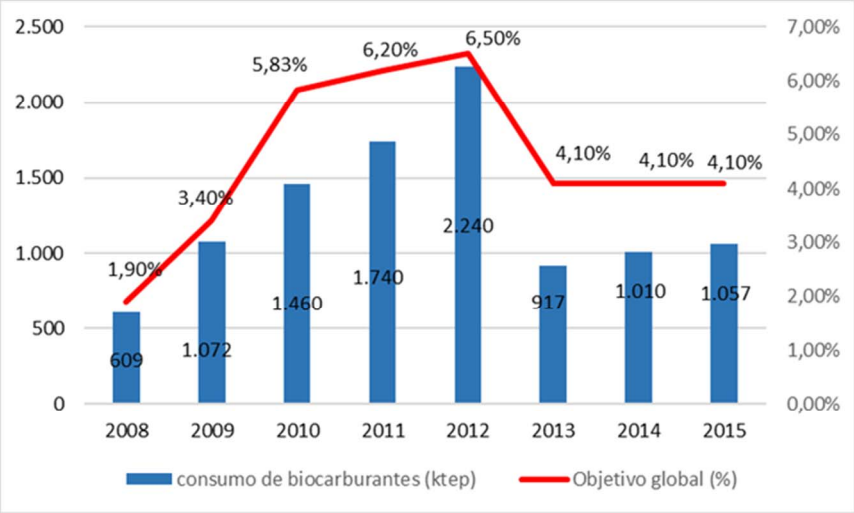
	2010	2011	2012	2013	2014	2015
Producción (t)	365.418	360.933	296.718	344.144	353.714	384.084
Capacidad (t/a)	464.058	464.058	464.058	464.058	389.703	389.703

Source: CNMC (production) and APPA-Biocarburantes (capacity); In tonnes (production) and tonnes per year (capacity).

These plants produced 384 084 tonnes of bioethanol, 9 % up on the previous year. Some 56 % of this production is for the domestic market and the rest is for export purposes. Our production plants recorded a rate of utilisation of installed capacity of 100 % in 2015.

The consumption of biofuels in Spain is largely shaped by minimum targets — mandatory under Spanish legislation since 2008 — for the sale or consumption of biofuels for transport purposes. An analysis of the historical trend shows that biofuel use has diminished by around 50 %, from 2 240 thousand tonnes of oil equivalent (ktoe) in 2012 to 1 057 ktoe in 2015. This is in line with the reduction in the minimum mandatory targets brought in by the Government in 2013. However, in December 2015 the Government passed a Royal Decree that raises the minimum overall mandatory target to 8.5 % of energy content in 2020.

Figure II-2. Use of biofuels and mandatory minimum targets for sale or consumption in 2008-2015



Source: CNMC, except for the 2008 figure which was provided by APPA-Biocarburantes based on Eurostat data. In kilotonnes of oil equivalent (ktoe).

In its report *Renewable energy in Europe 2016 - Recent growth and knock-on effects* (2016), the European Environment Agency (EEA) estimates that oil consumption was reduced by nearly 13 million tonnes of oil equivalent (toe) thanks to biofuel consumption in the EU in 2014. Moreover, 75 % of the biofuels consumed in the European Union (EU) are produced inside the EU, mainly using primary materials grown or generated in Europe.[53]

[53] Source: *Renewable energy progress*, European Commission (2015).

III. ROAD TRANSPORT

III.1. NATURAL GAS

III.1.1. INTRODUCTION

The following types of natural gas vehicles are currently available on the market:

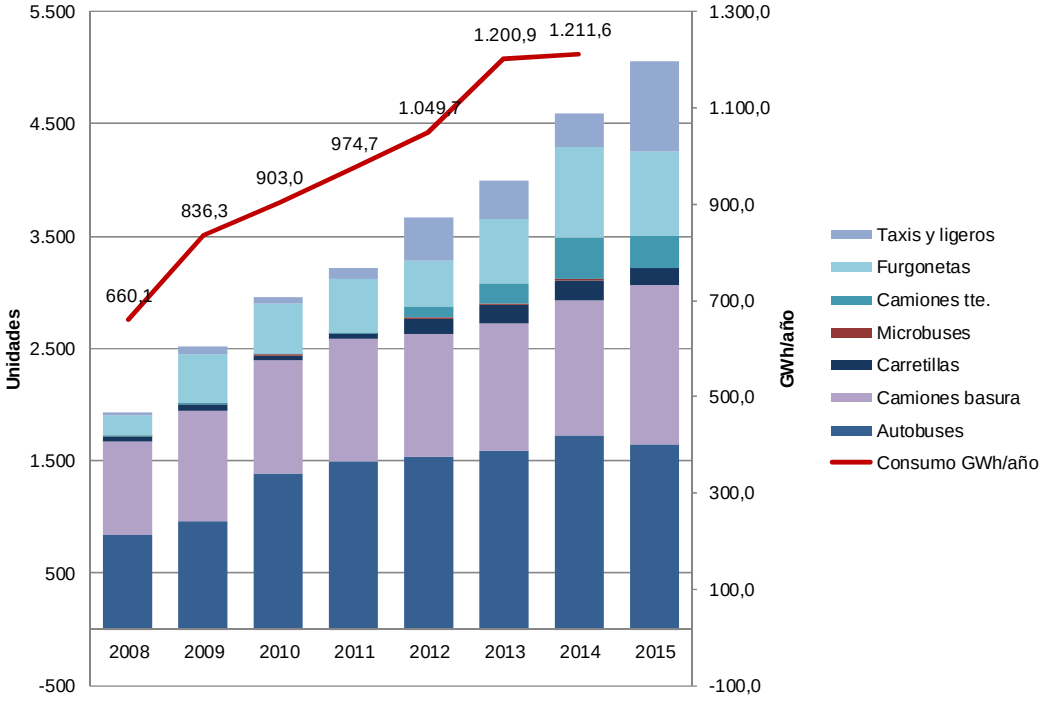
- Bi-fuel vehicles, with two separate tanks — one for conventional fuel and other for natural gas — and individual engine supply circuits. The vehicle uses one fuel or the other depending on which is available.
- Mono-fuel vehicles (also called 'dedicated' vehicles), which run on natural gas but have a small separate conventional fuel tank in case of emergency.
- Dual systems, which are designed for diesel engines: the engine cannot run solely on natural gas, and a certain proportion of diesel needs to be mixed in to allow fuel ignition through pressure. This technology is mainly used in heavy-duty vehicles.

FUEL CONSUMPTION BY NATURAL GAS VEHICLES

Road transport vehicles accounted for approximately 0.38 % (1 212 GWh) of total natural gas consumption in Spain in 2015.[54]

[54] Estimated natural gas consumption in road transport = 1 212 GWh in 2015 (Source: GASNAM)
Natural gas consumption in Spain = 314 210 GWh in 2015 (Source: CORES 2015 Annual Statistical Report)

Figure III-1. Estimated consumption of natural gas in road transport (2008-2015)



Source: GASNAM estimates

Table III-1. Estimated consumption of natural gas in road transport (2008-2015)

	2008	2009		2010		2011		2012		2013		2014		2015	
	Units	Units	Consumption in GWh/year	Units	Consumption in GWh/year	Units	Consumption in GWh/year	Units	Consumption in GWh/year	Units	Consumption in GWh/year	Units	Consumption in GWh/year	Units	Consumption in GWh/year
Buses	846	962.0	384.8	1 392	556.8	1 501	600.4	1 531	612.4	1 591	636.4	1 728	691.2	1 649	659.6
Refuse lorries	821	991.0	247.8	1 008	252.0	1 088	272.0	1 101	275.3	1 140	285.0	1 200	300.0	1 414	353.5
Forklifts	43	43.0	4.3	43	4.3	43	4.3	137	13.7	154	15.4	174	17.4	153	15.3
Minibuses	2	2.0	0.2	2	0.2	2	0.2	16	1.6	18	1.8	20	2.0	3	0.3
Goods lorries	10	10.0	4.0	10	4.0	10	4.0	91	36.4	182	72.8	364	145.6	281	112.4
Vans	180	445.0	15.6	445	15.6	475	16.6	410	14.4	574	20.1	804	28.2	753	26.4
Taxis and light vehicles	33	61.0	3.4	62	3.4	100	5.5	380	20.9	331	18.2	300	16.5	803	44.2
TOTAL	**1 935**	**2 514.0**	**660.1**	**2 962**	**836.3**	**3 219**	**903.0**	**3 666**	**974.7**	**3 990**	**1 049.7**	**4 590**	**1 200.9**	**5 056**	**1 211.6**

Source: GASNAM estimates

A CNG passenger car consumes approximately 3.5 kg per 100 km on average, whereas the average consumption of a long-distance lorry powered by LNG is between 28 and 30 kg per 100 km, depending on the route.

POLLUTANT EMISSIONS FROM NATURAL GAS VEHICLES[55]

According to the Ministry of Agriculture, Food and Environment's National Emissions List, natural gas produces average CO_2 emissions of 55-56 tonnes per terajoule, between 22 and 25 % lower than the emissions per unit of energy produced by conventional fuels (diesel/petrol). The sources consulted (JRC 2014,[56] municipal transport authorities of Madrid and Barcelona) place the average emissions of CO_2 per kilometre at around the same level as emissions from diesel, and lower than those from petrol. However, there are other sources which estimate average CO_2 emissions from natural gas to be 10 % lower than those of diesel (INSIA, 2009). In any case, the official limits[57] should be consulted for the approval of each specific model.

From a climate change mitigation perspective, using natural gas in the transport sector also opens up the way towards the use of biomethane, benefitting from the natural gas refuelling infrastructure and natural gas vehicles themselves. Biomethane emits significantly less greenhouse gases than conventional fuels.

As for local pollutants, natural gas contains no sulphur so there are no SO_X emissions. As for nitrogen oxides, based on the latest analysis methods used in the Ministry of Agriculture, Food and Environment's National Emissions List,[58] cars powered by natural gas emit an average of 0.056 g of NO_X per km, 8 % less than the average petrol car and 73 % less than the average diesel car (calculations based on a passenger car with a 1.4-2.0 L engine and Euro VI technology). Turning to particulate matter, passenger cars run on natural gas emit 0.0011 g of PM2.5 per kilometre, which is on average between 21 % and 93 % lower than conventional passenger cars running on petrol and diesel respectively.

The main characteristics of LNG and CNG vehicles are summarised below.

Table III-2. Main characteristics of LNG and CNG vehicles

MAIN CHARACTERISTICS OF LNG AND CNG VEHICLES	
PERFORMANCE	CNG in light- and heavy-duty vehicles for urban use (around 250 hp): similar performance to conventional fuels. LNG in long-haul lorries (over 26 tonnes): engine power is slightly below the average achieved by diesel engines (430 hp) although the latest developments are achieving 400 hp, and 430- and 460-hp models are planned for launch in 2017, which is why a large increase in the number of these vehicles on the roads is expected in the short-to-medium term.
DRIVING RANGE	CNG: passenger car = 400 km; lorry and suburban commuter bus = 500 km. Sufficient independent range for transport (light- and heavy-duty) in metropolitan areas. LNG: lorry = 1 500 km; sufficient range for international heavy-duty transport.

[55] All information in this section was provided by the Ministry of Agriculture, Food and Environment.
When analysing pollutant emissions from vehicles, we must distinguish between two different approaches. On the one hand, the inherent capacity of the fuel itself (natural gas) to emit pollutant gases or substances, and on the other, emissions caused by poor combustion of engines (the better the combustion the less CO_2 per unit of energy produced). This means that the same emissions do not occur when using the same fuel in different engines because of the differences in efficiency of those engines.

[56] Joint Research Centre-EUCAR-CONCAWE *Well-to-Wheels analysis of future automotive fuels and powertrains in the European context* (WELL-TO-TANK (WTT) Report) Version 4.a, 2014.
The following were involved in this study: the European Commission (through the JRC), the European refining sector (represented by CONCAWE, the European association of oil companies for environmental protection and health) and European vehicle manufacturers (through the European vehicle manufacturers' R&D association).
It concludes that natural gas can produce less CO_2 than petrol (0-30 % less) but more than conventional direct-injection diesel engines (0-15 % more).

[57] Commission Regulation (EU) No 459/2012 of 29 May 2012 amending Regulation (EC) No 715/2007 of the European Parliament and of the Council and Commission Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6)

[58] EMEP/EEA Guidebook 2013.

EMISSIONS	Particularly ideal for reducing local emissions (particulate matter, SO_X and NO_X). Natural gas emits less CO_2 than petrol but a similar level to diesel.
PRICE	Fuel price: natural gas has a lower end retail price than conventional fuels. Vehicle price: the purchase price of a natural gas-powered car is around 5 % higher than a petrol car and is comparable to the price of a diesel vehicle. The entry into force of the Euro VI standard has increased the purchase price and maintenance costs involved with diesel vehicles due to the filters and catalysts required for compliance with emission limits. There is therefore less difference in initial investment for a CNG/LNG vehicle compared to a Euro VI diesel vehicle.
REFUELLING	There is no technical limitation to supplying CNG anywhere in the country thanks to the pipeline network. LNG satellite plants mean that LNG can be supplied throughout Spanish territory. Supply points can be set up in locations where there is demand.
OPERATION	CNG and LNG refuelling operations at pumps are similar to those for conventional fuels. LNG requires some special safety measures for refuelling because of its low temperature. LNG cannot be stored in vehicle tanks for weeks as it progressively evaporates (boil-off), so it is more suitable for long-distance heavy-goods vehicles.

Source: authors' own

III.1.2. CURRENT SITUATION

NATURAL GAS VEHICLES ON THE ROADS AND NEW REGISTRATIONS

The charts above present GASNAM's estimation of the number of natural gas vehicles on the roads and figures by type of vehicle. According to the Directorate-General for Road Transport, 4 613 natural gas vehicles were on Spain's roads in June 2016, 95 % of them CNG and the remaining 5 % LNG.

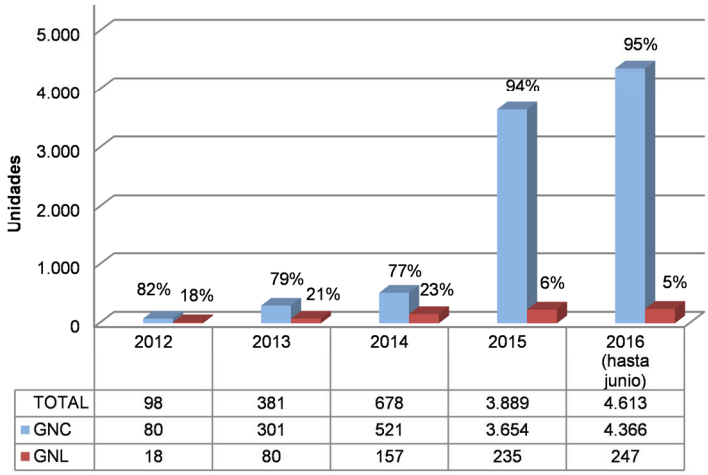
Table III-3. CNG and LNG vehicles on the roads (December 2012-June 2016)

CNG	2012	2013	2014	2015	2016 (up to June)
Lorries up to 3 500 kg	5	11	15	173	176
Lorries over 3 500 kg	10	56	63	1 324	1 374
Vans	10	88	157	369	437
Motorcycles	0	0	1	1	1
Passenger cars	4	14	107	308	792
Other	51	132	178	1 479	1 586
TOTAL	**80**	**301**	**521**	**3 654**	**4 366**

LNG	2012	2013	2014	2015	2016 (up to June)
Lorries over 3 500 kg	0	0	4	5	5
Other	18	80	153	230	242
TOTAL	**18**	**80**	**157**	**235**	**247**

Source: Directorate-General for Road Transport based on data existing at June 2016.

Graph III-1. CNG and LNG vehicles on the roads (December 2012-June 2016)



Source: Directorate-General for Road Transport based on data existing at June 2016.

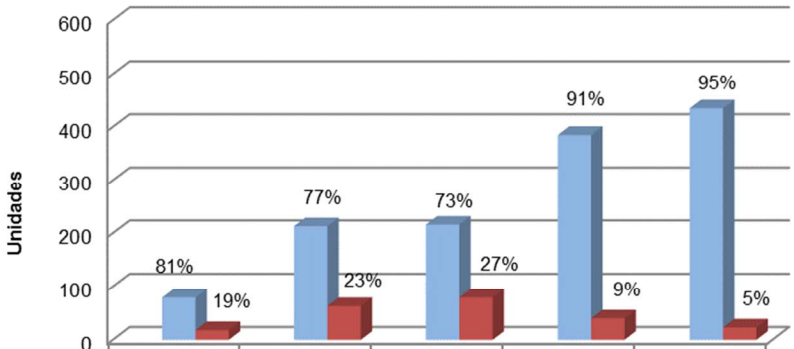
Table III-4. Registrations of new CNG and LNG vehicles (2012-June 2016)

CNG REGISTRATIONS	2012	2013	2014	2015	2016 (up to June)
Lorries up to 3 500 kg	5	6	5	39	3
Lorries over 3 500 kg	10	42	4	37	49
Vans	10	78	69	92	51
Motorcycles	0	0	1	0	0
Passenger cars	4	9	92	143	270
Other	50	78	45	74	62
TOTAL	**79**	**213**	**216**	**385**	**435**

LNG REGISTRATIONS	2012	2013	2014	2015	2016 (up to June)
Lorries over 3 500 kg	0	0	4	1	0
Other	18	63	75	39	23
TOTAL	**18**	**63**	**79**	**40**	**23**

Source: Directorate-General for Road Transport based on data existing at June 2016.

Graph III-2. Registrations of new CNG and LNG vehicles (2012-June 2016)

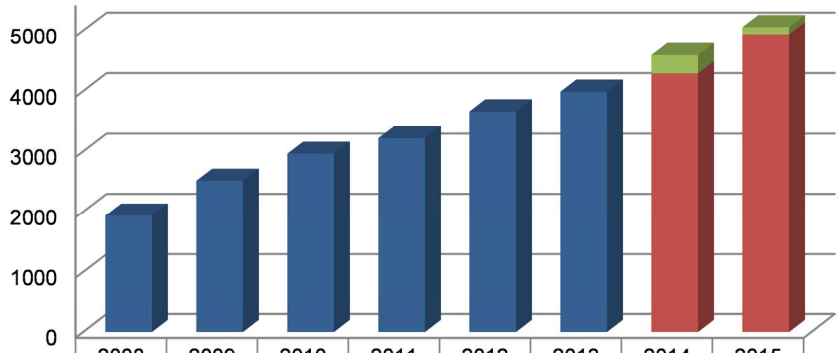


	2012	2013	2014	2015	2016 (hasta junio)
TOTAL	97	276	295	425	458
GNC	79	213	216	385	435
GNL	18	63	79	40	23

Source: Directorate-General for Road Transport based on data existing at June 2016.

It should be noted that the official data from the Directorate-General for Road Transport do not include vehicles adapted at repair garages other than the manufacturers' own garages. The Natural Gas for Mobility Association of Spain and Portugal (GASNAM) conducted several investigations, estimating the total number of vehicles at 5 056 (4 938 CNG and 118 LNG) in December 2015.

Graph III-3. Estimated numbers of CNG and LNG vehicles on the roads (December 2008-December 2015)



	2008	2009	2010	2011	2012	2013	2014	2015
Nº total vehículos GN	1.935	2.514	2.962	3.219	3.666	3.990	4.590	5.056
GNL							300	118
GNC							4.290	4.938

Source: GASNAM

Various different types of CNG vehicles are on the roads: cars, vans and heavy-duty urban vehicles (buses covering less than 300 km daily and lorries up to 26 tonnes). LNG, on the other hand, is currently used only in lorries transporting goods over long distances and with large loads (over 26 tonnes).

Fleets make up 90 % of all CNG vehicles. Public-service fleets are notable for the use of heavy-duty CNG vehicles, mainly buses and refuse collection lorries, which, according to GASNAM's estimates, account for 66 % of all CNG vehicles on Spain's roads. Around 20 Spanish cities have natural-gas-powered urban and intercity buses, most notably in Madrid[59] and its greater metropolitan area,[60] Barcelona, Seville,[61] Málaga, Valencia, Palma de Mallorca, Murcia, Toledo, Salamanca, Burgos and Guadalajara. Among the cities with CNG-powered refuse collection lorries are Madrid,[62] Barcelona, Vitoria, Oviedo, Gijón, Palma de Mallorca, A Coruña and Tarragona.

While there are no national aggregate figures for the light vehicles segment, the number of CNG taxis in the metropolitan areas of Madrid and Barcelona is growing considerably each year.

LNG long-haul lorries currently represent a very small percentage of the total number of lorries on Spain's roads; however, a gradual increase is expected in the coming months following the launch of a 400-hp LNG-powered tractor unit in June 2016. It has been announced that 460-hp LNG lorries will be launched onto the market in 2017-2018, bringing LNG performance into line with other heavy-duty transport vehicles used in Spain (430 hp). Several manufacturers are also developing LNG long-distance buses.

MANUFACTURE AND SALE OF NATURAL GAS VEHICLES IN SPAIN

Two models of natural gas vehicles are manufactured in Spain: the Seat Leon and Iveco Stralis. Seat has been making two CNG-powered versions of its Leon model (the Leon 1.4 and the Leon 1.4S) at its Martorell plant (Barcelona) since 2014, while Iveco has been manufacturing three versions of its Stralis lorry (CNG-only, LNG-only and mixed) in Madrid since 2011.

Table III-5. Natural gas vehicles manufactured in Spain as at September 2016

MANUFACTURER	PLANT	MODEL	VERSION	YEAR MANUFACTURING COMMENCED
SEAT	Martorell (Barcelona)	Passenger car: Leon	Leon 1.4	2014
			Leon ST 1.4	
IVECO	Madrid	Lorry over 3 500 kg: Stralis	Stralis LNG	2011
			Stralis CNG	
			Stralis CNG/LNG	

Source: Spanish Association of Car and Lorry Manufacturers (ANFAC)

More than 480 versions of nine different manufacturers' models are sold in Spain.[63] Qualified repair garages can also adapt petrol passenger cars registered from 2002 onwards to CNG, and some companies can convert diesel lorries to CNG through a dual system.

[59] Madrid's municipal transport authority (EMT Madrid) has 800 CNG buses in operation and plans to buy an additional 170 buses in late 2016, as a result of which 50 % of the total fleet of buses will be fuelled by CNG.
[60] The transport company holding the concession to operate services in the municipalities of Pinto, Valdemoro and Ciempozuelos (greater Madrid) has 25 CNG-fuelled buses, accounting for 10 % of its fleet.
[61] CNG powers 47 % of the total fleet of city buses in Seville (400 units). Source: *Gasactual*, April-June 2016 issue, Sedigas. *Gasactual*, April-June 2016 issue, Sedigas.
[62] CNG powers 100 % of the fleet of refuse collection lorries in the municipality of Madrid (650 vehicles in 2015).
[63] Source: Catalogue of vehicles taken from the database used by the Institute for Energy Diversification and Saving to manage purchase incentives under the MOVEA Plan.

EXISTING REFUELLING INFRASTRUCTURE

According to the Ministry of Industry, Energy and Tourism's 'Geoportal', 39 refuelling stations are open to the public in Spain: ten mixed (CNG/LNG), stations, five LNG-only stations and 24 CNG-only stations.[64] Another 69 private CNG refuelling stations are also in place for fleets.[65]

The Natural Gas for Mobility Association of Spain and Portugal (GASNAM) is aware of a further 20 refuelling stations under construction or awaiting opening to the public as at June 2016 (11 exclusively for CNG and nine mixed LNG/CNG).

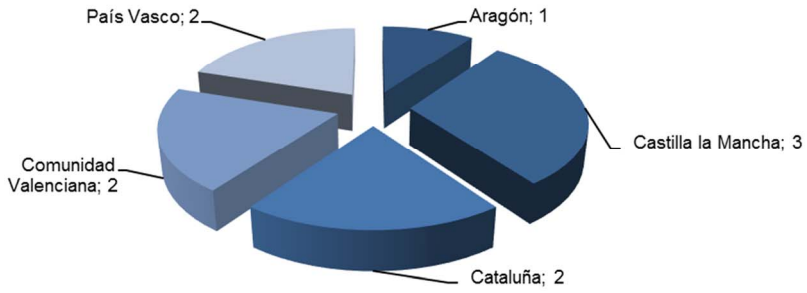
Table III-6. Mixed LNG/CNG refuelling stations accessible to the public by province as at June 2016

MIXED CNG/LNG REFUELLING STATIONS			
AUTONOMOUS COMMUNITY	**PROVINCE**	**TOTAL PROVINCE**	**TOTAL AUTONOMOUS COMMUNITY**
Aragon	Zaragoza	1	1
Castile-La Mancha	Guadalajara	2	3
	Cuenca	1	
Catalonia	Barcelona	1	2
	Tarragona	1	
Valencia	Valencia	1	2
	Alicante	1	
Basque Country	Alava	1	2
	Vizcaya	1	
TOTAL		**10**	**10**

Source: Geoportal of the Ministry of Industry, Energy and Tourism

[64] Details are provided in Annex B.
[65] Source of information on private CNG stations: Natural Gas for Mobility Association of Spain and Portugal (GASNAM). Details are provided in Annex B.

Graph III-4. Mixed LNG/CNG refuelling stations accessible to the public by Autonomous Community as at June 2016



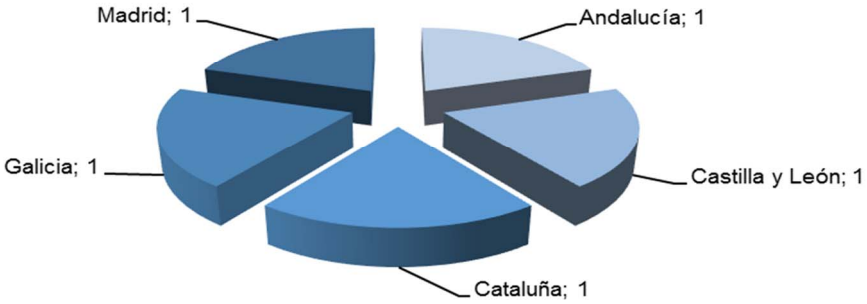
Source: Geoportal of the Ministry of Industry, Energy and Tourism

Table III-7. LNG-only refuelling stations accessible to the public by province as at June 2016

LNG REFUELLING STATIONS			
Autonomous Community	**Province**	**Total Province**	**Total Autonomous Community**
Andalusia	SEVILLE	1	1
Castile-Leon	BURGOS	1	1
Catalonia	BARCELONA	1	1
Galicia	A CORUÑA	1	1
Madrid	MADRID	1	1
TOTAL		**5**	**5**

Source: Geoportal of the Ministry of Industry, Energy and Tourism

Graph III-5. LNG-only refuelling stations accessible to the public by Autonomous Community as at June 2016



Source: Geoportal of the Ministry of Industry, Energy and Tourism

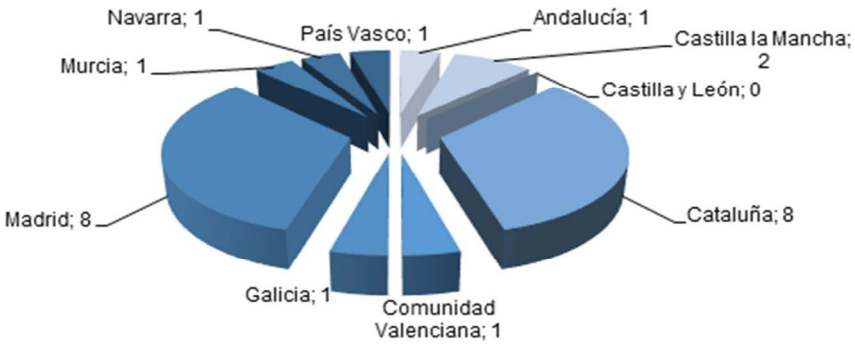
Table III-8. CNG-only refuelling stations accessible to the public by province as at June 2016

CNG REFUELLING STATIONS

Autonomous Community	Province	Total Province	Total Autonomous Community
Andalusia	Seville	1	1
Castile-La Mancha	Toledo	1	2
	Guadalajara	1	
Castile-Leon	Burgos	0	0
Catalonia	Barcelona	8	8
Valencia	Valencia	1	1
Galicia	Ourense	1	1
Madrid	Madrid	8	8
Murcia	Murcia	1	1
Navarre	Navarre	1	1
Basque Country	Guipuzcoa	1	1
TOTAL		**24**	**24**

Source: Geoportal of the Ministry of Industry, Energy and Tourism

Graph III-6. CNG-only refuelling stations accessible to the public by Autonomous Community as at June 2016



Source: Geoportal of the Ministry of Industry, Energy and Tourism

Table III-9. Natural gas refuelling stations under construction or awaiting opening to the public as at June 2016

AUTONOMOUS COMMUNITY	PROVINCE	MIXED LNG/CNG	LNG	CNG
Andalusia	Seville	1		
	Granada	1		
	Cadiz	1		
	Total Andalusia	3	0	0
Aragon	Zaragoza			2
	Total Aragon	0	0	2
Asturias	Asturias			1
	Total Asturias	0	0	1

Catalonia	Barcelona	2		1
	Girona	2		
	Total Catalonia	4	0	1
Madrid	Madrid	1		6
	Total Madrid	1	0	6
Basque Country	Alava			1
	Total Basque Country	0	0	1
Valencia	Valencia	1		
	Total Valencia	1	0	0
TOTAL		**9**	**0**	**11**

Source: GASNAM

The main stumbling block in the development of natural gas is the considerable investment involved in building refuelling stations: around €500 000 for CNG stations with two refuelling points and around €800 000 for mixed stations with one LNG and two CNG refuelling points.

In order to provide relevant, clear and consistent information about the location of refuelling points, as laid down in Article 7 (*User information*) of Directive 2014/94/EU, the Ministry of Industry, Energy and Tourism publishes real-time information on the location of active CNG and LNG refuelling points[66] and the prices they charge on its Geoportal.[67]

The Natural Gas for Mobility Association of Spain and Portugal (GASNAM) also lists the locations of refuelling CNG and LNG stations on its website.[68] Some of these refuelling stations require users to be registered as customers before they can refuel there, so there are differing degrees of public accessibility. Similarly, the Catalan Energy Institute (ICAEN) publishes a map of refuelling points for natural gas vehicles that are open to the public in Catalonia.[69]

III.1.3. MARKET FORECASTS AND OBJECTIVES

OPPORTUNITIES

The expected market trend is shaped by the opportunities presented by the use of natural gas in road transport:

Table III-10. Opportunities presented by the use of natural gas in road transport

OPPORTUNITIES PRESENTED BY THE USE OF NATURAL GAS IN ROAD TRANSPORT

[66] 'Active' means stations that are not temporarily or definitively closed, and which have submitted prices for the reference products in the last two weeks. The companies that sell natural gas are not legally obliged to provide this information to the Ministry of Industry, Energy and Tourism. They follow a recommendation in doing so.
[67] http://www.minetur.gob.es/energia/es-ES/Servicios/Paginas/consultasdecarburantes.aspx.
[68] http://gasnam.es/estaciones-gas-natural-vehicular.
[69] http://icaen.gencat.cat/es/pice_ambits_tematics/pice_l_energia_als_transports_/pice_la_diversificacio_energetica_del_sector_transport/#FW_bloc_2ebf63f2-26d2-11e4-964f-000c29cdf219_2.

OPPORTUNITIES PRESENTED BY THE USE OF NATURAL GAS IN ROAD TRANSPORT	
INDUSTRIAL OPPORTUNITY	Encouraging vehicle and equipment manufacturers to broaden the range on offer. Future development of LNG engines with over 400 hp. Positive effect on Spanish industry, a heavy user of natural gas (accounting for 75 % of domestic demand) due to the reduction in prices that could come about as a result of increased consumption in transport. Natural gas engines can run on a mixture of natural gas and 25 % hydrogen without diminishing performance, opening the door to the use of hydrogen in transport.
ENERGY OPPORTUNITY	Diversification of primary energy sources, aiding security of supply. Increased demand for the gas system without the need for more investment, possibly leading to greater utilisation of facilities, thus making them more sustainable. Mitigating seasonal fluctuations in gas system demand. Reduced dependency on oil.
ENVIRONMENTAL OPPORTUNITY	Using natural gas greatly reduces local emissions, and could possibly reduce CO_2 emissions compared to petrol vehicles. In the future natural gas vehicles will be able to run on biomethane from renewable sources.

Source: authors' own

ESTIMATED NUMBER OF VEHICLES

The European Natural & Bio Gas Vehicle Association (NGVA Europe) estimates that there will be eight million vehicles powered by natural gas on Europe's roads by 2020.[70] If the Spanish market develops in line with this forecast, Spain will have approximately 18 000 natural gas vehicles (800 LNG and 17 200 CNG). The reasons for believing that the Spanish market will grow in line with the European market are as follows:

- The strategic position of natural gas in Spain (seven regasification plants in place, the potential and extensive reach of the small-scale network, the fleet of 250 LNG tanker lorries, 932 satellite plants, etc.).[71]
- Natural gas's potential to reduce local emissions.
- The progressive increase in availability of CNG vehicles on the market and improvements in their technical characteristics.
- The increase in LNG lorry sales as a result of the launch of 400hp engines in June 2016. The LNG market is expected to develop considerably as of 2017 following the launch of 450hp lorries, with sufficient power to present a real alternative to diesel lorries on all types of routes.
- Promotional measures carried out since 2015 as part of Spain's New Energy Vehicle Promotion Strategy.
- Incentives put in place by local authorities to improve air quality in cities (traffic and parking policies) within their Mobility Plans.
- Support from this National Policy Framework.

[70] Estimates provided by GASNAM in November 2015.
[71] The strategic position of natural gas in Spain is described in Section II.1.

INFRASTRUCTURE ESTIMATES

When forecasting the development of refuelling infrastructure in line with development of the natural gas market, it should be noted that Spain's National Policy Framework must comply with the requirements of Article 6 of Directive 2014/94/EU, ensuring that there is a sufficient number of refuelling points to allow the circulation of:

- LNG heavy-duty motor vehicles throughout the core TEN-T network by 2025 (Article 6(4))
- CNG motor vehicles throughout the core TEN-T network by 2025 (Article 6(8))
- CNG motor vehicles in urban/suburban agglomerations and other densely populated areas by 2020 (Article 6(7))

Spain is in a good position in terms of LNG supply points, with 15 LNG stations currently in operation and open to the public (ten mixed LNG/CNG and five LNG-only stations)[72] and nine under construction,[73] all located along the core TEN-T network or at a minimal distance from it. Based on this situation, future trends in the development of refuelling infrastructure will be shaped by the market itself. The recommendation in the Directive to make LNG refuelling points available approximately every 400 km must also be taken into account. Applying this recommendation would mean that ten new LNG stations would be needed within the TEN-T core network today, although this would be subject to market developments, technology and new vehicle ranges in the years to come.

Furthermore, private businesses have expressed a real interest in investing in a further 31 fixed refuelling stations — 20 joint LNG-CNG stations and 11 CNG-only stations — between now and 2020. For such investments, and where needed to ensure cost-effectiveness, companies could apply for aid from specific financial instruments of the European Union.

It has become clear that private investors want the new refuelling infrastructure to mainly consist of mixed LNG/CNG facilities located in urban agglomerations along the TEN-T network. This decision is based on the fact that the stations will be used both by long-haul heavy-duty LNG vehicles circulating along the basic TEN-T network and CNG vehicles whose scope is limited to urban areas. This scenario is based on:

- Expected growth in the number of long-haul LNG lorries on the roads following the launch of a 400hp engine in June 2016. With 450hp expected to be available as of 2017, LNG lorries will be capable of replacing diesel models on all journey types.
- The expected development of long-distance LNG buses in the coming years. Using these buses will significantly increase demand in major urban agglomerations located throughout the core TEN-T network.
- A significant increase in the number of CNG vehicles in public service fleets (refuse lorries and buses) and professional fleets (taxis, goods vehicles, factory vehicles, etc.).

We can therefore confidently assert that, with our 15 existing stations, nine mixed stations currently under construction and the interest expressed by private investors in building 20 new mixed stations by 2020, Spain is well on the way to compliance with the requirements of Directive 2014/94/EU as regards the LNG infrastructure for heavy goods vehicles to be installed along the basic TEN-T network by 2025.

[72] Seville, Zaragoza, Cuenca, Guadalajara (2), Burgos, Barcelona (2), Tarragona, Madrid, Valencia, Alicante, A Coruña, Alava, Vizcaya (15 in total).
[73] Nine filling stations under construction in seven provinces: Cadiz, Granada, Seville, Barcelona (2), Girona (2), Madrid and Valencia.

As any new LNG supply points will always be equipped for mixed LNG/CNG supply, Spain will also be in a good position to ensure a CNG supply point approximately every 400 km along the basic TEN-T network, without the need for additional investment.[74] While it is true that the current range of some vehicles (i.e. passenger cars running exclusively on CNG) is only 400 km, the additional conventional fuel tank makes it possible to continue the journey beyond this range. In any case, technological developments that increase the range of CNG vehicles are also expected by 2020.

Finally, taking into account the existing mixed LNG/CNG stations and those planned for construction, the 24 existing CNG stations, the 11 CNG stations under construction, and the interest shown by investors in building another 11 CNG stations in the near future, we can say that Spain is on track to meet the requirement to ensure that, by 2020, urban agglomerations of more than 250 000 inhabitants have sufficient refuelling points for the CNG vehicle market.

III.2. ELECTRICITY

III.2.1. INTRODUCTION

The definition of an electric vehicle is a vehicle that is fully or partially powered by an electric motor running on chemical energy stored in one or more batteries that can be charged using an external power supply.[75] The National Policy Framework only covers vehicles that need a charging point to power their batteries when they are parked. Three types of electric vehicle are currently available on the Spanish market:

- Pure electric vehicles/battery electric vehicles (BEVs), which are solely powered by an electric motor fed by batteries that are recharged via a mains power outlet. Their range is limited by their battery capacity, and is currently between 120 and 200 km in cars.[76] Second-generation batteries that can achieve ranges of 300 km have recently begun to appear on the market.

- Extended-range electric vehicle (EREVs), plug-in electric vehicles that also feature a small heat engine that drives a generator to charge the batteries. Propulsion is exclusively electric, but the batteries are charged through the auxiliary combustion system. These vehicles offer a range of approximately 80 km in electric mode.

- Plug-in hybrid electric vehicles (PHEVs), which combine electric propulsion fuelled by energy from the electrical grid with conventional heat-driven propulsion. They can offer a greater range in electric-only mode — and therefore significantly lower emissions — than (non-plug-in) conventional hybrids, and are also equipped with regenerative braking systems. These vehicles offer a range of between 15 and 50 km in electric-only mode.

FUEL CONSUMPTION BY ELECTRIC VEHICLES[77]

On 16 October 16 2015, the Spanish Cabinet formally approved a paper entitled Energy Planning: 2015-2020 Development Plan for the Electricity Transmission Network. This electricity forecast takes into account the objectives set out in the New Energy Vehicle Promotion Strategy for the 2014-2020 period.

According to this planning paper, which uses conservative criteria, electricity consumption is expected to be around 1.5 TWh more than the annual electricity demand currently forecast for 2020 (between 273.1 TWh and 284.9 TWh for mainland Spain depending on the scenario taken into account). These estimates project an

[74] Only five of the existing LNG refuelling stations exclusively supply LNG and therefore cannot be used by CNG vehicles. However, two of them are at locations where there are also CNG points open to the public.
[75] All electric vehicles can be equipped with regenerative braking systems, which can charge the battery during deceleration and braking.
[76] There are models that can achieve a range of 600 km but their presence on the Spanish market is negligible.
[77] All data provided in this section are from the Subdirectorate-General of Energy Planning at the Ministry of Industry and from REE.

increase in demand of around 30 MW in off-peak nighttime hours and an increase in winter peak-time hours of around 300 MW (0 MW in summer peak-time hours) in 2020.

The rise of electric mobility will bring changes to electricity demand, with more variability and critical spikes. To monitor this new demand and manage it flexibly and intelligently in the future, Red Electrica de España (REE, the Spanish grid operator) is developing an Electric Vehicle Control Centre (CECOVEL), a global pioneer in the development of smart energy systems, aiming for an efficient and safe transition to the increased demand from electric vehicles.

Among the benefits of incorporating electric vehicles into the Spanish electricity system is making greater use of renewable energy. In an ideal situation, i.e. with optimal system utilisation, drivers would charge their vehicles at night, supported by smart charging management mechanisms. However, as drivers' habits vary, it is necessary to adapt the operation of the electricity system to their charging habits in real time, ensuring flexibility. To do this, REE has modelled a series of future scenarios based on different estimated degrees of penetration, from which the following can be concluded:

- The demand for energy from electric vehicles is not expected to be significant issue for the electricity system for at least the next 15 years. The energy to be supplied to electric vehicles in 2030 (a hypothetical 2 600 000 vehicles) is not expected to exceed 2.4 % of the total national demand for electricity. This figure is below the threshold of error in long-term demand forecasts.

- In terms of power, if charging is not managed properly it could cause demand to spike excessively if electric vehicles are powered up simultaneously. Specifically, if 20 % of the hypothetical 2 600 000 electric vehicles in circulation in 2030 were to be simultaneously charging in the daytime, the demand spike could represent 13 % of overall mainland demand at certain points during the day.

Electric vehicles can be used to as a system for modulating power demand and a new tool in the operation of the Spanish electricity system. If used properly, they can be an extremely valuable tool, helping to reduce the cost of mobility, increasing the efficiency of the electricity system by flattening the curve of aggregated demand, thus bringing stability over time, reducing the peak-trough ratio and maximising the use of unmanageable renewable energy such as wind and solar power. It is therefore necessary to ensure that this new load and the associated infrastructure are managed intelligently in order to ensure that vehicles are charged at the times that most benefit the electricity system (using distributed energy storage, smart grids, etc.) while also being consistent with users' mobility needs. It is therefore essential to encourage all measures that use price signalling to shift consumption from peak to off-peak periods, such as a super-off-peak nighttime rate.

Another of the synergies that electric vehicles can bring to the electricity sector is the fact that, once vehicle batteries have stopped working they can be given a second life in less intensive uses such as energy storage and the injection of renewable electricity into the distribution network.

Because electric motors are more energy-efficient than internal combustion engines, not being limited by the Carnot cycle, electric vehicles consume less energy than vehicles running on conventional fuel. The Business Association for the Development and Promotion of Electric Vehicles (AEDIVE) estimates consumption of 10-16 kWh per 100 km for an electric car, around 90 kWh per 100 km for an electric bus and around 300 kWh per 100 km for a 12-metre bus.

POLLUTANT EMISSIONS FROM ELECTRIC VEHICLES[78]

Pure electric vehicles (BEVs) do not produce any tank-to-wheel greenhouse gas emissions (CO_2 equivalent). While emissions from plug-in hybrids (PHEVs) and extended range electric vehicles (EREVs) vary depending

[78] Unless otherwise stated, all data are from the Ministry of Agriculture, Food and Environment.

on how far they can be driven in electric mode, they are usually below 40 g of CO_2 per kilometre according to the Ministry of Agriculture, Food and Environment's National Emissions List. Pure electric vehicles (BEVs) do not emit local pollutants (NO_X, CO, particulates, etc.), while PHEVs and EREVs emit a considerably reduced amount.

The emissions caused by the generation of the energy used to run the vehicle must be calculated considering that Spain's overall electricity mix produces emissions of 0.30 kg of CO_2 per kWh in 2015, according to data from the Spanish Markets and Competition Commission (CNMC). Based on an average energy consumption of 16 kWh per 100 km, this means that a BEV would produce indirect emissions of around 50 g of CO_2 per kilometre, which is 66 % lower than tank-to-wheel emissions from conventional petrol or diesel cars. The figures for EREVs and PHEVs do not exceed 90 g of CO_2 per kilometre.

Charging vehicles using electricity from renewable sources would reduce their total emissions to zero,[79] and, in any case, emissions will be reduced in the long term thanks to Spain's electricity generation policies.

Conversely, batteries can have a large impact on the environment due to both the energy required to manufacture them and the risk of waste batteries polluting the subsoil or seabed. However, used batteries (lead-acid or nickel-metal hydride) are fully recyclable in Spain, as required by Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and Directive 2000/53/EC on end-of-life vehicles. These Directives were incorporated into Spanish law by Royal Decree 106/2008 of 1 February 2008 on batteries and accumulators and the environmental management of waste batteries and accumulators (as amended by Royal Decree 710/2015).

The main characteristics of electric vehicles are summarised below.

Table III-11. Main characteristics of electric vehicles

MAIN CHARACTERISTICS OF ELECTRIC VEHICLES	
PERFORMANCE	Electric engines are more efficient than thermal engines.
DRIVING RANGE	Most pure electric cars (BEVs) on the market can achieve a range of 150-200 km, sufficient for most urban journeys (average 30 km and less than one hour). Although there are electric models with greater ranges, their presence on the Spanish market in negligible. Second-generation batteries capable of ranges of 300 km have recently begun to appear on the market.
EMISSIONS	Using electric vehicles allows us to reduce emissions, even making it possible for zero emissions in urban areas. This makes electric vehicles especially suitable for mobility within major cities. Actual emissions depend on the energy mix used for generating electricity. Emissions from power generation are relatively low in Spain, standing at 0.30 kg of CO_2 per kWh, giving 50 g of CO_2 per kilometre. If charged using electricity from renewable sources, electric vehicles (BEVs) have zero emissions. Proper recycling of batteries must be ensured.

[79] The electricity companies can prove the renewable origin of the energy supplied at a given charging station.

MAIN CHARACTERISTICS OF ELECTRIC VEHICLES	
PRICE	Price of electricity for charging electric vehicles: a super-off-peak electricity rate was introduced in 2011 with the aim of promoting the slow charging of electric vehicles between 01:00 and 07:00, when demand on the system is lowest, with reduced prices to encourage a shift in consumption away from peak hours in order to flatten the demand curve. Slow charging at home overnight costs less (€2 per 100 km) than running vehicles on conventional fuels. Reference pricing is used on the Spanish and Portuguese electricity markets. The purchase price of pure electric vehicles (BEVs) is 30-40 % higher than petrol or diesel counterparts, mainly due to the cost of batteries and the fact that they are manufactured on a smaller scale. However, maintenance and the electricity used to drive them cost substantially less.
REFUELLING	Installing charging stations at drivers' homes and workplaces or in the tertiary sector (hotels, restaurants, shopping centres, etc.) ensures accessibility to the public. However, the type of housing commonly found in Spain (blocks of flats in city centres) makes the installation of charging stations in residential areas more expensive.
OPERATION	Slow charging stations use the same voltage and power as households, meaning that no specific operating procedures are necessary at charging stations. However, fast charging stations require power of 50 kW. If electric vehicles become commonplace by 2030, the simultaneous connection of large numbers of vehicles for charging could account for up to 10 % of national nighttime power demand. Intelligent load management by the grid operator (REE) is therefore considered a key factor in ensuring sustainable deployment throughout the electricity system.

Source: authors' own

III.2.2. CURRENT SITUATION

ELECTRIC VEHICLES ON THE ROADS AND NEW REGISTRATIONS

According to data from the Directorate-General for Road Transport (DGT), 18 187 electric vehicles were on Spanish roads in June 2016.[80] Passenger cars account for 37 % of these, followed by motorcycles (19 %), heavy quadricycles (14 %), two-wheeled mopeds (10 %), vans (8 %) and other vehicles (12 %).

In terms of technology, 87 % are pure electric vehicles (BEVs), 11 % are plug-in hybrids (PHEVs) and only 2 % are extended-range electric vehicles (EREVs).

A total of 2 577 electric vehicles were registered in the first half of 2016, equivalent to 90 % of the number of electric vehicles registered in the whole of 2015 (2 866 units). Registrations are concentrated in the provinces of Madrid and Barcelona.[81]

[80] This figure includes pure electric vehicles (BEVs), extended-range electric vehicles (EREVs) and plug-in hybrid vehicles (PHEVs) but not hybrid vehicles (HEVs) or electric bicycles.

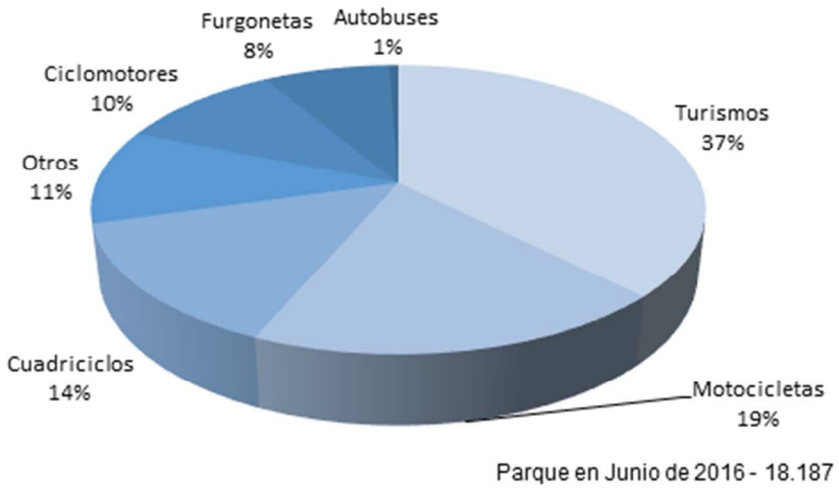
[81] Please note that company cars are often registered in Madrid or Barcelona regardless of the province in which they are to be used. In any case, Madrid and Barcelona city councils offer the greatest incentives (tax and traffic/parking) to electric mobility in Spain.

Table III-12. Electric vehicles (BEVs, EREVs and PHEVs) on the roads (December 2011-June 2016)

Parque	2011			2012			2013			2014			2015			2016 (hasta Junio)		
Tipo	**BEV**	**EREV**	**PHEV**	**BEV**	**EREV**	**PHEV**	**BEV**	**EREV**	**PHEV**	**BEV**	**EREV**	**PHEV**	**BEV**	**EREV**	**PHEV**	**BEV**	**EREV**	**PHEV**
Turismos (tipo DGT 40 y 25)	494	2	18	925	50	82	1.642	66	144	2.525	161	430	3.564	209	960	4.583	379	1.868
Motocicletas (tipo DGT 50y 51)	1.134	0	44	2.162	0	44	2.880	0	44	3.213	0	42	3.342	0	39	3.393	1	39
Derivados, Furgonetas y Pick Up (tipo DGT 0G Y 20)	117	0	0	302	0	0	364	0	0	678	0	0	1.027	0	3	1.444	0	3
Cuadriciclos (tipo DGT 54 y 92)	491	0	1	1.633	0	2	2.062	0	2	2.333	0	3	2.508	4	5	2.550	5	5
Ciclomotores (tipo DGT 90)	1.142	0	0	1.302	0	0	1.450	0	0	1.641	1	0	1.653	0	0	1.869	0	0
Autobuses y Autocares (tipo DGT empieza por 3)	32	0	22	46	0	32	53	0	31	30	6	33	58	7	34	61	7	35
Otros vehículos fuera de esos TIPOS dgt que tengan informado la categoría eléctrica (BEV/REEV/PHEV)	1.043	0	15	1.123	0	20	1.181	0	22	1.357	0	19	1.700	4	19	1.923	4	18
TOTAL	**4.453**	**2**	**100**	**7.493**	**50**	**180**	**9.632**	**66**	**243**	**11.777**	**168**	**527**	**13.852**	**224**	**1.060**	**15.823**	**396**	**1.968**
TOTAL ANUAL	**4.555**			**7.723**			**9.941**			**12.472**			**15.136**			**18.187**		

Source: Directorate-General for Road Transport based on data existing at June 2016.

Graph III-7. Electric vehicles (BEVs, EREVs and PHEVs) on the roads by type as at June 2016



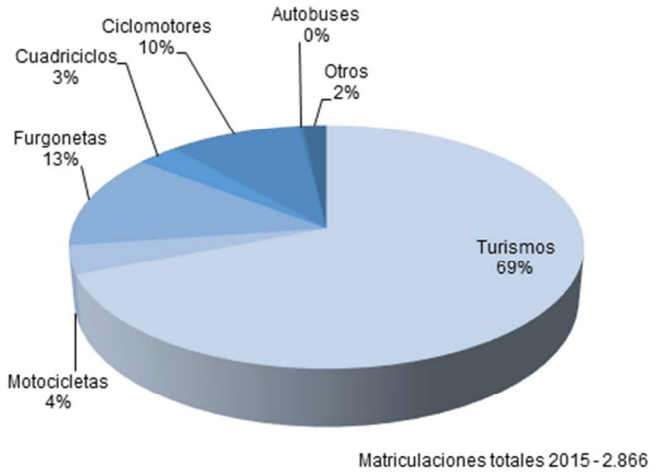
Source: Directorate-General for Road Transport based on data existing at June 2016.

Table III-13. Registrations of new electric vehicles(BEVs, EREVs and PHEVs) (2011-June 2016)

Matriculaciones	2011			2012			2013			2014			2015			2016 (hasta Junio)		
Tipo	BEV	EREV	PHEV	BEV	EREV	PHEV	BEV	EREV	PHEV	BEV	EREV	PHEV	BEV	EREV	PHEV	BEV	EREV	PHEV
Turismos (tipo DGT 40 y 25)	384	2	8	440	48	64	806	20	68	1.036	105	325	1.168	48	660	858	97	822
Motocicletas (tipo DGT 50y 51)	440	0	20	1.057	0	0	774	0	1	405	0	0	228	0	1	97	1	0
Derivados, Furgonetas y Pick Up (tipo DGT 0G Y 20)	48	0	0	197	0	0	74	0	0	332	0	0	365	0	3	326	0	0
Cuadriciclos (tipo DGT 54 y 92)	118	0	0	1.158	0	1	457	0	0	313	0	1	214	4	2	76	1	0
Ciclomotores (tipo DGT 90)	244	0	0	315	0	0	268	0	0	313	1	0	79	0	0	248	0	0
Autobuses y Autocares (tipo DGT empieza por 3)	5	0	9	14	0	13	4	0	0	3	6	1	2	1	2	5	0	2
Otros vehículos fuera de esos TIPOS dgt que tengan informado la categoría eléctrica	92	0	9	75	0	6	68	0	1	92	0	0	89	0	0	44	0	0
TOTAL	**1.331**	**2**	**46**	**3.256**	**48**	**84**	**2.451**	**20**	**70**	**2.494**	**112**	**327**	**2.145**	**53**	**668**	**1.654**	**99**	**824**
TOTAL ANUAL	**1.379**			**3.388**			**2.541**			**2.933**			**2.866**			**2.577**		

Source: Directorate-General for Road Transport based on data existing at June 2016.

Graph III-8. Registrations of electric vehicles (BEVs, EREVs and PHEVs) by type in 2015



Source: Directorate-General for Road Transport based on data existing at June 2016.

MANUFACTURE AND SALE OF ELECTRIC VEHICLES

Eleven models of electric quadricycles and commercial vehicles were being manufactured in Spain in September 2016, as shown in the table below. Moreover, electric buses and minibuses are manufactured by companies such as Irizar, Merkum and Unvi, while companies such as Torrot, Scutum, Volta, Rieju, Bultaco and GoingGreen produce electric motorcycles and scooters.

Table III-14. Quadricycles and commercial vehicles manufactured in Spain in September 2016

MANUFACTURER	MODEL	PLANT	VEHICLE TYPE
PSA Citroën - Peugeot	Partner Electric	Vigo (since 2013)	Commercial
	Berlingo Electric		
Renault	Twizy 45	Valladolid (since 2012)	Quadricycle
	Twizy 80		
Nissan	eNV200	Barcelona (since 2014)	Commercial
Comarth	CrossRider	Murcia	Quadricycle
	T-Truck		
	T-Bus		
	CR Sport		
	Toy Rider		
Little Electric Cars	Little 4	Pontevedra	Quadricycle

Source: ANFAC (PSA, Renault, Nissan) and AEDIVE (Comarth, Little Electric Cars).[82]

There are over 150 different passenger cars and commercial vehicles on the market, produced by 18 different manufacturers (Renault, Audi, Porsche, Toyota, Iveco, Esogon, DFSK, BMW, VW, Microvett, Mitsubishi, Mercedes, Kia, Ford, Citroen, Smart, Nissan, Peugeot, etc.),[83] along with 75 models of quadricycles from manufacturers such as Baya, Teycars, Little Cars, Renault, Storm Groupil, Mega and X&Y vehicles, as well as motorcycles, buses (Irizar), minibuses and lorries for urban use.

The purchase price of pure electric vehicles (BEVs) is 30-40 % higher than petrol or diesel counterparts, mainly due to the cost of batteries and the fact that they are manufactured on a smaller scale. However, maintenance and the electricity used to drive them cost substantially less.

EXISTING CHARGING INFRASTRUCTURE

Electric charging infrastructure is divided into three types with different characteristics: (1) home charging, with a charging point needed for each vehicle; (2) top-up charging in medium- to long-stay car parks in the tertiary sector (at shopping centres, leisure areas, railway stations, airports and restaurants, for example); and (3) emergency fast-charging infrastructure located at strategic locations both in cities and along the trunk road network so that electric vehicles can function outside of the urban environment.

One particular feature of electric vehicle charging is that, more than 90 % of the time, it takes place when the vehicle is parked in a home or company garage.[84] Charging also takes place mainly at night due to the price incentives. To charge his or her vehicle in this way, the user needs an electric vehicle charger (see Special-Purpose Installations: Electric vehicle charging infrastructure, Complementary Technical Instruction BT52, part of Spain's Electrical and Technical Regulations for Low-Voltage Systems[85]). The equipment for this type of charging point for light vehicles in Spain costs between €500 and €1 000, plus installation costs.

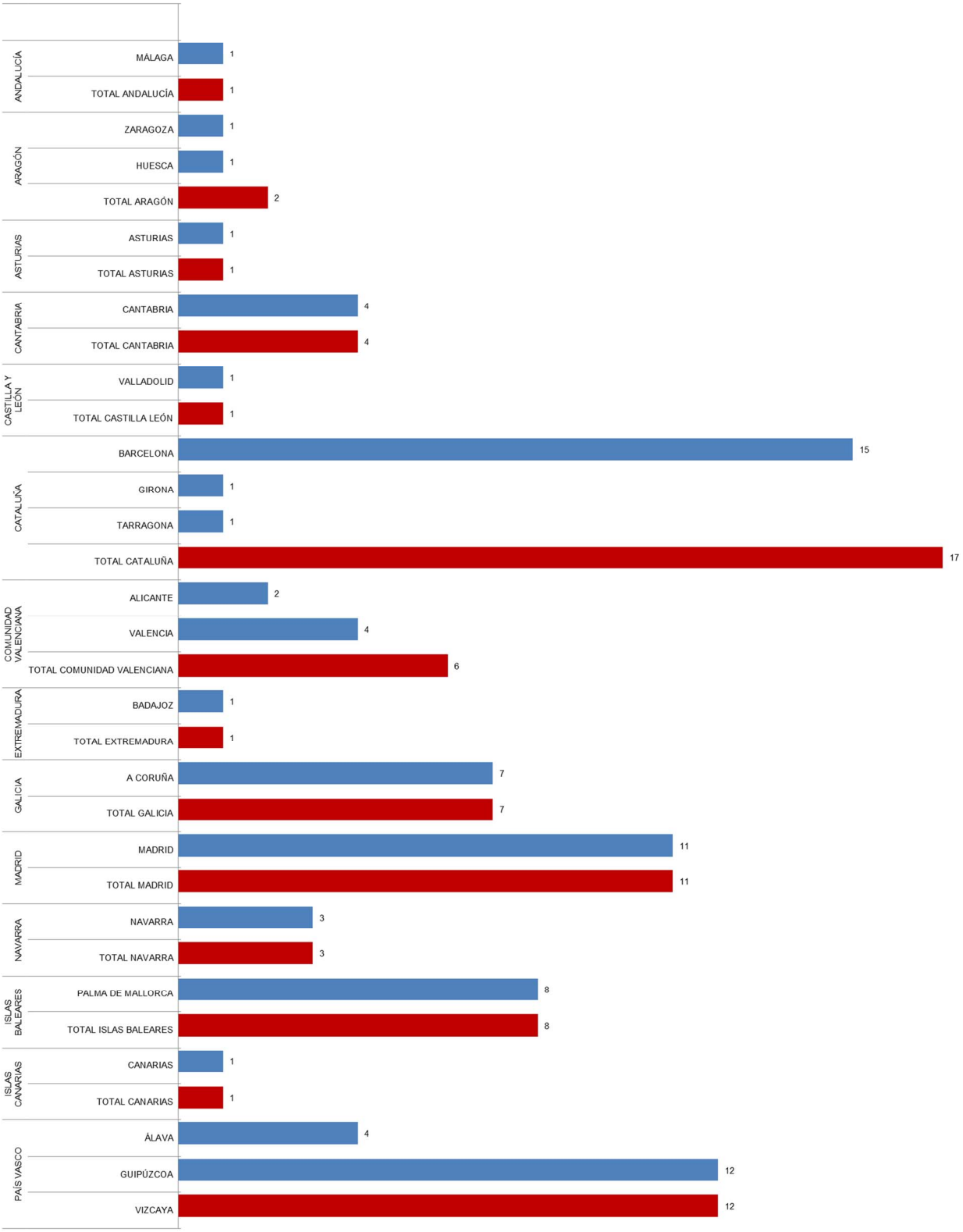
[82] Mercedes' electric Viano/Vito has not been manufactured at the Vitoria plant since 2012.
[83] Source: Catalogue of vehicles taken from the database used by the Institute for Energy Diversification and Saving to manage purchase incentives under the MOVEA Plan.
[84] Source: Zem2all project led by Málaga City Council.
[85] Published by the Ministry of Industry, Energy and Tourism to regulate and promote electric charging points.

As well as individual vehicle charging points, a network of public charging points is also needed to ensure that unexpected incidents in day-to-day driving do not bring vehicles to a standstill. This public network prevents any potential anxiety about driving range on the part of private users, as well as serving the logistics sector and public service vehicles (electric taxis).

In Spain, since the publication of Royal Decree 647/2011 of 9 May 2011, charging points that sell electricity to the public must be managed by a 'charge operator', an entity legally authorised to resell electricity for the purpose of charging electric vehicles. Under Article 3(4) of this Royal Decree, the Directorate-General for Energy Policy and Mines is required forward the information it receives to the Spanish Markets and Competition Commission (CNMC), which will publish a list of all 'charge operators' and the facilities they operate on its website, updated at least once a month. Official data from the CNMC show that there are 31 registered 'charge operators' in Spain, operating 91 charging points/stations in total.[86]

[86] Details are published on the CNMC website and updated monthly.

Graph III-9. Charging points operated by charge operators by province as at 1 July 2016



Source: CNMC. As at 1 July 2016.

Table III-15. Charging points operated by charge operators by province as at 1 July 2016

CHARGING POINTS RUN BY CHARGE OPERATORS			
AUTONOMOUS COMMUNITY	**PROVINCE**	**TOTAL**	**TOTAL**
		PROVINCE	**AUTONOMOUS COMMUNITIES**
ANDALUSIA	MALAGA	1	1
ARAGON	ZARAGOZA	1	2
	HUESCA	1	
ASTURIAS	ASTURIAS	1	1
CANTABRIA	CANTABRIA	4	4
CASTILE (LEON)	VALLADOLID	1	1
CATALONIA	BARCELONA	15	17
	GIRONA	1	
	TARRAGONA	1	
VALENCIA	ALICANTE	2	6
	VALENCIA	4	
EXTREMADURA	BADAJOZ	1	1
GALICIA	A CORUÑA	7	7
MADRID	MADRID	11	11
NAVARRE	NAVARRE	3	3
BALEARICS	PALMA DE MALLORCA	8	8
CANARY	ISLANDS	1	1
BASQUE COUNTRY	ALAVA	4	28
	GUIPUZCOA	12	
	VIZCAYA	12	
TOTAL			**91**

Source: CNMC. Updated to 1 July 2016.

From information provided by various business associations, it would appear that more charging points are in the process of being added to the CNMC register (over 1 650 additional points with more than 4 500 sockets at tertiary-sector establishment whose main activity is not the resale of electricity, such as shopping centres, hotels, public car parks, supermarkets, car dealerships, etc.). It would appear that these establishments are not currently charging users for this electricity.

Table III-16. Existing charge points by type of premises as at June 2016

TYPE	NUMBER OF LOCATIONS	NUMBER OF CHARGE POINTS
Car park	369	1483
Street level	410	941
Shopping centre	143	489
Limited access	179	408

TYPE	NUMBER OF LOCATIONS	NUMBER OF CHARGE POINTS
Car dealership	189	398
Hotel	131	234
Restaurant	85	172
Service station	64	144
Shop	31	143
Repair garage	35	88
Campsite	14	30
Reserved for taxis	5	9
Airport	4	8
TOTAL	**1 659**	**4 547**

Source: Electromaps

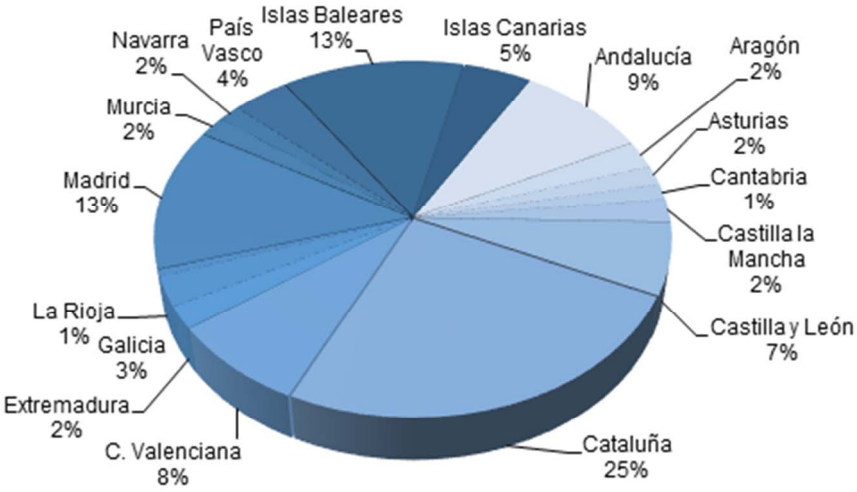
Table III-17. Existing charge points by Autonomous Community and province as at June 2016

AUTONOMOUS COMMUNITY	PROVINCE	SOCKETS	LOCATIONS	TOTAL CHARGE POINTS	TOTAL LOCATIONS
Andalusia	Almeria	15	9	320	154
	Cadiz	24	13		
	Cordoba	22	7		
	Granada	57	30		
	Huelva	14	8		
	Jaen	6	4		
	Malaga	80	35		
	Seville	102	48		
Aragon	Huesca	9	6	119	41
	Teruel	26	9		
	Zaragoza	84	26		
Asturias	Asturias	49	29	49	29
Cantabria	Cantabria	41	24	41	24
Castile-La Mancha	Albacete	21	8	85	35
	Ciudad Real	5	3		
	Cuenca	14	6		
	Guadalajara	17	7		
	Toledo	28	11		
Castile-Leon	Avila	8	6	227	108
	Burgos	25	12		

AUTONOMOUS COMMUNITY	PROVINCE	SOCKETS	LOCATIONS	TOTAL CHARGE POINTS	TOTAL LOCATIONS
	Leon	49	13		
	Salamanca	9	6		
	Segovia	10	6		
	Soria	13	7		
	Palencia	28	16		
	Valladolid	76	39		
	Zamora	9	3		
Catalonia	Barcelona	1257	330	1447	418
	Girona	88	45		
	Lleida	24	11		
	Tarragona	78	32		
Valencia	Alicante	220	61	415	132
	Castellón	40	19		
	Valencia	155	52		
Extremadura	Badajoz	75	32	79	34
	Cáceres	4	2		
Galicia	A Coruña	52	18	127	45
	Lugo	4	3		
	Ourense	9	5		
	Pontevedra	62	19		
La Rioja	La Rioja	19	10	19	10
Madrid	Madrid	753	216	753	216
Murcia	Murcia	61	30	61	30
Navarre	Navarre	63	26	63	26
Basque Country	Alava	23	9	179	66
	Vizcaya	82	32		
	Guipuzcoa	74	25		
Balearic Islands	Balearic Islands	393	212	393	212
Canary Islands	Las Palmas	65	33	170	79
	Santa Cruz de Tenerife	105	46		
TOTAL		**4 547**	**1 659**	**4 547**	**1 659**

Source: Electromaps

Graph III-10. Existing charge points by Autonomous Community as at June 2016



Source: Electromaps

Various Spanish entities are actively working on pilot projects involving innovative recharging solutions that suit the specific needs of both users and cities. Among the projects carried out, the following are noteworthy for their potential to be rolled out nationwide.

1. Large-scale installation of public charging points in Barcelona

According to Barcelona City Council, the city has 303 public charging points, of which 121 are located at street level (15 are fast recharging points that can power a battery up to 80 % in less than 30 minutes), and 182 are located in underground car parks (of these, 74 % are for cars and 26 % are for motorcycles). These are universal charging points that can cover the three systems currently available on the market and allow up to two vehicles to be charged at once. Most of these public points are free for users, being publicly funded by the local authority.

Barcelona also has over 100 charging points in private premises such as shopping centres, hotels, etc. These are for public use but are privately operated.

As for the greater metropolitan area of Barcelona, in 2015, FGC, SIMON, DTES, RAILGRUP, VOLTOUR, ICAEN, IMESAPI and EMPARK signed an agreement to install five charging stations for electric vehicles in the car parks of the Volpelleres, Martorell, Igualada, Sant Quirze del Valles and Sant Cugat del Valles public transport hubs (these are all railway stations operated by Ferrocarrils de la Generalitat (FGC)).

2. Fast-charging Car Club (e-Car)

The company Endesa has launched a network of six fast recharging points strategically located throughout the island of Mallorca to ensure that any electric vehicle can travel around the island without any concerns about driving range. These refuelling points can charge the battery up to 80 % in less than 30 minutes and currently cost €6 per charge. The points are located at an average distance of 35 kilometres apart.

This initiative aims to improve driving range, peace of mind and savings for users with each charge. A mobile application allows drivers to locate their nearest point, reserve it, find the best route there and calculate the travel time. Furthermore, the charging points are equipped with all three connector types currently available

on the market and can therefore be used to charge all types of electric vehicle, regardless of the manufacturer. This initiative has been co-financed by the European Regional Development Fund.

3. The 'Zero Emissions Mobility to All' (ZEM2ALL) Project

This initiative ended in January 2016 after four years in operation. The aim was to test the operation of electric vehicles and their acceptance by the public in a real-life environment: the city of Malaga and its surrounding area (Marbella and Fuengirola). It was the largest pilot project on electric mobility carried out to date in Spain. A fleet of 200 electric vehicles, 220 conventional charging points and 23 fast charging points were placed in nine locations. Under this initiative, the cars were driven over 4.6 million kilometres, charged over 100 000 times, cutting CO_2 emissions by 330 tonnes. The project was supported by Malaga City Council, the Industrial Technology Development Centre (CDTI) and Endesa, and involved the Japanese government through NEDO.

As for the development of a charging point industry, eight companies with manufacturing capacity in Spain for normal and fast charging points are currently exporting to countries including Russia, Norway, the Netherlands and the United Kingdom.

III.2.3. MARKET FORECASTS AND OBJECTIVES

OPPORTUNITIES

The expected market trend is shaped by the opportunities presented by the use of electricity in road transport:

Table III-18. Opportunities presented by the use of electricity in road transport

OPPORTUNITIES PRESENTED BY THE USE OF ELECTRICITY IN ROAD TRANSPORT	
INDUSTRIAL OPPORTUNITY	Increased range of vehicles and equipment offered by manufacturers, promoting their development and Spain's leading role in the manufacture of new EAVs and components. Development of new sustainable urban mobility businesses. This makes it possible to provide charging points in cities as well as changing the ways in which vehicles are owned and used. These vehicles are replaced more frequently than private vehicles. Development of new businesses and specialities such as battery recycling. Once they can no longer be used in electric vehicles, batteries can be used for energy storage in distribution networks and to assist in the management of renewable electricity.
ENERGY OPPORTUNITY	Helps to diversify primary energy sources. Increases off-peak demand on the electrical system (overnight charging), flattening the demand curve. Improves the efficiency of the electricity system without the need for additional investment. Use of surplus overnight wind power output. Taking advantage of combined-cycle generation capacity to meet occasional demand spikes such as increased traffic in holiday periods, etc.
ENVIRONMENTAL OPPORTUNITY	Electric vehicles eliminate local CO_2 emissions. Taking into account the entire cycle from generation to use, electric vehicles also bring a drastic reduction in CO_2 emissions due to the national energy mix, helping us to meet European and international commitments.

Source: authors' own

ESTIMATED NUMBER OF ELECTRIC VEHICLES

Although electric vehicles still account for a rather insignificant proportion of overall registrations (in 2015 electric vehicles accounted for 0.3 % of total vehicle registrations in Spain), they are gradually growing, encouraged by the 2014-2020 New Energy Vehicle Promotion Strategy, with 2 577 electric vehicles registered in the first half of 2016, equivalent to 90 % of the total number of electric vehicles registered in 2015.

While an estimate of the number of vehicles registered in 2020 based on the continuation of the same annual trend that has characterised the market since 2010 (an average annual increase of around 20 %) is around 38 000, thanks to the incentives for electric mobility introduced by the 2014-2020 New Energy Vehicle Promotion Strategy and this National Policy Framework, we can reasonably predict that around 150 000 electric vehicles will be on Spain's roads by 2020.

PUBLIC CHARGING POINTS

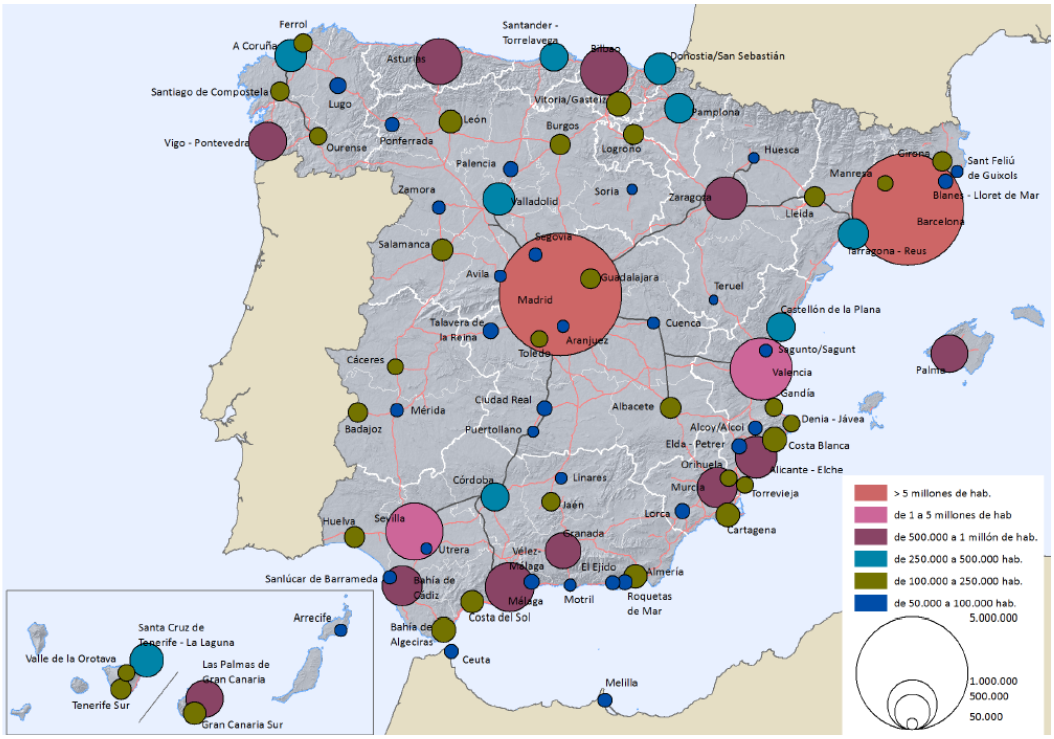
When estimating the future trend in charging infrastructure, we have taken into account Article 4 of Directive 2014/94/EU, which requires us to guarantee the circulation of electric vehicles by 2020 both in urban/suburban agglomerations and other densely populated areas as well as along certain as-yet-unidentified Spanish networks.

Charge operators are currently running charging points at 91 urban locations distributed throughout 14 Autonomous Communities.[87] Additionally, as has already been discussed, there are probably more than 4 500 public charging points/sockets at more than 1 650 locations in the process of registration on the CNMC's list. These points are associated with tertiary-sector establishments — not primarily engaged in the resale of electricity — distributed throughout Spain.[88] Taking this situation as a starting point, future trends in public charging points will be driven by developments in the vehicle market, and by the combined efforts of regional and — in particular — local authorities.

As for the requirement that we designate the agglomerations, densely populated areas and networks in which public charging points are to be located (Article 3(1) of the Directive), this National Policy Framework is based on the premise that, at the very least, those metropolitan areas with more than 250 000 inhabitants must have a sufficient number of public charging points to keep up with market developments. Spain already has widespread charging infrastructure in metropolitan areas with populations of over 5 million (Madrid and Barcelona) and between 1 and 5 million (Seville and Valencia). Specific plans are also in place for several metropolitan areas of between 500 000 and 1 000 000 inhabitants (e.g. the e-Car scheme in Palma de Mallorca). Following these trends, charging infrastructure will continue to expand, starting from the metropolitan areas listed in the graphic below, prioritising areas based on size.

[87] See Annex B.
[88] See Annex B.

Table III-19. Spain's major metropolitan areas



Source: National Statistics Institute.

In any case, the role of local authorities is key in developing charging infrastructure in these urban agglomerations. They are in charge of authorising the installation of points on public roads and for establishing mobility policies (regulated parking fees, access to restricted areas, measures taken when pollution thresholds are reached, etc.) and road tax rebates.

Collaboration between Autonomous Community and municipal authorities has led to the development of public charging infrastructure in various metropolitan areas such as Madrid, Catalonia, Castile-Leon, the Basque Country, Andalusia and Valencia. For example, the authorities of the Autonomous Community of Madrid and Madrid City Council are working on a map of the areas in which charging points should be placed within their respective jurisdictions, based on the premise that a point should never be more than ten minutes' drive away. Meanwhile, the Catalan authorities have set up a dedicated committee to encourage the development of charging infrastructure (TIRVEC). This aims to act as a forum which, through dialogue, strengthens cooperation between Catalan organisations — both public and private — and fosters the installation of charging points along Catalan main roads and motorways.

In addition to regional and local initiatives, the following national measures will encourage the development of public charging points in all urban agglomerations that put electric mobility on their agendas:

- The MOVEA Plan includes a specific line of aid for the installation of fast and semi-fast charging points in public locations. This aid can be accessed by private companies, local authorities and Autonomous Communities.

- The Operational Programme for Sustainable Growth (POCS) — under the European Structural and Investment Funds — includes funding that can be accessed by municipal authorities (or multi-municipality bodies) that install charging infrastructure up to 2020.

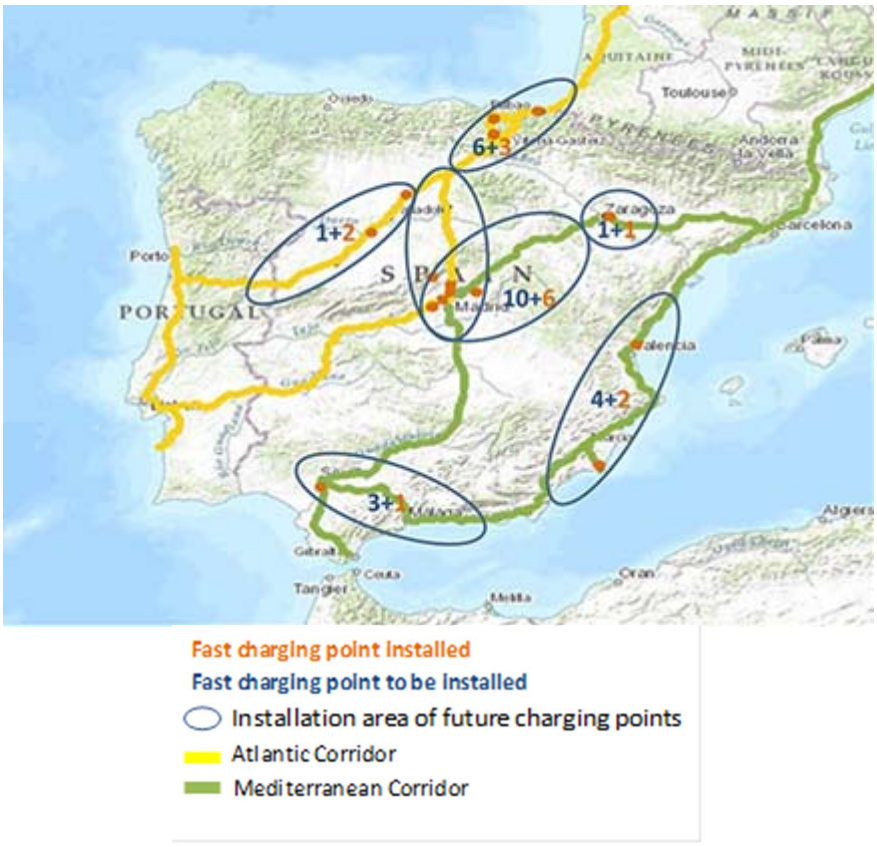
- RENFE's department in charge of railway stations is preparing an action plan to install charging points in some existing station car parks. This measure complements the requirement under ITC BT-52 to include charging points in the designs for all new public car parks.

- AENA SA, the body responsible for the installation of charging points at airports, is studying different options for operating points while ensuring their financial viability.

Outside the urban sphere, the governments of Spain (through the Ministry of Industry, Energy and Tourism and the Ministry of Infrastructure and Transport) and Portugal have jointly set up an eight-member consortium[89] for the installation of fast charging points along the Atlantic and Mediterranean corridors. This will make it possible to study the business model with real parameters, with a view to installing charging infrastructure along the basic TEN-T network and thus connecting the Iberian Peninsula with the rest of the EU.

Under this project, entitled 'Spanish and Portuguese Infrastructure Corridors for Fast Charging of Electric Vehicles' (CIRVE), at strategic locations along these corridors within Spain, 25 new fast recharging points will be piloted and 15 existing points adapted. The investment associated with the project in Spain will be financed through the 2015 call for funding from the Connecting Europe Facility (CEF).

Figure III-2. Map of charging points under the CIRVE project



Source: Report on the CIRVE project presented to the CEF 2015

[89] IBIL, Iberdrola, Endesa, GIC, EDP, AEDIVE, CEIIA and Renault.

Depending on the results achieved by this project, the estimated number of charging points needed to boost circulation throughout the country — and particularly in the basic TEN-T network — will be updated in future revisions of this National Policy Framework.

III.3. LIQUEFIED PETROLEUM GAS

III.3.1. INTRODUCTION

FUEL CONSUMPTION BY LPG VEHICLES

In 2015, LPG vehicles on Spain's roads[90] consumed 43 000 tonnes of fuel (approximately 500 GWh).[91]

It should be noted that LPG vehicles consume more fuel than their counterparts run on traditional fuels. The average consumption of an LPG passenger car is 9.5 litres per 100 kilometres, compared to 8 litres of petrol in an equivalent version, or 6.5 litres of diesel.[92]

New technologies such as direct injection are being developed in order to extend the benefits of LPG carburetion to cars, thus improving fuel economy and reducing CO_2 emissions.

POLLUTANT EMISSIONS FROM LPG VEHICLES[93]

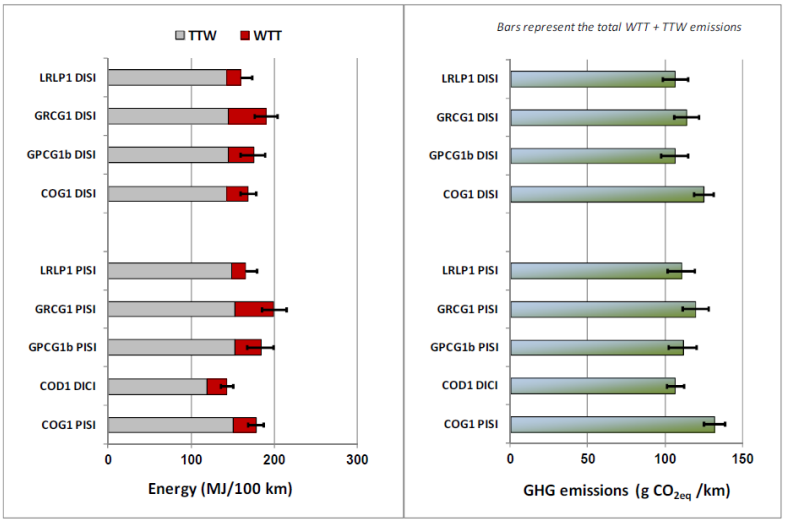
According to the Ministry of Agriculture, Food and Environment's National Emissions List, liquefied petroleum gas emits 65 tonnes of CO_2 per terajoule of energy, which is between 12 and 15 % lower than the figure for conventional fuels (petrol/diesel).

According to the sources consulted (JRC 2014;[94] EMT Madrid and TMB Barcelona) average CO_2 emissions per kilometre are similar to or higher than those of diesel vehicles and lower than those of petrol vehicles.

[90] Approximately 50 000 vehicles according to the Spanish LPG Association (AOGLP).
[91] Source: CORES
[92] Due to the weight of LPG tanks, LPG vehicles can weigh up to 5 % more than vehicles running on conventional fuels. This weight gain leads to an increase in consumption and therefore higher pollutant emissions.
[93] Unless otherwise stated, all information in this section was provided by the Ministry of Agriculture, Food and Environment. In any case, the official limits should be consulted for the approval of each specific model.
[94] Joint Research Centre-EUCAR-CONCAWE *Well-to-Wheels analysis of future automotive fuels and powertrains in the European context* (WELL-TO-TANK (WTT) Report) Version 4.a, 2014.
The following were involved in this study: the European Commission (through the JRC), the European refining sector (represented by CONCAWE, the European association of oil companies for environmental protection and health) and European vehicle manufacturers (through the European vehicle manufacturers' R&D association).

Figure III-3. Comparison of CO_2 emissions between LPG vehicles and conventional fuel vehicles (diesel/petrol)

Figure 3.3.5-4a/b WTW total expended energy expended and GHG emissions for LPG (2020+ PISI & DISI vehicles)



Key to pathway codes

COG1	Conventional gasoline
COD1	Conventional diesel fuel
GPCG1b	CNG from imported NG 4000 km
GRCG1	CNG from remote LNG, vap at import terminal
LRLP1	LPG imported from remote gas field

Source: JRC v4.a, 2014.

Note that emissions from the process of extraction and subsequent refining are similar to those for conventional fuels (diesel and petrol) and have therefore been left out of this analysis.

As for local air pollutants, particulate emissions are significantly reduced: on average 21 % and 27 % less petrol and diesel passenger cars, respectively. An LPG passenger car emits between 8 % and 73 % less NO_X than the average conventional passenger car (1.4-2 litre engine and Euro VI) running on petrol and diesel, respectively. Therefore LPG is an option for bringing C-segment vehicles into line with the Euro VI regulations on NO_X emissions at a competitive price.

The main characteristics of LPG in road transport are summarised below.

Table III-20. Main characteristics of LPG vehicles

MAIN CHARACTERISTICS OF LPG VEHICLES	
PERFORMANCE	Same performance as conventional fuels.
DRIVING RANGE	Exclusively LPG mode offers a range comparable to that of conventional vehicles.
EMISSIONS	Reduces local pollutants (NOx and particulates), improving air quality in large population centres. CO_2 emissions are lower than those of petrol and similar to those for diesel.

PRICE	Price of manufacture of LPG vehicles: Similar to conventional diesel vehicles and between 700 to 1 000 euros more expensive than petrol vehicles. Conversion costs between €1 000 and €2 500 depending on engine capacity. Fuel price: The price of LPG on international markets is linked to oil prices, although, unlike oil, LPG is influenced by the price of naphtha for petrochemical use and local over- or under-supply issues. In Spain the price is currently lower than that of conventional fuels.
REFUELLING	Refuelling infrastructure is already in place across Spain (468 service stations throughout all Autonomous Communities). Sufficient infrastructure will be in place by 2017 to serve 200 000 vehicles (around 50 000 LPG vehicles are currently on the roads in Spain). Refuelling time is similar to that of conventional fuels.
OPERATION	Users do not need to change any habits.

Source: authors' own

III.3.2. CURRENT SITUATION

LPG VEHICLES ON THE ROADS AND NEW REGISTRATIONS

According to data from the Directorate-General for Road Transport (DGT), 8 133 LPG vehicles were on Spanish roads in June 2016. Registrations have grown at an annual rate of 200 % since 2012, as the table below shows.[95] Passenger cars account for 89 % of total LPG vehicles, followed at a considerable distance by vans (7 %). Considerable development — mainly engine development — is needed before this technology is suitable for heavy goods vehicles. There are therefore only a handful of LPG HGVs on Spain's roads.

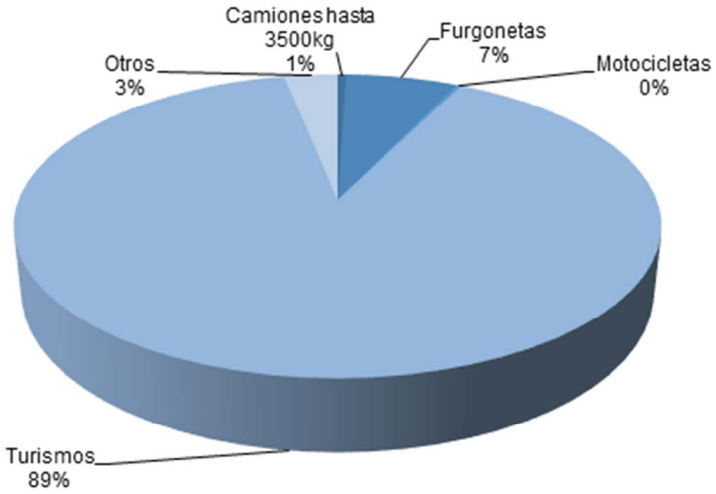
Table III-21. LPG vehicles on the roads (December 2012-June 2016)

LPG	2012	2013	2014	2015	2016 (up to June)
Lorries up to 3 500 kg	6	25	25	39	40
Vans	17	55	182	413	539
Motorcycles	5	6	14	20	22
Passenger cars	250	895	1 994	4 883	7 274
Other	18	44	93	221	258
Total	**296**	**1 025**	**2 308**	**5 576**	**8 133**

Source: Directorate-General for Road Transport based on data existing at June 2016.

[95] The Directorate-General for Road Transport does not have specific figures on LPG vehicles dating prior to 2012.

Graph III-11. LPG vehicles on the roads by type as at June 2016



Source: Directorate-General for Road Transport based on data existing at June 2016.

Table III-22. Registrations of new LPG vehicles by type (2012-June 2016)

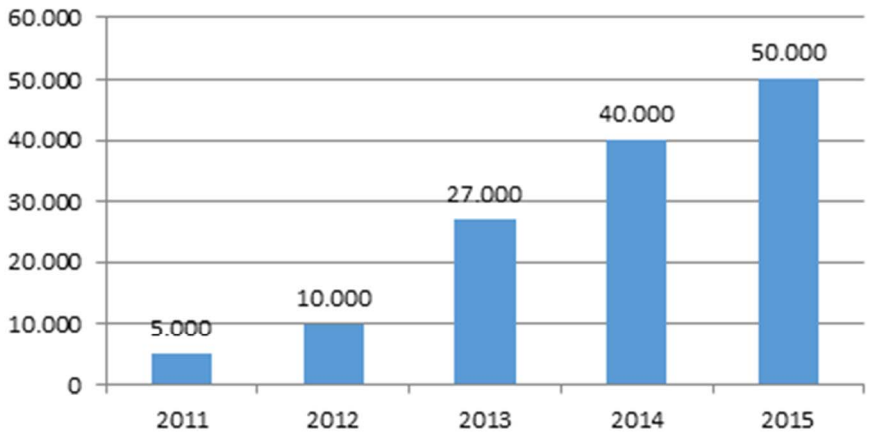
LPG REGISTRATIONS	2012	2013	2014	2015	Up to June 2016
Lorries up to 3 500 kg	6	19	0	9	0
Vans	16	36	125	222	73
Motorcycles	5	2	8	3	2
Passenger cars	215	556	1 109	2 339	796
Other	8	1	0	1	1
TOTAL	**250**	**614**	**1 242**	**2 574**	**872**

Source: Directorate-General for Road Transport based on data existing at June 2016.

Please note that the above figures do not fully account for vehicles converted prior to March 2015 at repair garages not affiliated to the vehicle manufacturers. The Spanish Association of LPG Operators (AOLPG) has surveyed[96] the total number of LPG-powered vehicles in Spain,[97] arriving at an estimate of 50 000 cars in 2015, representing 0.22 % of all passenger cars on Spanish roads.[98] The number of LPG cars on the roads as estimated by the AOLPG has grown by 58 % since 2011.[99]

[96] Calculations are based on analysis performed by LPG operators using actual consumption recorded at service stations, which is cross-checked against customer databases to avoid vehicles being counted twice.
[97] Foreign vehicles in transit through Spain are also recorded.
[98] According to the DGT there were 22 355 022 passenger cars on the roads in 2015.
[99] 5 000 in 2011, 10 000 in 2012, 27 000 in 2013 40 000 in 2014 and 50 000 in 2015.

Graph III-12. Trend in LPG vehicles on the roads as estimated by the AOGLP (December 2011-December 2015)



Source: Spanish LPG Association (AOGLP).

The AOLPG estimates that 50 % of LPG vehicles are used for professional purposes — mainly taxis, company cars used by sales representatives, and vehicles used by driving schools — and 50 % for private use. On the subject of LPG vehicles used in public services, there are approximately 8 000 LPG taxis in Spain, mainly in Madrid (4 000 taxis), Barcelona (1 200 taxis), Valencia, Palma de Mallorca, Seville, Malaga, Vigo and Zaragoza. Moreover, the city of Valladolid has around 100 urban buses with 330-hp engines manufactured by MAN.

Heavy goods vehicles are estimated to make up only 2 % (1 000 units) of all LPG vehicles on the roads. They are mainly used for last-mile delivery (urban goods distribution).

MANUFACTURE AND SALE OF LPG VEHICLES IN SPAIN

Three LPG models are currently being manufactured at the Opel plant in Figueruelas: the Mokka, the Meriva 1.4 and the Corsa (versions 1.2 and 1.4).[100]

Over 1 000 vehicle models from 14 manufacturers (Alfa Romeo, Citroen, Dacia, Fiat, Ford, Lancia, Opel, Renault, Ssangyong, Subaru, Seat, Suzuki, Piaggio and Skoda) are known to be on the market in Spain.[101] Over 250 repair garages are qualified to convert vehicles from petrol to LPG.

The purchase price of LPG vehicles ex-works is between €700 and €1 000 higher than the equivalent petrol model and in the same range as diesel models. Conventional petrol vehicles can also be converted to run on LGP at repair garages not affiliated to the manufacturers. In this case, the cost of conversion depends on the engine capacity. It costs around €1 000-€1 500 (excluding VAT) to convert a vehicle with a 4-6-cylinder engine and between €2 000 and €2 500 (excluding VAT) to convert an eight-cylinder engine.

[100] In the past, PSA produced the C-Elysee, Volkswagen manufactured the Polo LPG in Pamplona and Seat made the Altea LPG in Martorell.

[101] Source: Catalogue of vehicles taken from the database used by the Institute for Energy Diversification and Saving to manage purchase incentives under the MOVEA Plan.

EXISTING REFUELLING INFRASTRUCTURE

In June 2016 Spain had 468 public LPG refuelling stations, representing 4.5 % of all service stations.[102] Some 500 companies are estimated to have fleets of LPG vehicles and their own private LPG supply points. The number of public stations accessible has grown around 60 % over the last five years (2011 to 2015).[103] Based on the investments announced by LPG merchants, some 600 service stations with LPG services are expected to be in place by the end of 2017.

Table III-23. Existing LPG refuelling stations by Autonomous Community and province as at June 2016

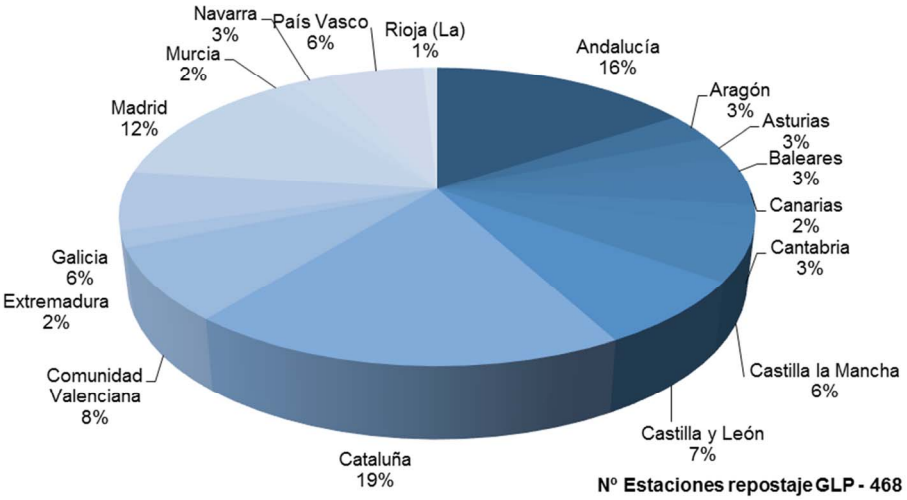
LPG STATIONS			
AUTONOMOUS COMMUNITY	**PROVINCE**	**TOTAL PROVINCE**	**TOTAL AUTONOMOUS COMMUNITY**
Andalusia	ALMERIA	7	74
	CADIZ	10	
	CORDOBA	4	
	HUELVA	5	
	JAEN	6	
	MALAGA	15	
	SEVILLE	20	
Aragon	HUESCA	2	14
	TERUEL	3	
	ZARAGOZA	9	
Asturias	ASTURIAS	12	12
Balearic Islands	BALEARIC ISLANDS	14	14
Canary Islands	LAS PALMAS	7	11
	SANTA CRUZ DE TENERIFE	4	
Cantabria	CANTABRIA	12	12
Castile-La Mancha	ALBACETE	5	26
	CIUDAD REAL	5	
	CUENCA	5	
	GUADALAJARA	2	
	TOLEDO	9	
Castile-Leon	AVILA	2	34
	BURGOS	5	
	LEÓN	5	
	PALENCIA	4	
	SALAMANCA	4	

[102] Source: Geoportal of the Ministry of Industry, Energy and Tourism
[103] Source: Spanish LPG Association (AOGLP).

LPG STATIONS			
AUTONOMOUS COMMUNITY	**PROVINCE**	**TOTAL PROVINCE**	**TOTAL AUTONOMOUS COMMUNITY**
	SEGOVIA	3	
	SORIA	2	
	VALLADOLID	5	
	ZAMORA	4	
Catalonia	BARCELONA	56	88
	GIRONA	15	
	LLEIDA	7	
	TARRAGONA	10	
Ceuta	CEUTA	0	0
Valencia	ALICANTE	19	37
	CASTELLÓN	5	
	VALENCIA	13	
Extremadura	BADAJOZ	3	8
	CÁCERES	5	
Galicia	A CORUÑA	16	30
	LUGO	2	
	OURENSE	3	
	PONTEVEDRA	9	
Madrid	MADRID	56	56
Melilla	MELILLA	0	0
Murcia	MURCIA	9	9
Navarre	NAVARRE	12	12
Basque Country	ALAVA	6	27
	GUIPUZCOA	13	
	VIZCAYA	8	
La Rioja	LA RIOJA	4	4
TOTAL		**468**	**468**

Source: Geoportal of the Ministry of Industry, Energy and Tourism

Graph III-13. Existing LPG refuelling stations by Autonomous Community as at June 2016



Source: Geoportal of the Ministry of Industry, Energy and Tourism

Table III-24. Number of LPG refuelling stations (December 2011- December 2015)

	2011	2012	2013	2014	2015
Number of LPG service stations	50	155	265	375	455

Source: Spanish LPG Association (AOGLP).

The table below shows the main LPG retailers in Spain and the number of service stations operated by each.

Table III-25. Share of LPG refuelling stations by company, June 2016

SELLER	PERCENTAGE SHARE OF SERVICE STATIONS
REPSOL	77 %
CEPSA	8 %
VITOGAS	5 %
DISA	2 %
GALP	1 %
OTHER	7 %
TOTAL	**100 %**

Source: Geoportal of the Ministry of Industry, Energy and Tourism

The existing public LPG refuelling infrastructure is considered reasonably well distributed throughout Spain.

To help users locate LPG refuelling stations, the Ministry of Industry, Energy and Tourism publishes their locations and the prices charged on its Geoportal (http://geoportalgasolineras.es).[104] The Spanish Association of LPG Operators (AOLPG) has also created an online tool which can be accessed via its website[105] and on mobile devices, and a map of LPG refuelling points in Catalonia is published on the website[106] of the Catalan Energy Institute (ICAEN).

III.3.3. MARKET FORECASTS AND OBJECTIVES

MARKET OPPORTUNITIES

The outlook for LPG in Spain is optimistic given the opportunities identified, details of which are as follows:

Table III-26. Opportunities presented by the use of LPG in road transport

OPPORTUNITIES PRESENTED BY THE USE OF LPG IN ROAD TRANSPORT	
INDUSTRIAL OPPORTUNITY	Encouraging vehicle and equipment manufacturers to broaden the range on offer. LPG heavy-duty vehicles are expected to be developed in the future.
ENERGY OPPORTUNITY	Provides a use for the propane and butane (LPG is a mixture of both) resulting from refining processes, home use of which has decreased with the arrival of urban natural gas.
ENVIRONMENTAL OPPORTUNITY	CO_2 emissions equal to diesel and lower than petrol. Significantly reduced local emissions. The technology is available, mature and accessible without major investment.

Source: authors' own

ESTIMATED NUMBERS OF LPG CARS ON THE ROADS AND REFUELLING POINTS IN PLACE BY 2020

Thanks to the measures contained in both the 2014-2020 New Energy Vehicle Promotion Strategy and this National Policy Framework, market development is expected to increase the number of LPG vehicles to 200 000-250 000 by 2020.

This estimated increase in the number of LPG vehicles on the roads is based on the assumption that the private sector will have sufficient incentive to increase the number of LPG refuelling points and that, in turn, this widespread availability of supply infrastructure will make the purchase of LPG vehicles an attractive option for new users, thus increasing the number of vehicles and refuelling points.

The infrastructure expected to be put in place by the private sector by the end of 2017 (around 600 stations according to the AOLPG) will be sufficient to service 200 000 vehicles. Moreover, so that potential users have refuelling points near their usual routes, it would be reasonable to aim for a network of between 800 and 1 000 refuelling stations by 2020.

[104] Companies supplying LPG at refuelling stations must report data to the Ministry of Industry, Tourism and Trade in accordance with Ministerial Order ITC/2308/2007 of 25 July 2007 on the reporting of activities related to the supply of petroleum products.
[105] http://www.aoglp.com/que-es-autogas/donde-repostar/
[106] https://www.google.com/maps/d/edit?hl=ca&authuser=0&mid=z4xnIt9uT66s.kuGVFWgWagXU

III.4. HYDROGEN

III.4.1. INTRODUCTION

Hydrogen has two main applications as an energy carrier in the automotive sector: in fuel cells and in alternative internal combustion engines (ICE). The latest developments show that fuel cells are being favoured over ICEs because of their greater efficiency.[107] A fuel cell is an electrochemical device that produces electricity (and water) from stored hydrogen (and atmospheric air). Fuel cells also have no moving parts and therefore do not create any noise or vibration and are easier to maintain.

Several pilot projects have been carried out in Spain involving fuel cell electric vehicles (FCEVs). These projects demonstrate the great future potential of hydrogen in road transport. A passenger car stores enough fuel to travel 500 to 600 km,[108] while the range of a city bus is around 350 km.[109] Refuelling time is similar to that for conventional vehicles.[110] Despite significant efforts in RDI, and progress achieved in the transportation and storage of hydrogen at high pressures (350-700 bar), today the biggest limitation is the high cost of the systems involved.[111] However, more widespread selling of these vehicles will bring economies of scale that will cut costs significantly.

The Government of Aragon is notable among regional initiatives to promote hydrogen, having been strongly committed to this technology since 2003, when it agreed to be a founding member of the Foundation for the Development of New Hydrogen Technologies in Aragon. This support has resulted in: the 2nd Regional Plan for Research, Development and Knowledge Transfer; the Aragonese Strategy for Climate Change and Clean Energy (EACCEL); the Aragonese Growth and Competitiveness Strategy; the Aragonese Strategy for Research and Innovation for smart specialisation RIS3 Aragon; the Aragon Energy Plan 2013-2020; the Strategy for Spatial Planning of Aragon; the Aragon 2014-2020 ERDF Operational Programme (OP); and separate comprehensive strategies. The 3rd Master Plan 2016-2020 for hydrogen in Aragon is currently in force as a continuation of the 2007-2010 and 2011-2015 Master Plans. It encompasses the region's activities in hydrogen technologies through five lines of work. Meanwhile, Andalusia, through both the Andalusian Energy Agency and the Agency for Innovation and Development of Andalusia (IDEA) has the following lines of work relating to the use of hydrogen in road transport: the Development Strategy for Hydrogen in Andalusia in the field of RIS3[112] (November 2015); the Planning for deployment of the hydrogen refuelling stations needed to facilitate the use of this gas as fuel in Andalusia[113] (November 2015); and Opportunities for the Hydrogen Economy for SMEs in Andalusia[114] (November 2015). Finally, hydrogen is one of the energy sources covered in the Energy Strategy of Andalusia 2020.[115]

Eleven Autonomous Communities have included hydrogen in their smart specialisation strategies (RIS3): the Basque Country, Catalonia, Andalusia, Murcia, Valencia, Aragon, Castile-la Mancha, the Canary Islands, Extremadura, the Balearic Islands and Castile-Leon.

[107] As they use an electrochemical process rather than internal combustion and are not therefore limited by the Carnot cycle, they yield better energy efficiency.
[108] Approximate ranges for passenger cars: Toyota Mirai = 550 km; Hyundai ix35 = 590 km according to NECD (New European Driving Cycle).
[109] Fuel Cells and Hydrogen Joint Undertaking (FCH JU).
[110] At 700 bar pressure a passenger car tank can be filled (5 kg) in three minutes.
[111] Cars have an average price of €50 000-60 000 (excluding VAT) and the investment needed to open a hydrogen station is up to €1.4 million depending on whether or not hydrogen is to be produced on-site hydrogen and on daily production capacity. Source: *Development Strategy for Hydrogen in Andalusia*, Agency for Innovation and Development of Andalusia (IDEA).
[112] http://aeh2.org/images/stories/PDF/estrategia%20del%20hidrogeno%20en%20andalucia.pdf
[113] http://aeh2.org/images/stories/PDF/planificacion%20del%20despliegue%20de%20las%20estaciones%20de%20servicio%20de%20hidrgeno.pdf
[114] http://aeh2.org/images/stories/PDF/AeH2_PYMES%20Andalucia_def.pdf
[115] https://www.agenciaandaluzadelaenergia.es/EEA/

EMISSIONS FROM FUEL CELL ELECTRIC VEHICLES (FCEVS)

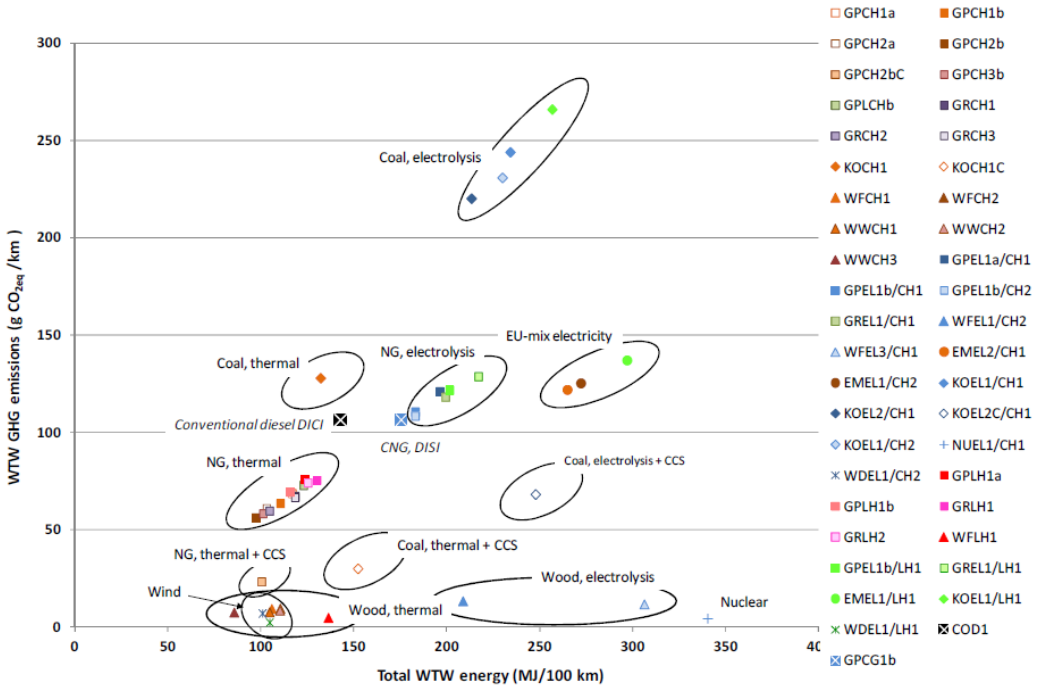
Hydrogen can also be used in internal combustion vehicles. On a tank-to-wheel basis, these vehicles emit a certain amount of NOx, but zero CO_2 or particulates. On a well-to-wheel basis, emissions could increase depending the source used to produce the hydrogen. Therefore, from an environmental point of view, hydrogen fuel cell vehicles (FCEVs) are by far the better option.

FCEVs produce zero pollutant emissions during use (from tank to wheel) since as they only give off water vapour and heat. Total well-to-wheel emissions depend solely on the method used to produce and distribute the hydrogen.

At the moment, hydrogen is mainly being produced by reforming natural gas through a thermal process. Even so, it can have a smaller carbon footprint than conventional fuels. The use of hydrogen in vehicles is even more attractive if the hydrogen is produced by electrolysis, since in this case the emissions depend on the national power generation mix. The ideal scenario would be the exclusive use of electricity from renewable sources during electrolysis, thus achieving zero total emissions.

The following graph shows the total emissions from the different processes used to obtain hydrogen:

Figure III-4. Comparison of CO_2 emissions between hydrogen vehicles and conventional fuel vehicles (diesel/petrol) for the different hydrogen production processes



Source: JRC v4.a, 2014.[116]

[116] Joint Research Centre-EUCAR-CONCAWE *Well-to-Wheels analysis of future automotive fuels and powertrains in the European context* (WELL-TO-TANK (WTT) Report) Version 4.a, 2014.

TAXATION OF HYDROGEN USED IN VEHICLES

Hydrogen is taxed when used in vehicles with internal combustion engines (ICEs), either on its own or mixed with other fuels. However, it is not currently subject to taxation when used in fuel cell electric vehicles (FCEVs).

The main characteristics of FCEVs are summarised below.

Table III-27. Characteristics of FCEVs

CHARACTERISTICS OF FCEVS	
PERFORMANCE	Unlike battery-powered electric vehicles, FCEV performance is not linked to the type of battery used to power the engine. A fuel cell is an electrochemical device whose efficiency is not subject to the Carnot cycle. It is therefore possible to increase efficiency from 20 % (conventional passenger car) to 60 % (FCEV).
DRIVING RANGE	Similar to petrol/diesel passenger cars: 550-600 km. City buses have a range of 350 km.
EMISSIONS	Zero tank-to-wheel emissions. Considering the total cycle from generation through to use on the road, emissions depend on the source of the hydrogen, although even using reformed natural gas rather than electrolysis can result in lower total emissions than conventional fuels.
PRICE	The price of this fuel is not indexed to the oil price. The main drawbacks are that the selling price of hydrogen varies greatly depending on the production process (reforming natural gas, electrolysis, etc.), and logistics. The current price at Spain's hydrogen plants is competitive with conventional technology. The cars currently on the market have a high sales price (€50 000-60 000).
REFUELLING	Passenger car refuelling time is similar to conventional counterparts (three minutes for a 5 kg tank). Spain has six hydrogen refuelling stations.
OPERATION	Hydrogen can be stored weeks without deterioration, leakage or losing its attributes. Vehicles store hydrogen at pressures between 350 and 700 bar, while at hydrogen plants it can be stored at slightly higher pressures.

Source: authors' own

III.4.2. CURRENT SITUATION

HYDROGEN VEHICLES ON THE ROADS

The only hydrogen vehicles on Spain's roads are those involved in pilot projects.[117] According to data from the Directorate-General for Road Transport (DGT), as at June 2016 11 vehicles are authorised to circulate on public roads.

Table III-28. Hydrogen vehicles on the roads (December 2012-June 2016)

HYDROGEN VEHICLES	2012	2013	2014	2015	2016 (up to June)

The following were involved in this study: the European Commission (through the JRC), the European refining sector (represented by CONCAWE, the European association of oil companies for environmental protection and health) and European vehicle manufacturers (through EUCAR, the European vehicle manufacturers' R&D association).

[117] CUTE, ECTOS, HyChain, Hércules, Delfín and ExpoAgua are the names of the main pilot projects.

Lorries up to 3 500 kg	0	0	1	0	0
Vans	0	0	1	0	0
Motorcycles	0	0	1	0	0
Passenger cars	1	2	2	2	3
Other	0	0	33	8	8
Total	**1**	**2**	**38**	**10**	**11**

Source: Directorate-General for Road Transport based on data existing at June 2016.

MANUFACTURE AND SALE OF HYDROGEN VEHICLES

Asian carmakers are the currently only ones mass-producing hydrogen-powered cars. In 2013 Hyundai launched its ix35 model, followed by Toyota with its Mirai model and, in late 2015, Honda introduced the Clarity Fuel Cell. Meanwhile European (BMW, Mercedes, Volkswagen and Audi) and American (General Motors) manufacturers have announced their plans to launch vehicles between 2017 and 2020.

EXISTING REFUELLING INFRASTRUCTURE

Spain has six hydrogen stations with varying operational status. The locations and technical characteristics of these stations are detailed below.

Table III-29. Existing hydrogen stations as at June 2016

AUTONOMOUS COMMUNITY	LOCATION	YEAR OPENED	ACCESS TYPE	OPERATED BY
Andalusia	Sanlúcar la Mayor (Seville)	2010	Open to the public	Abengoa
	Puerto de Sevilla (Seville)	2015	Open to the public	Abengoa
Aragon	Valderespartera (Zaragoza)	2008	Restricted use	Expo Zaragoza Empresarial, S.A.
	Walqa Science and Technology Park, Ctra Zaragoza-Huesca km 75 (Huesca)	2010	Open to the public	Fundación del Hidrógeno de Aragón
Castile-La Mancha	La Torrecica (Albacete)	2012		AJUSA
	Puertollano (Ciudad Real)	2016	Open to the public	CNH2

Source: AeH2.

Table III-30. Technical characteristics of existing hydrogen stations as at June 2016

LOCATION	CAN SERVICE CARS?	CAN SERVICE BUSES?	CAN SERVICE OTHER VEHICLES?	NUMBER OF PUMPS	H_2 PRODUCTION	H_2 SOURCE	DELIVERY	PRESSURE [118] (BAR)
Sanlúcar la Mayor (Seville)	Yes	Yes	Yes	1	Can be supplied with gas under pressure but also produces gas on-site using renewable electrolysis.	Renewable electrolysis	Under pressure	350
Puerto de Sevilla (Seville)	Yes	Yes	Yes	1	Can be supplied with gas under pressure but also produces gas on-site using renewable electrolysis.	Renewable electrolysis	Under pressure	350
Valderespartera (Zaragoza)	Yes	Yes	Yes	2	External supplier and on-site production		Under pressure	200-350
Walqa Science and Technology Park	Yes	Yes	Yes	2	On-site production with electrolysis using solar/wind energy	Renewable electrolysis	Under pressure	200-350
La Torrecica (Albacete)	Yes	Yes			External supplier and on-site production			350
Puertollano (Ciudad Real)	Yes	No	Depending on tank	1	On-site production with electrolysis using solar energy	Solar	Under pressure	350

Source: AeH2.

A project entitled H2PiyR, funded by the Spain-France-Andorra Cross-Border Cooperation Programme (POCTEFA INTERREG V-A) set up by the European Commission to promote sustainable development in the border territories between the three countries, will commence in the second half of 2016. This project aims to develop a cross-border corridor of hydrogen stations, connecting the regions of the POCTEFA area (Spain, Andorra and France).

Under this project four hydrogen stations will be built in Spain (Zaragoza, Huesca city, Fraga (Huesca) and Tarragona), one in Andorra and one in France (Palmiers). These six new hydrogen stations will join the two already built in Aragon (at the 75 km point on the Zaragoza-Huesca trunk road and in Zaragoza-Valdespartera) and the two that are currently being built in southern France (Rodez and Albi). At least sixteen fuel cell vehicles (six cars, eight lorries and two buses) will also be piloted in this project. The bodies involved in the project foresee the extension of this corridor into Spanish territory, and so could seek co-financing through other European programmes (Horizon 2020/FCH-JU and CEF Mechanism).

[118] The new international technical standards issued by the Society of Automotive Engineers (SAE) for hydrogen stations require hydrogen to be stored at 700 bar.

III.4.3. MARKET FORECASTS AND OBJECTIVES

MARKET OPPORTUNITIES

The outlook for FCEVs in Spain is optimistic given the opportunities identified, details of which are as follows:

Table III-31. Opportunities presented by the use of hydrogen fuel cells in road transport

OPPORTUNITIES PRESENTED BY THE USE OF HYDROGEN FUEL CELLS (FCEVS)	
INDUSTRIAL OPPORTUNITY	Encouraging manufacturers to increase the range of vehicles and components/equipment — (1) hydrogen storage tanks, (2) electrolysers (3) fuel cells (4) industrial equipment for renewable energy, etc. — on offer. Making use of synergies with battery electric vehicles as the propulsion system is similar.
ENERGY OPPORTUNITY	Hydrogen can be produced locally and from renewable sources. Hydrogen generation from renewable sources: (1) reduces dependency on imported energy, (2) improves the management of intermittent sources (wind and solar power) and (3) allows hydrogen to be produced locally from a renewable source via electrolysis. Reforming natural gas is the system traditionally used to produce hydrogen in Spain, but to ensure sustainability it should be produced by electrolysis using electricity from renewable sources.
ENVIRONMENTAL OPPORTUNITY	Zero emissions from tank to wheel. If renewable energy is used to produce the hydrogen, there will also be zero emissions from generation to wheel.

Source: authors' own

HYDROGEN REFUELLING INFRASTRUCTURE IN SPAIN

Hydrogen is recognised as an excellent choice for shifting the Spanish transport sector towards the use of renewable energy, local fuel production, energy efficiency and sustainability.

Both local authorities and the private sector have a key role to play in promoting hydrogen in Spain. In municipalities with high levels of pollution, turning to hydrogen is an interesting option for city councils as they replace their municipal vehicles, particularly those used for public services. The high initial investment required to establish refuelling infrastructure means it is necessary to seek out synergies in the production of hydrogen (either on-site or at plants) with the businesses that are habitual consumers of hydrogen and future hydrogen station operators.

Hydrogen mobility in Spain will begin with the six existing hydrogen stations and four additional stations planned for construction as part of project H2PiyR (POCTEFA-INTERREG initiative). Gradual expansion is expected, starting with areas in which demand is greatest, with the private sector having already expressed an interest in investing in those areas in order to achieve the desired national coverage. The ten hydrogen stations already planned will allow pilot projects to be carried out in real-life environments, as well as allowing us to assess the feasibility on connections with the other EU countries via France. The aim will be to serve specific market niches (public buses, taxis, company fleets, etc.), giving us a model on the basis of which to define future initiatives under a strategy to establish hydrogen infrastructure nationwide.

A multidisciplinary working panel is currently being set up to prepare the starting points for the future deployment of hydrogen infrastructure. This group is expected to start work in the autumn of 2016. Its intended composition is as follows: private companies representing the entire hydrogen value chain; technology centres; the Ministry of Industry, Energy and Tourism; the Ministry of Transport and Infrastructure; and any local and regional authorities interested in taking part. As part of its programme, this working group

should encourage the creation of a consortium to draw up a project for infrastructure to be built by private investors, which could seek co-financing from EU funds (FCH-JU and/or CEF).

Based on the foregoing, preliminary estimates currently suggest that we can expect to have approximately 500 FCEVs on Spanish roads and 20 hydrogen stations by 2020.

III.5. BIOFUELS

III.5.1. INTRODUCTION

EMISSIONS FROM VEHICLES POWERED BY BIOFUELS[119]

When discussing pollutant emissions, we must make a clear distinction between biofuels from food crops (first-generation biofuels) and biofuels produced from waste or other raw materials not grown on farmland, such as algae (advanced biofuels).

The use of biofuels instead of fossil fuels reduces greenhouse gas emissions throughout the life cycle of the fuel. However, an accurate analysis must take into account extraction, direct land use change, indirect land use change (ILUC), use of agrochemicals, transportation, refining, etc. Thus, first-generation biofuels can produce considerable emissions in the extraction and production processes. The table below shows the values for the main types of biofuels, excluding ILUC emissions.

Table III-32. Typical GHG emission reductions brought by using biofuels instead of conventional fuels (Directive 2009/28/EC on the promotion of the use of energy from renewable sources)

BIOFUEL TYPE	TYPICAL VALUES
Sugar beet ethanol	61 %
Wheat ethanol (natural gas as process fuel in conventional boiler)	45 %
Sugar cane ethanol	71 %
Rape seed biodiesel	45 %
Sunflower biodiesel	58 %
Soybean biodiesel	40 %
Waste oil biodiesel	88 %
Biogas from municipal organic waste as compressed natural gas	80 %

Source: Ministry of Agriculture, Food and Environment, based on Directive 2009/28/EC on the promotion of the use of energy from renewable sources.

As the table shows, biofuels from agricultural raw materials typically emit between 40 and 70 % less greenhouse gases than conventional fuels (diesel/petrol). This reduction is increased to at least 80 % when the biofuel is made from oils, fats or organic animal waste. These reductions do not take into account potential net carbon emissions due to indirect land use changes (ILUC).

[119] Unless otherwise stated, all information in this section was provided by the Ministry of Agriculture, Food and Environment.

If we take net carbon emissions due to ILUC into account, first-generation biodiesel offers hardly any net reduction (and in some cases could even represent a net emission), while first-generation bioethanol offers a net reduction of between 30 and 45 %. However, there is still much scientific uncertainty in the assessment of the ILUC effect.

The table below lists the ILUC values for the first-generation biofuels covered by Directive (EU) 2015/1513 of 9 September 2015 amending Directive 98/70/EC, relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources.

Table III-33. ILUC emissions of first-generation biofuels (Directive 2015/1315)

RAW MATERIAL	MEAN (GR CO_2/MJ)*	RANGE
Cereals and starch-rich crops	12	8 to 16
Sugars	13	4 to 17
Oil crops	55	33 to 66
* Total emissions per unit of energy from conventional fuels are approximately 90 g CO_2/MJ. * Values between the 5th and 95th percentiles		

Source: Ministry of Agriculture, Food and Environment, based on Directive (EU) 2015/1513

Most greenhouse gas emissions from first-generation biofuels are produced outside Spain from crops located in Latin America or Asia.

Under Article 17 of Directive 2009/28/EC, as amended by Directive 2015/1513, the greenhouse gas emissions from biofuels produced in facilities that were operational before 5 October 2015 must be reduced by at least 35 % by 31 December 2017 and by at least 50 % as of 2018, and the emissions from biofuels produced in facilities commencing operations as of 5 October 2015 must be cut by at least 60 %.

Turning to air pollutants, the use of biofuels considerably reduces emissions of particulate matter (by up to 47 %) and carbon monoxide (up to 20 %). While nitrogen oxide (NO_X) emissions can be reduced by using bioethanol, they can be increased by the use of biodiesel (up to 9 % depending on operating conditions), although this can be mitigated by fine-tuning the engine.[120]

Adding bioethanol to petrol also increases its octane rating and improves engine efficiency, making it possible to replace the other carcinogen-containing additives commonly used for this purpose, benzene for example.[121]

The biofuels consumed in the European Union meet strict sustainability criteria that ensure emission reduction and full respect for the environment.

FUEL ECONOMY IN VEHICLES POWERED BY BIOFUELS

Biofuels have a lower energy content than conventional fuels (petrol and diesel), meaning that more fuel is needed to cover the same distance. While petrol and diesel have an energy content of 0.7643 toe/m³ and 0.8598 toe/m³ respectively, the values for ethanol and biodiesel are 0.5016 toe/m³ and 0.7882 toe/m³, respectively.

[120] Lapuerta M, et al. *Effect of biodiesel fuels on diesel engine emissions*; Progress Energy Combust Sci, 2007.
[121] *Meta□analysis for an E20/25 technical development study □ Task 2: Meta□analysis of E20/25 trial reports and associated data*; Technische Universität Wien & IFA, 2014.

TAXATION OF BIOFUELS

The ten-year period for which biofuels were covered by a special rate (0 %) for the Hydrocarbon Tax ended on 1 January 2013. Biofuels are now subject to the same tax rate as the fossil fuels they replace or with which they are mixed (diesel and petrol).

The main characteristics of vehicles powered by biofuels are summarised below.

Table III-34. Characteristics of vehicles powered by biofuels

MAIN CHARACTERISTICS OF VEHICLES POWERED BY BIOFUELS	
PERFORMANCE	Same performance values as the fossil fuels that are mixed with or replaced by biofuels. Biofuels are suited for the same uses as the fuels with which they are mixed or which they replace.
DRIVING RANGE	Vehicles powered by biofuels achieve the same driving range as on the conventional fuels with which biofuels are mixed or which they replace.
EMISSIONS	Particulate and carbon monoxide (CO) emissions are reduced. Using potentially polluting waste (used frying oil, industrial waste fats or solid waste) to make biofuels allows us to recover energy from such waste prevents them from being released into the environment. However, to reduce net emissions the GHG emissions associated with the biofuel manufacturing process must be kept in check. As NO_X emissions are not naturally reduced, additional catalytic reduction systems are required. Biogas from municipal waste has a high sulphur content and low methane concentration so additional desulphurisation and concentration processes are necessary.
PRICE	According to the CNMC, in 2015 the average difference between the price of sustainable biodiesel and the price of diesel was $318 per tonne and the average difference between the price of bioethanol and the price of petrol was $202.9 per tonne. For end users, the retail price of blends with a low biofuel content is similar to the price of conventional fuels.
REFUELLING	Biofuel does not need specific refuelling infrastructure, as the most suitable way to supply it is to mix it in with petrol or diesel. Users do not need to change their refuelling habits. Currently only 0.9 % of service stations offer blends with a high biofuel content (87 stations offer biodiesel and only 13 offer bioethanol).
OPERATION	The operational procedures are the same as those for the fuel replaced by or mixed with biofuels.

Source: authors' own

III.5.2. CURRENT SITUATION

BIOFUEL-POWERED VEHICLES ON THE ROADS AND NEW REGISTRATIONS

Generally all diesel vehicles marketed in Spain are guaranteed to run on a blend of up to 7 % of biodiesel by volume (B7). Meanwhile, vehicles with petrol engines manufactured before 2000 are usually only guaranteed to run on a blend of up to 5 % bioethanol by volume (E5) while those manufactured as of 2000 are compatible with petrol containing up to 10 % bioethanol by volume (E10).

Many manufacturers offer vehicles that can use fuel containing a higher proportion of biodiesel or bioethanol, so it is always necessary to consult the manufacturer's technical specifications.

Currently there are no official figures for the number of vehicles compatible with blends with higher concentrations than E10 or B7, or registrations of such vehicles.[122]

EXISTING REFUELLING INFRASTRUCTURE

All normal diesel pumps at Spanish service stations can supply blends with up to 7 % biodiesel by volume (B7), so whenever a vehicle is filled with diesel, some biodiesel is being consumed. Moreover, 87 service stations are offering blends containing a higher biodiesel content or pure biodiesel.[123] These are specifically labelled with the letter B for biodiesel and the percentage composition.

Similarly, all petrols sold in Spain for automotive use can contain up to 5 % bioethanol by volume, so whenever a vehicle is filled with petrol, some bioethanol is being consumed. Moreover, 13 service stations are offering petrol blends containing up to 85 % bioethanol by volume.[124] These are specifically labelled with the letter E for bioethanol and the percentage composition.

Pumps must be labelled with the biofuel content of the fuel they deliver. Although proportions are not standardised, the possible options are as follows:

[122] The Directorate-General for Road Transport (DGT) is responsible for publishing statistics on motor vehicles.
[123] Source: Geoportal of the Ministry of Industry, Energy and Tourism As at 1 July 2016.
[124] Source: Geoportal of the Ministry of Industry, Energy and Tourism As at 1 July 2016.

Table III-35. Possible blends of biofuels used in motor vehicles

BIOETHANOL		BIODIESEL	
E5	up to 5 % bioethanol and 95 % petrol	**B7**	up to 7 % biodiesel and 93 % diesel
E10	10 % bioethanol and 90 % petrol	**B10**	10 % biodiesel and 90 % diesel
E15	15 % bioethanol and 85 % petrol	**B30**	30 % biodiesel and 70 % diesel
E85	85 % bioethanol and 15 % petrol	**B100**	100 % biodiesel

Source: authors' own

The number of service stations offering blends with a higher biofuel content (E5 and B7) has dropped significantly from 500 in 2011 to 100 today, representing 0.9 % of all Spanish service stations.[125][126] This decrease is the result of two factors: the abolition, in late 2012, of the exemption for biofuels in hydrocarbons tax; and the reduction in mandatory levels of biofuels in motor fuels from the 6.5 % set for 2012 to 4.1 % in 2013, 2014 and 2015 (both figures calculated in energy terms).

Companies supplying biofuels at refuelling stations must report data to the Ministry of Industry, Tourism and Trade in accordance with Ministerial Order ITC/2308/2007 of 25 July 2007 on the reporting of activities related to the supply of petroleum products. The Ministry of Industry, Energy and Tourism's Geoportal ensures that users in Spain are provided with relevant, clear and consistent information on the location and price of all refuelling points for biofuels as required by Article 7(7) of Directive 2014/94/EU. The Andalusian Public Energy Agency has also published a map of service stations supplying biofuels in Andalusia.[127]

III.5.3. MARKET FORECASTS AND OBJECTIVES

MARKET OPPORTUNITIES

The outlook for biofuels in Spain is optimistic given the opportunities identified, details of which are as follows:

- Biofuels are currently the leading form of renewable energy used in transport, helping us to meet the target laid down in Directive 2009/28/EU for fuels used in transport to use 10 % of energy from renewable sources by 2010.
- Compatibility with petrol and diesel engines: All vehicles on Spain's roads today can use the B7 and E5 blends. Many manufacturers assure that their vehicles will function with more biofuel-heavy blends, so it is always necessary to consult the vehicle specifications.
- Compatibility with existing refuelling infrastructure and distribution for petrol and diesel: Biofuels can be supplied at existing service stations and therefore do not require any new distribution and supply infrastructure to be built.
- Using biofuels can lead to a reduction in net greenhouse gas emissions; it is, however, necessary to take the full cycle of extraction and direct and indirect land use changes into account.

[125] According to the CORES 2015 Annual Statistical Report, compiled using data from AOP, UPI and sector companies in 2015 Spain had 10 947 fuel outlets (petrol and diesel).

[126] The low number of service stations that selling more biofuel-heavy blends contrasts with the situation in other countries such as France, Germany, Sweden (where 10 % of cars on the roads are powered by biofuel) or Finland. Details of the 100 service stations that sell blends with a higher biofuel content than E5 and B7 are provided in Annex B.

[127] https://www.agenciaandaluzadelaenergia.es/ciudadania/energia-andalucia/cartografia-energetica/mapa-suministro

- Regarding air quality in large urban agglomerations, biofuel use reduces particulate and CO emissions. Specifically bioethanol reduces NO_X emissions.
- Obtaining fuel from biomass also allows us to make use of waste material (used frying oil, municipal solid waste, etc.).
- In 2015 biofuels were manufactured at 36 industrial plants in Spain: 32 producing biodiesel and four bioethanol, utilising installed capacity at respective rates of 26 % and 100 %.
- The growth of the biofuels industry can generate investment and employment, particularly in rural areas, by encouraging the creation of different agricultural industries.[128]
- Biofuels offer the same range and refuelling time as conventional fuels.
- Biofuels are highly biodegradable: spills are naturally eliminated within 21 days on average, with limited hazard and toxicity to the environment.

Table III-36. Opportunities presented by the use of biofuels in road transport

OPPORTUNITIES PRESENTED BY THE USE OF BIOFUELS IN ROAD TRANSPORT	
INDUSTRIAL OPPORTUNITY	Increasing demand will make it possible to consolidate the associated production of biofuels, which currently already has sufficient capacity (4.1 million tonnes per year) to meet current and projected industry consumption. There are 36 industrial plants (32 for biodiesel and 4 for bioethanol), combining experience and competitiveness. Advanced biofuel technologies are being developed, with great future prospects.
ENERGY OPPORTUNITY	Biofuels allow us to increase the use of renewable energy in transport, helping to comply with Directive 2009/28/EU.
ENVIRONMENTAL OPPORTUNITY	Emissions of greenhouse gases, particulates and CO are reduced. Use of bioethanol reduces NO_X emissions. Biofuel production makes use of waste. Renewable source.

Source: authors' own

MANDATORY SALES AND/OR CONSUMPTION TARGETS

The consumption of biofuels in Spain is supported primarily by the legally established minimum mandatory targets for sale or consumption of biofuels for transport purposes. The targets currently in force (for the period 2016-2020) are established in Royal Decree 1085/2015 of 4 December 2015 on the promotion of biofuels. These targets are expected to be reached by:

- Mixing biodiesel into fossil diesel at 7 % by volume (B7) and bioethanol into fossil petrol at 5 % by volume (E5), since all the cars on Spain's roads are guaranteed to work with these blends without any need for engine adaptations. Spain does not therefore expect growth in the use of blends labelled as having a greater biofuel content than E5 and B7, as technical specifications for motor fuels with higher biofuel contents are not being developed.
- The use of biofuels made from raw materials counted twice as per Annex IX of Directive 2009/28/EC.
- The use of hydrotreated vegetable oil (HVO diesel).

[128] 75 % of the biofuels consumed in the European Union (EU) are produced inside the EU, mainly using primary materials grown or generated in Europe. Source: *Renewable energy progress*, European Commission (2015).

Therefore, this National Policy Framework maintains the quantitative targets established by Royal Decree 1085/2015 of 4 December 2015 on the promotion of biofuels, as listed below.

Table III-37. Market trend up to 2020 based on mandatory targets for biofuels

	2016	2017	2018	2019	2020
Mandatory biofuel sales and/or consumption targets (%)	4.3 %	5 %	6 %	7 %	8.5 %

Source: Royal Decree 1085/2015 of 4 December 2015 on the promotion of biofuels.

Attention is drawn to Article 7(a) of Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce of greenhouse gas emissions and amending Council Directive 1999/32/EC as regards the specification of fuel used by inland waterway vessels and repealing Directive 93/12/EEC. That Article required life-cycle greenhouse gas emissions per unit of energy supplied by fuels to be cut by 6 % by 2020. To this end, Council Directive 2015/652 of 20 April 2015 laying down the calculation methods and reporting requirements pursuant to the aforementioned Directive 98/70/EC must be transposed by 21 April 2017.

Indeed, one of the options for achieving these emission reductions, along with the use of alternative fuels and reducing emissions during production (upstream emissions reduction or UER) is to use biofuels in amounts that could increase their percentage penetration to even higher levels than those stated. This depends on the technical solutions chosen by operators and the transposition of the Directive, which is currently in progress.

III.6. MEASURES AT NATIONAL LEVEL

Three Main Priorities have been selected in order to design specific measures that implement the New Energy Vehicle Promotion Strategy:

- **Priority I - Market.** Initiatives that drive demand in order to increase the range on offer and promote economies of scale.
- **Priority II - Infrastructure.** Initiatives to promote an infrastructure network that meets users' mobility needs.
- **Priority III - Industrialisation.** Initiatives encouraging the creation of an industry for NEVs and the associated supply points, with the aim of placing Spain at the forefront of these technologies.

These three areas are linked by the Cross-cutting Priority - Regulatory Framework through which legislation and tax breaks are put in place to ensure continuity and stability for all initiatives, making it possible to provide certainty to the market, to investors in infrastructure and to the drivers of industrialisation. Within the Priority Areas, **six specific action areas** have been defined:

In Priority I - Market.
- Area I: Acquisition of new energy vehicles
- Area II: Raising the profile of alternative fuels

In Priority II - Infrastructure.
- Area III: Refuelling infrastructure

In Priority III - Industrialisation.
- Area IV: Promoting industrialisation and RDI

In the 'Regulatory Framework' cross-cutting priority
- Area V: Legislation
- Area VI: Tax incentives

In total, 38 **Promotional Measures** encouraging the use of alternative fuels in road transport are in place at central government level. Their relationship with the priorities and areas of operation are detailed out below.

MARKET	**ACQUISITION OF NEW ENERGY VEHICLES**	
	MK-1	MOVEA Plan-acquisition
	MK-2	Agreement to improve financing terms for NEV purchases
	MK-3	Climate projects
	MK-4	Environment action plans
	RAISING THE PROFILE OF ALTERNATIVE FUELS	
	DC-1	MOVEA website
	DC-2	Zero, Eco, C and B labels
	DC-3	Participation in the European Alternative Fuels Observatory
	DC-4	Practical courses on driving NEVs
	DC-5	Courses for the haulage industry on NEVS
INFRASTRUCTURE	IFR-1	MOVEA Plan-infrastructure
	IFR-2	Promoting participation in the INTERREG programme

	IFR-3	Promoting participation in project of common interest within the TEN-T networks
	IFR-4	Financial support for municipal authorities for installing supply infrastructure
	IFR-5	Installation of electric vehicle charge points at railway stations and airports
	IFR-6	Spanish-Portuguese-French electric vehicle promotion initiative
	IFR-7	Obligation to install charging infrastructure under Complementary Technical Instruction BT52
INDUSTRIALISATION	FIDi-1	Innovative Business Groups programme
	FIDi-2	RDI lines linked to alternative fuels
	FIDi-3	Incentives for participation in Joint Technology Initiatives and PPPs at European level
	FIDi-4	National Smart Cities Network
	FIDi-5	Promoting Technology Platforms for NEV development
	FIDi-6	Promoting research centres and infrastructure for NEV development
	FIDi-7	Reindustrialisation and industrial competitiveness programme

REGULATORY FRAMEWORK	**LEGISLATION**	
	NR-1	Charge managers Analysis of how the defined role meets market requirements
	NR-2	Super-off-peak electricity tariff
	NR-3	Electric vehicle charging infrastructure, Complementary Technical Instruction BT52
	NR-4	Analysis of tolls for charging points
	NR-5	Authorisation to install charging points in residential buildings
	NR-6	Exemption from limits for chauffeur-driven car hire permits
	NR-7	Registration of vehicles authorised with higher gross vehicle weight ratings
	NR-8	Permission to use high-occupancy vehicle (HOV) lanes
	NR-9	Mandatory biofuel targets
	NR-10	Inclusion of environmental criteria in the tendering of public transport services
	NR-11	Inclusion of NEVs in the catalogue of vehicles for the Public Authority Fleet Replacement Agreement
	NR-12	Participation in technical committees on standardisation (ISO, CEN/CENELEC and AENOR).
	TAX INCENTIVES	
	IF-1	Road tax rebates
	IF-2	Car registration tax rebates
	IF-3	Personal income tax reduction applicable to benefits in-kind

MARKET PRIORITY

ACQUISITION OF NEW ENERGY VEHICLES

MK-1	MARKET	ACQUISITION OF NEW ENERGY VEHICLES	
MOVEA Plan-acquisition		Royal Decree 1078/2015 of 27 November 2015 on the MOVEA Plan, and subsequent legislation	Ministry of Industry, Energy and Tourism-Directorate-General for Industry and SMEs

AIM: To subsidise the **purchase of new energy vehicles**

DESCRIPTION: The Plan for Sustainable Mobility using New Energy Vehicles (the MOVEA Plan) boosts the market by granting direct aid for the purchase of new energy vehicles (NEVs). There are incentives for all vehicle types. The purchase of commercial vehicles is particularly emphasised with a view to facilitating the addition of NEVs to the fleets operated by public and private enterprises, particularly SMEs and self-employed traders. The aim is for companies to better understand the benefits of these vehicles, not only in terms of the total cost of use but also in terms of institutional reputation.

This new plan launched in 2016 unifies the pre-existing central government subsidies (under the MOVELE Programme and the Environment and Air Action Plan), ensuring continuity in Spain's commitment to sustainable mobility. Approximately €37 million euros were awarded for the purchase of electric vehicles under the Programme to Boost Demand for Electric Vehicles (MOVELE), framed within the 2014-2020 New Energy Vehicle Comprehensive Promotion Strategy, which was operational until 2015. The Environment and Air Action Plan (PIMA-Aire) aimed to reduce emissions of air pollutants, primarily particulates and CO_2, by replacing the commercial vehicles on Spain's roads with more efficient and environmentally friendly models available on the Spanish market. This Plan was in effect for four cycles and the associated budget was €54 million.

For 2016, the MOVEA Plan has a total budget of €16.6 million for the purchase of NEVs. The beneficiaries of this aid may be private individuals, sole traders, private companies, local authorities, Autonomous Communities and central government bodies. The categories of vehicles eligible for such aid are: quadricycles, passenger cars, large and small vans, coaches, buses, lorries and motorcycles. The amount of aid depends on the vehicle category and the technology driving it.

Whether this Plan can continue to run in the future and the assigned budget will be conditioned by budgetary stability targets and by an ongoing assessment of the need for the Plan and its economic impact.

IMPACT: Increases the number of new energy vehicles for all types of beneficiaries and vehicle categories.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

MK-2	MARKET	ACQUISITION OF NEW ENERGY VEHICLES	
Agreement to improve financing terms for NEV purchases		Cooperation agreement	Ministry of Industry, Energy and Tourism-Directorate-General for Industry and SMEs-CERSA
AIM: To encourage the purchase of new energy vehicles by improving financing			
DESCRIPTION: In 2013, CERSA (Compañía Española de Reafianzamiento, S.A., a State-owned enterprise under the Ministry of Industry) signed a cooperation agreement with automotive industry associations (ANFAC, ANIACAM, FACONAUTO and GANVAM) to improve the financing conditions offered to sole traders and SMEs enterprises in hte purchase of passenger and commercial vehicles. This agreement facilitates the financing of new energy vehicles backed by the 23 mutual guarantee schemes.			
IMPACT: Replacement of SMEs' and sole traders' vehicles by NEVs			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

MK-3	MARKET	ACQUISITION OF NEW ENERGY VEHICLES	
Climate projects		Annual calls for funding	Ministry of Agriculture, Food and the Environment
AIM: To grant aid for low-carbon growth, consolidating a sustainable and innovative economy			
DESCRIPTION: The Climate Projects are initiatives carried out in non-ETS sectors (agriculture, transport, residential and waste) to encourage low-carbon activities. The certified reductions in carbon achieved by the approved projects are purchased by the Carbon Fund for a Sustainable Economy (FES-CO_2), thus contributing to their financial viability. The aim of FES-CO_2 is to promote low-carbon growth, consolidating a sustainable and innovative economy that creates jobs and wealth in sectors associated with action for climate change and whose activity is not regulated by the Sustainable Economy Act (Act 2/2011). Among the projects, there is a specific activity programme for mobility using electric vehicles. In the 2016 call for applications, a total budget of €20 million is available and each tonne of CO_2 reduction is quantified at €9.70. A specific programme has been created to promote the installation of charging infrastructure.			
IMPACT: Replacement of conventional vehicles from the fleets of companies or municipal authorities with electric vehicles and installation of charging points			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

MK-4	MARKET	ACQUISITION OF NEW ENERGY VEHICLES
Environment action plans	Annual calls for applications published by Royal Decree Royal Decree 1007/2015 Royal Decree 1081/2014	Ministry of Agriculture, Food and the Environment-Ministry of Infrastructure and Transport Private sector

AIM: To grant aid for scrapping vehicles and encourage their replacement.

DESCRIPTION: The Environment Plans ('PIMA') are a way of encouraging concrete measures that contribute to improving environmental conditions. The different proposed PIMAs also have a positive effect on economic development and job creation. Some highlights are:

- PIMA Business: an initiative aimed at reducing direct emissions of greenhouse gases (GHGs) by businesses. The beneficiaries of this incentive are companies committed to the carbon footprint scheme and listed in the Carbon Footprint, Compensation and CO_2 Absorption Project Register. PIMA Business finances 15 % of investments in reducing CO_2 emissions by companies listed on the Carbon Footprint Register, up to a ceiling of 150 000 euros.
- PIMA Transport: The Ministry of Agriculture, Food and Environment provides direct aid for the replacement of buses and heavy goods vehicles With the heavy goods vehicles and passenger buses on the roads today getting older and older, it makes sense to grant aid for retiring aged vehicles from service. This plan includes incentives for the scrapping of buses and freight vehicles with independent towing capacity of more than 3.5 tonnes gross vehicle weight and which are more than eight years old. The aim is to shift the transportation of goods or passengers to heavy-duty vehicles with lower emission levels of CO_2 and air pollutants, such as new energy vehicles.

IMPACT: The replacement of conventional vehicles from companies' and sole traders' fleets with NEVs. The PIMA Transport plan pays particular attention to heavy goods vehicles.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

RAISING THE PROFILE OF ALTERNATIVE FUELS

DC-1	MARKET	RAISING THE PROFILE OF ALTERNATIVE FUELS	
MOVEA website		New Energy Vehicle (NEV) Promotion Strategy	Ministry of Industry, Energy and Tourism-Directorate-General for Industry and SMEs Ministry of Industry, Energy and Tourism-Institute for Energy Diversification and Saving

AIM: To encourage institutional communications on NEVs

DESCRIPTION: Spain has put together a Plan for Institutional Communications on New Energy Vehicles, which includes the following activities:

- Design of 'VEA' [Spanish for NEV] and 'MOVEA' branding. Both come with a manual for using the branding in different formats, which serves as a guide for manufacturers and associations.
  - VEA branding has been designed to be used as an umbrella term encompassing all new energy vehicles, with variations for each technology (electric, NG, LPG, hydrogen and biofuel).
  - MOVEA includes plans to boost sustainable mobility.
- MOVEA has a website (http://www.moveaplan.gob.es/) which aims to provide potential users with a complete overview of each alternative fuel, including technical aspects such as the complete catalogue of vehicles, the location of charging and/or refuelling points for alternative fuels, the current fleet, etc.
- Different communication strategies are being put carried out to promote the incentives for alternative fuels through participation in conferences targeting the various stakeholders in sustainable mobility (local and regional public authorities, professional associations, industry clusters and the general public). Different strategies have been created according to the needs of each stakeholder.

IMPACT: The MOVEA website makes it possible to present the benefits of new energy vehicles to society, as well as giving visibility to the different measures to boost NEVs.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

DC-2	MARKET	RAISING THE PROFILE OF ALTERNATIVE FUELS	
Zero, Eco, C and B labels		Decision of the Directorate-General for Road Transport dated 13 April 2016	Directorate-General for Road Transport

AIM: To facilitate the identification of new energy vehicles

DESCRIPTION: The Decision of the Directorate-General for Road Transport dated 13 April 2016 (published in the Official State Gazette on 21 April 2016) created four labels that categorise vehicles by their environmental impact in terms of local pollutant emissions. These environmental labels classify and grade 50 % of the vehicles on the roads in Spain.

The reason for categorising vehicles is to ensure the positive discrimination of more environmentally friendly vehicles. It is also intended to aid the application of municipal initiatives to restrict traffic during peak pollution periods, policies to promote new technology through tax benefits, and mobility and environment policies.

Displaying the label is voluntary. However, since it allows the least polluting vehicles to be identified quickly, it is recommended that the label be displayed in the lower right corner of the front windscreen, or in the absence of a front windscreen, on any visible part of the vehicle. The labels come in the form of circular stickers, with different colours for the different categories and amount of local emissions. They include a QR code with information about the registration year, make, model, fuel, electric category and range,

EURO emissions and rating for tax purposes. The label number, vehicle registration number and power source are also stated.

Since April 2015 the owners of vehicles producing 'zero local emissions' have received 'ZERO' labels. This category is applicable to the following types of vehicle from the L, M1, N1, M2, m³, N2 and N3 categories of the Register of Vehicles:

- Battery electric vehicles (BEVs)
- Extended-range electric vehicles (EREVs)
- Plug-in hybrid electric vehicles (PHEVs) with a a range of 40 km in electric-only mode
- Fuel cell electric vehicles (FCEVs)
- Hydrogen internal combustion engine vehicles (HICEVs)

The scheme is to be extended to the following categories from the second half of 2016:

'ECO':
- M1- and N1-category vehicles listed in the Register of Vehicles as plug-in hybrids with range <40 km, non-plug-in hybrids (HEVs), and compressed natural gas (CNG) or liquefied petroleum gas (LPG) vehicles. In all cases, they must meet the requirements for the 'C' label.
- M2-, M3, N2- and N3-category vehicles listed in the Register of Vehicles as plug-in hybrids with range <40 km, non-plug-in hybrids (HEVs), and compressed natural gas (CNG), liquefied natural gas (LNG) or liquefied petroleum gas (LPG) vehicles. In all cases, they must meet the requirements for the 'C' label.

'C':
- M1- and N1-category vehicles listed in the Register of Vehicles as petrol EURO 4/IV, 5/V or 6/VI or diesel EURO 6/VI.
- M2-, M3- N2- and N3-category vehicles listed in the Register of Vehicles as petrol Euro VI/6 or diesel Euro VI/6.

'B':
- M1- and N1-category vehicles listed in the Register of Vehicles as petrol EURO 3/III or diesel EURO 4/IV or 5/V.
- M2-, M3- N2- and N3-category vehicles listed in the Register of Vehicles as petrol Euro IV/4 or V/5 or diesel Euro IV/4 or V/5.

IMPACT: These labels allow NEVs to be identified, a very useful tool for carrying out initiatives to encourage their use.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

DC-3	MARKET	RAISING THE PROFILE OF ALTERNATIVE FUELS
Participation in the European Alternative Fuels Observatory		Directorate-General for Industry and SMEs-Ministry of Industry, Energy and Tourism Directorate-General for Road Transport Institute for Energy Diversification and Saving

AIM: To set up information platform for monitoring alternative fuels in the EU

DESCRIPTION: The European Alternative Fuels Observatory was created by the European Commission to be the central point of reference for statistical data, information and news about alternative fuels in transport in Europe. The Observatory helps support market development in the European Union and is a key tool for the implementation of Directive 2014/94/EU on the deployment of alternative fuels infrastructure.

The Observatory is currently compiling all relevant statistical data on vehicles and infrastructure, legislation, support and incentive programmes, regularly presenting analysis and general information, such as news and publications. To this end, the Directorate-General for Road Transport and the Directorate-General for Industry and SMEs have formed a working panel to ensure a coordinated provision of information to the Observatory by Spain.

IMPACT: The EAFO statistical data from the EU Member States to be compiled and consolidated.				
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

DC-4	MARKET	RAISING THE PROFILE OF ALTERNATIVE FUELS	
Practical courses on driving NEVs			Directorate-General for Road Transport
AIM: To inform future drivers about NEV technology			
DESCRIPTION: The Directorate-General for Road Transport is encouraging driving schools to provide practical training on driving new energy vehicles (NEV) and efficient driving.			
IMPACT: This training raises awareness of NEVs among younger drivers, who are more likely to adopt new technologies.			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

DC-5	MARKET	RAISING THE PROFILE OF ALTERNATIVE FUELS	
Courses for the haulage industry on NEVS			Ministry of Infrastructure and Transport
AIM: To improve the training of road haulage industry professionals			
DESCRIPTION: Within the scope of the support for professional training in the passenger transport and haulage industries, the Ministry of Infrastructure and Transport offers specific aid for the haulage sector to help fund courses and seminars on topics of interest to the sector with the aim of improving the training of its professionals. As of 2016, courses and seminars on the use of alternative fuels in the road haulage industry are to be considered are topics of interest to the sector and will therefore fall within the scope of the aid.			
IMPACT: This measure makes it possible to provide specific training for the road haulage sector, in particular on the topic of alternative fuels.			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

INFRASTRUCTURE PRIORITY

REFUELLING INFRASTRUCTURE

IFR-1	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
MOVEA Plan-infrastructure		Royal Decree 1078/2015 of 27 November 2015 on the MOVEA Plan, and subsequent legislation	Ministry of Industry, Energy and Tourism-Private sector
AIM: To promote the installation of fast and semi-fast electric vehicle charging points in public locations, with a view to encouraging the installation of the infrastructure needed to ensure growth in the use of electric vehicles and the corresponding charging points at private homes and businesses.			
DESCRIPTION: The MOVEA Plan includes aid for the installation of fast and semi-fast electric vehicle charging points in public locations. This aid can be accessed by private companies, local authorities and Autonomous Communities. The plan also requires vendors to facilitate the installation of charging points specifically for the buyer. Whether this Plan can continue to run in the future and the assigned budget will be conditioned by budgetary stability targets and by an ongoing assessment of the need for the Plan and its economic impact.			
IMPACT: The installation of EV charging points can be encouraged through the MOVEA plan.			

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

IFR-2	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
Promoting participation in the INTERREG programme		INTERREG	Ministry of Finance and Public Authorities-Directorate-General for EU Funds
AIM: The Directorate-General for EU Funds encourages Spanish bodies to take part in the EUROPE INTERREG programme.			
DESCRIPTION: This is a programme for the exchange of experiences and knowledge with the aim of improving regional development policies, mainly European regional programmes for Investment in Growth and Jobs. To this end, the programme prioritises four thematic goals, focusing on: promoting research and innovation; competitiveness of SMEs; the transition to a low-carbon economy; and environmental protection and efficient use of resources where Spanish regional alternative fuel initiatives can obtain financing.			
IMPACT: Project H2PiyR. This project is covered by the INTERREG V Spain-France Andorra European Territorial Cooperation programme (POCTEFA 2014-2020), created to promote sustainable development of border territory between three countries (Spain, Andorra and France), and is set to be launched in the second half of 2016, involving the installation six new hydrogen stations that will generate hydrogen from renewable sources of energy sources. Four of them will be located in Spain (Zaragoza, Huesca capital Fraga-Huesca, Tarragona), one in Andorra and one in France (Palmiers). These six new hydrogen stations will join the two already built in Aragon (Walqa Science and Technology Park in Huesca and Zaragoza-Valdespartera) and the two that are currently being built in southern France (Rodez and Albi). Additionally, at least 16 fuel cell vehicles (six cars, eight lorries and two buses) will be piloted to test the optimal routes and FCEV technology in the Pyrenees region. Project leaders expect this corridor to be extended within the framework of other European initiatives. The project is coordinated by the Foundation for the Development of New Hydrogen Technologies in Aragon, which will develop a cross-border corridor of hydrogen stations linking up the POCTEFA regions with the vehicular hydrogen supply infrastructure established under sustainable mobility strategies by the countries of central and northern Europe where hydrogen mobility is more widespread. This project has an estimated budget of €3.8 million (65 % co-financed) and has received institutional support from the regional governments of Aragon and Catalonia.			

Natural gas	Electricity	LPG	Hydrogen	Biofuels

IFR-3	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
Promoting participation in project of common interest within the TEN-T networks		Connecting Europe Facility	Ministry of Industry, Energy and Tourism-Ministry of Infrastructure and Transport

AIM: The State Secretariat for Infrastructure, Transport and Housing (Ministry of Infrastructure and Transport) and the Secretariat-General of Industry and SMEs (Ministry of Industry) are jointly encouraging the participation of the Spanish private sector in the planning and development of the Trans-European Transport Network.

DESCRIPTION: Projects with European added value and significant social benefits that do not receive adequate financing from the market will be specifically promoted through the following initiatives:

- Encouraging the dissemination of relevant information in Spain:
  - All information relating to public calls for applications for European funds is published on the website of the Ministry of Infrastructure and Transport.
  - Specific information sessions are organised.
  - The e-mail account buzontent@fomento can be used to respond to requests for specific information from interested parties.
  - Distribution list comprising mostly private companies that have shown interest or have previously worked with TEN-T programmes, to which all information of interest is sent directly and regularly.
  - Support in the preparation and submission of applications for aid through the organisation of meetings and relations with the European Commission.
  - Monitoring and subsequent supervision of projects that have received funding.

IMPACT: To date, many Spanish organisations have taken part in projects to develop infrastructure for the deployment of new energy vehicles, including:

- The 'Spanish and Portuguese Infrastructure Corridors for Fast Charging of Electric Vehicles' project (CIRVE): 25 new fast recharging points will be piloted and 15 existing points adapted at strategic locations along the Iberian TEN-T corridors (Mediterranean and Atlantic). Assessing the feasibility of installing fast charging points for electric vehicles along the Atlantic and Mediterranean corridors that connect Spain and Portugal with the EU.
- Repsol-Butano Project: Installation in Spain of 51 LPG refuelling points along the Iberian corridors of the TEN-T network
- Project Ham: Installation in Spain of a mixed LNG/CNG plant as part of a European project in Mediterranean regions.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

IFR-4	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
Financial support for municipal authorities (and multi-municipality bodies) for installing supply infrastructure		Population over 20 000: Ministerial Order HAP/2427/2015 of 13 November 2015 Population under 20 000: Call for applications to be published by the Institute for Energy Diversification and Saving	Ministry of Finance and Public Authorities-Directorate-General for EU Funds Ministry of Industry, Energy and Tourism-Institute for Energy Diversification and Saving

AIM: To finance initiatives aimed at sustainable and integrated urban development, including alternative fuel infrastructure.

DESCRIPTION: The 2014-2020 European Structural and Investment Funds (ESIFs) include, for Spain, the Operational Programme for Sustainable Growth, which is provides financing for sustainable, integrated urban development (SIUD) initiatives. This programme is aimed at municipalities or multi-municipality bodies that submit SIUD strategies, so they may also include initiatives for alternative fuel infrastructure.

- For town councils and multi-municipality bodies of more than 20 000 inhabitants, these funds are managed by the Ministry of Finance and Public Authorities. The terms and conditions and the first call for the submission of SIUD strategies were published by Ministerial Order HAP/2427/2015 of 13 November 2015. A second call for 2016 was launched by Ministerial Order HAP/1610/2016 of 6 October 2016.
- For town councils and multi-municipality bodies with fewer than 20 000 inhabitants, a specific line has been established in the mobility area which, in Spain, is managed by the Institute for Energy Diversification and Saving as an ERDF intermediate body. The aid budgeted for 2016 amounts to €336 million.

IMPACT: This financial support makes it possible to carry out sustainable integrated urban development initiatives through town councils and multi-municipality bodies. These development plans may include the deployment of new energy vehicles and the associated supply infrastructure.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

IFR-5	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
Installation of electric vehicle charge points at railway stations and airports			Ministry of Infrastructure and Transport-AENA Ministry of Infrastructure and Transport-ADIF-RENFE

AIM: Installation of electric vehicle charging infrastructure at airports and railway stations

DESCRIPTION:

- AENA currently has a fleet of 13 electric vehicles for the airports of Madrid-Barajas, Palma de Mallorca and Lanzarote. The use of these vehicles is estimated to reduce CO_2 emissions by 5 200 kilos and reduce costs by €5 100 euros per year.

  They are used to service airports in the activities carried out by, among others, the operations, environment and engineering departments.

  These cars are supplied with power using specially designed recharging infrastructure. In total 53 charging points have been installed, supplied by Endesa: 18 at Madrid-Barajas Airport; 15 at Barcelona-El Prat Airport; 10 at Palma de Mallorca Airport and 8 at Lanzarote Airport. The vehicles are charged in off-peak or night hours when the airport has less demand for electricity, so that the impact on the existing electricity system is minimal. Putting this fleet of electric vehicles into operation represents the continuation of AENA's commitment to electric mobility, following short pilot tests carried out in 2010 at the airports of Madrid-Barajas and Barcelona-El Prat. These tests yielded positive results for use in the field of airport activity.

- RENFE's department in charge of railway stations, the Ministry of Infrastructure and Transport and Adif (the Railway Infrastructure Administrator) are planning to install charging points at stations. Some of the stations will make use of the power generated by the braking of trains. This intention materialised as the Ferrolinera 3.0 project, launched by the Ministry of Infrastructure and Transport and Adif to install electric vehicle charging points at railway stations.

IMPACT: To date, Spain has plans to provide:

- A total of 53 recharging points for service vehicles distributed across four Spanish airports.
- Charging points at railway stations.

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

IFR-6	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
Spanish-Portuguese-French electric vehicle promotion initiative			Ministry of Industry, Energy and Tourism-Secretariat-General for Industry and SMEs Ministry of Agriculture, Food and the Environment

AIM: Promotion and coordination to encourage electric vehicle use

DESCRIPTION: In November 2015 representatives of the governments of Spain (the Minister for Agriculture, Food and Environment and the Secretary-General for Industry and SMEs), Portugal and France signed a joint declaration for the promotion of electric vehicles

This Spanish-Portuguese-French initiative identifies ten initiatives encouraging the use of electric vehicles, as well as setting up a working panel to carry out an infrastructure project involving the installation of public charging stations throughout the Iberian Peninsula.

Demand management:

1. Information campaigns to raise awareness of existing measures to facilitate the development of electric mobility and publicise the reliability of this type of vehicle.

2. Promotion of training courses aimed at different target groups: the staff of repair garage and dealership networks, and other users of electric vehicles and electrical mobility infrastructures.

3. Advantages for users of electric vehicles based on the identification of their vehicles with certificates, license plates or labels recognisable by the competent authorities. The aim is to facilitate the adoption of measures such as reducing public parking fees, giving tax breaks, giving preferential access to central areas, etc.

4. Maintaining demand-boosting policies so that production can reach maturity.

5. Support in the replacement of public and private vehicles, which plays a key role in the emergence of these vehicles onto the market.

Research, development and innovation

6. Research and development into new, more competitive batteries: supporting industry RDI efforts through public instruments developed by the countries' governments.

7. Managing on-the-move charging through the interoperability of charging services and networks.

8. Innovative solutions for the installation of charging infrastructure.

Boosting infrastructure

9. Development of basic public infrastructure to encourage the market.

10. Establishing international corridors. This infrastructure must be developed in a standardised way through joint projects in order to work on interoperability.

IMPACT: Coordination among Member States in the development of NEV infrastructure

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

IFR-7	INFRASTRUCTURE	REFUELLING INFRASTRUCTURE	
Obligation to install charging infrastructure under Complementary Technical Instruction BT52		Royal Decree 1053/2014 of 12 December 2014.	Ministry of Industry, Energy and Tourism

AIM: Promoting recharging infrastructure

DESCRIPTION: Royal Decree 1053/2014 requires new residential buildings with private car parks to have electric charging facilities, with the cost of installing these to be included in the overall cost of the new-build. New public car parks (shopping centres, public buildings, etc.) must also have a charging point for every 40 spaces. For all new buildings or car parks, the following minimum electric vehicle charging facilities are required:

- In new one-family homes with a parking space or an area designed to accommodate an electric vehicle, an exclusive circuit for charging electric vehicles must be installed.
- In car parks or garages belonging to blocks of flats, a main line through communal areas (using pipes, channels, trays, etc.) must be in place so that power can be channelled to charging points located in the car parks. In addition, in the space where the electricity meters are located, at least one spare slot will be added so that a meter can be fitted for the charging apparatus; and space will be reserved for devices that protect against current surges associated with the meter.
- Car parks or parking areas for private, cooperative or company fleets, and for office vehicles for staff and associates, and municipal vehicle pounds must have the facilities necessary to supply a charging station for every 40 parking spaces.
- Car parks or permanent public parking areas must have a recharging station for every 40 parking spaces.

Also, on public roads the necessary facilities must be installed to supply charging stations located in spaces intended for electric vehicles, as included in sustainable mobility plans at municipal and multi-municipality level.

As for existing buildings, when the first charging point is installed, common elements enabling the infrastructure to accommodate new points in the future must be installed at the same time.

IMPACT: Development of charging infrastructure in new buildings

Natural gas	Electricity	LPG	Hydrogen	Biofuels

PRIORITY: PROMOTING INDUSTRIALISATION AND RDI

FIDi-1	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
Innovative Business Groups programme		Ministerial Order IET/1009/2016 of 20 June 2016 and subsequent measures	Ministry of Industry, Energy and Tourism-Directorate-General for Industry and SMEs

AIM: Encouraging the creation of industry clusters and providing funding for their innovation projects, with the aim of promoting the collaboration of the main stakeholders of the value chain for new energy vehicles.

DESCRIPTION: The Ministry of Industry, Energy and Tourism encourages the creation of industry clusters as ways of promoting collaboration between the manufacturing sector, universities and R&D in order to improve competitiveness. Industry clusters increase both technical and financial capabilities for technological innovation projects with a wider scope, enabling the development of industrial solutions relating to mobility with alternative fuels, where execution of such projects by each entity individually would not be feasible.

Once formally established, industry clusters can be beneficiaries of this support policy developed by the central government through the Innovative Business Groups Programme run by the Secretariat-General for Industry and SMEs, as well as other similar Autonomous Community initiatives.

IMPACT: At the present date Spain has the following Innovative Business Groups active in alternative fuel-powered transport:

- Business Association for the Development and Promotion of Electric Vehicles (AEDIVE): includes stakeholders present throughout the entire value chain of electric mobility. This group has received public funding to support its strategy of innovation and competitiveness in the following areas: (1) Development of charging infrastructure, (2) Boosting demand for vehicles and promoting demand in urban environments, (3) Finding synergies along the entire value chain (4) Encouraging the development and industrial production of vehicles, components and equipment in Spain and (5) Establishment of an Observatory for Technological Oversight of electric vehicles.
- Innovative Business Group for New Hydrogen Technologies (AEI-NTH): Represents 66 public and private entities from different sectors related to hydrogen in transport.
- National LPG industry cluster: Set up in September 2016 to promote innovative projects.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

FIDi-2	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
RDI lines linked to alternative fuels			Directorate-General for Innovation and Competition-Industrial Technology Development Centre-Ministry of Industry, Energy and Tourism

AIM: Specific support promoting RDI projects linked to alternative fuels.

DESCRIPTION: The Ministry of Economy and Competitiveness, through both the Directorate-General for Innovation and Competition and the Industrial Technology Development Centre (CDTI), offers aid lines that particularly benefit projects that, due to their push effect on the rest of the supply chain, enable the development and manufacture of modes of transport with alternative fuels in Spain. The main initiatives in place to support projects related to alternative fuels for transport are cited below:

- RIS3: Support and coordination of the Smart Specialisation Strategy (RIS3) aimed at focusing the productive/entrepreneurial capacity of the Autonomous Communities on potentially competitive areas that can generate development, such as areas linked to alternative fuels, in order to maximise performance and avoid overlaps.
- EEA Grants: Within the environment and climate change areas, including funding for projects related to alternative fuels.
- International aid for RDI: to carry out projects in partnership with organisations and companies, such as the programmes managed by the CDTI, Eureka and Iberoeka; such programmes support bilateral projects with countries with which agreements are in place, and international projects with Unilateral Certification and Monitoring with countries where the CDTI is present.
- Collaboration Challenges Programme: an opportunity for companies and R & D agents to carry out innovative projects in cooperation and with outcomes relevant to the market. Both in the transport-related challenge and in the challenge of energy and climate change, there is support for projects focused on developing alternative fuels.
- Innovative Public Purchase (CPI): a public policy that combines improving public service with promotion of business innovation through procurement of goods, works or services not available at the time of tendering and which are developed through the efforts of the public body issuing the tender. This policy is promoted through the Directorate-General for Innovation and Competitiveness, which supports public buyers, and the CDTI, which supports bidding companies.
- Other programmes in this area: R & D Projects (PID), Direct Innovation Lines (SCI), Global Innovation Lines (LIG), the CIEN programme and the NEOTEC programme.

Attention is drawn to the Ministry of Industry, Energy and Tourism's participation in the following initiatives:

- The Digital Economy and Society Strategic Initiative: seeks to boost technologies with low maturity and high potential for transformation of the ICT sector through the implementation of projects with high technological risk. In addition there is support for large experimental R & D projects based on technologies that fit into the thematic priority for industries of the future, such as those associated with alternative fuels.
- Specific annual calls for interest: each year there is a call for expressions of interest intended solely to incentivise projects related to the priority thematic areas included in the State Plan for Scientific-Technical Research and Innovation. These include, inter alia, hydrogen and fuel cell technologies, covering: (1) hydrogen production; (2) research and development of hydrogen technologies and fuel cells; (3) hydrogen storage and distribution, and (4) portable and stationary uses of hydrogen.

IMPACT: Improve the range offered by manufacturers of modes of transport and their specific components; knowledge exchange between research institutions and enterprises; refuelling/charging infrastructure; and solving problems related to safety, recycling at end of use, etc.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

FIDi-3	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
Incentives for Spanish participation in Joint Technology Initiatives and PPPs at European level		H2020	Directorate-General for Innovation and Competition-Industrial Technology Development Centre-Directorate-General for Industry and SMEs

AIM: To promote participation in initiatives in the private sector, the European Union and its Member States undertake to support and jointly promote the development and implementation of a programme of research and innovation, aimed at achieving industrial leadership and tackling specific social challenges for the development of new energy vehicles.

DESCRIPTION: In particular, the promotion of participation is highlighted in the following joint initiatives at European level:

- GEAR2030: A high-level international working group created to ensure a coordinated approach to the challenges that the European car industry is facing in the next 15 years. By participating, Spain seeks to promote the contribution of Spanish entities in activities and international working groups to thereby position itself as a key player in the development of alternative fuels for transport and attract new investment.
- Green Cars Initiative: This Public-Private Partnership, with a focus on energy efficient vehicles and alternative driving systems, aims to accelerate research, development and demonstration of technologies that allow the efficient use of clean energy in road transport.
- European Joint Technology Initiative — Hydrogen and Fuel Cells (JTI-FCH): Spain encourages the submission of hydrogen and fuel cell projects through calls for applications launched by the CDTI across the Spanish hydrogen sector.

IMPACT: Participation of the private sector, companies and associations in European technology development projects concerning new energy vehicles.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

FIDi-4	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
National Smart Cities Network			Ministry of Industry, Energy and Tourism-State Secretariat for Telecommunications and Information Society

AIM: The National Plan for Smart Cities in Spain seeks to promote the Smart Cities technology industry, particularly industry linked to mobility with alternative fuels, to help local authorities in the process of transformation to Smart Cities and Tourist Destinations. So, its goal is to improve the effectiveness and efficiency of local authorities in providing public services through the use of ICT and to advance the governance of the Smart City and Tourist Destination system.

DESCRIPTION: The plan is coordinated through the Ministry of Industry's State Secretariat for Telecommunications and Information Society through the creation of the Smart Cities Advisory Council. The plan was initially provided with a total budget of €153 million, which will co-finance investment through the European Regional Development Fund (ERDF) and the contributions of other authorities and the private sector will be added.

IMPACT: This plan allows initiatives for improving energy efficiency in cities to take place.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

FIDi-5	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
Technology platforms			Ministry of Economy and Competitiveness-Ministry of Industry, Energy and Tourism-Private sector

AIM: Promoting technological and strategic cooperation in the field of technologies related to new energy vehicles.

DESCRIPTION: Spain has the following national Technology Platforms:

- Spanish Technology Platform for Automotive and Mobility (M2F-move to future): The Ministry of Economy and Competitiveness finances this platform, with the aim of establishing a forum for discussion related to new technologies with application to new energy vehicles, by which it will be possible to achieve the reduction of pollutant emissions into the atmosphere, as well as sustainable mobility. It seeks to promote R & D and to establish strategic alliances between companies, research centres and universities, in order to direct and align their efforts in R & D so as to achieve these objectives.
- Spanish Technology Platform of the Road (PTC): The Ministry of Economy and Competitiveness supports this meeting forum for all actors in the science-technology-enterprise system with an important role in promoting employment, competitiveness and growth in the road infrastructure sector in Spain. Its activities include: defining policies and priorities for NEV R & D, as well as promoting and encouraging cooperation with national, international and inter-company agencies for such development.
- Integrated Logistics, Intermodality and Mobility (LOGISTOP): The Ministry of Economy and Competitiveness supports this platform with the goal of boosting cooperation and energising all key personnel in the Science-Technology-Business field who are working within its scope, encouraging the formation of consortia to conduct scientific and technological research.
- Spanish Technological Platform for Sustainable Chemistry (SUSHEM): groups together all stakeholders in the field of Industrial Chemistry and Biotechnology, promoting activities in cooperation, exchange of knowledge and experiences with the ultimate aim of proposing and implementing innovative and competitive initiatives of a strategic nature to help solve social challenges, including the promotion of technologies in the sector for use in new energy vehicles for the sustainability of road transport.
- The Spanish Hydrogen and Fuel Cell Technology Platform (PTE-HPC): Since 2005, Spain has had this platform, which serves as a discussion forum to bring together the experiences and efforts of the 175 member organisations representing over 300 participants. 52 % of its members are companies, 21 % are technology centres and universities, 17 % government bodies and the remaining 10 % are associations and non-profit entities. The activities of its participants are as follows: 33 % linked to the production of hydrogen, 18 % to storage and distribution of hydrogen, another 18 % to vehicles and infrastructure and the remaining percentage to uses of hydrogen. It is an initiative backed by the Spanish Hydrogen Association and overseen by the Ministry of Economy and Competitiveness.
- Spanish Biomass Technology Platform (BIOPLAT): Pursues the development of technological and business strategies for promoting sustainable use of biomass in Spain and its applications in biofuels. Since its inception in 2006, the number of participating entities amounts to a total of 317, among which there are 34 universities, 55 technology centres and foundations, 27 public entities, 4 research organisations, 23 businesses and 174 cooperative associations.
- Inter-platform Working Group on alternative fuels: this was created with the aim of combining the efforts of the different thematic platforms of alternative fuels in the transport sector.

IMPACT: There are already a total of six technology platforms and one inter-platform working group, addressing the identification of key technologies and the promotion of research projects to accelerate progress in the field of vehicles powered by alternative energy.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

FIDi-6	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
Research centres and infrastructure			Ministry of Economy and Competitiveness

AIM: To provide suitable research infrastructure for the development of new technologies, including those with application in the field of new energy vehicles.

DESCRIPTION: Spain has the following Unique Scientific-Technical Infrastructures linked to the development of technologies related to alternative fuel vehicles:

- The **National Centre for Experimentation in Hydrogen and Fuel Cell Technology** (CNH2): Spain's flagship hydrogen research facility. It was created in 2007 as a public consortium, between the then Ministry of Education and Science and the Government of Castile-La Mancha, with 50 % each. It acts as an executive agent of the Spanish Science, Technology and Innovation system and is now attached to the central government authorities. It is based in Puertollano (Ciudad Real). This centre contributes to the implementation of scientific advances achieved by national and international research groups, the dissemination of scientific knowledge adapted for application in useful technological development and research, along with the piloting of transformation processes using hydrogen as an energy carrier and its final application in possible uses.
- The **Almeria Solar Platform**: Belonging to the Energy, Environment and Technology Research Centre (CIEMAT), which is the largest research, development and testing centre in Europe dedicated to solar concentration technologies, as well as electricity generation. It has a research group dedicated to RDI in the integration of solar energy into large-scale hydrogen production. The main fields of action in this regard are the development of processes and technologies for decarbonisation and recovery of fossil fuels of low quality, as well as dissociation of water for hydrogen production using thermochemical cycles with concentrated solar energy.
- The **National Institute for Aerospace Technology**: This is a stand-alone agency attached to the Ministry of Defence, a pioneer in conducting R & D in hydrogen technology in Spain, which has a centre for certification and approval of automobiles. It has notable experience in: (1) characterisation of low and medium temperature prototype fuel cells (power range up to 30 kW), (2) the design, installation, monitoring and evaluation of demonstrators based on energy systems using hydrogen and fuel cells, (3) national projects (Hercules) for adaptation of conventional vehicles for use with hydrogen fuel cells, (4) other European projects (FEBUS, FCTESTNET and FCTESQA) for the development of standards and procedures for testing and characterisation of fuel cells in their application to vehicles (cars and buses), (5) development of standards for type approval of refuelling stations for hydrogen through the European project HyAPPROVAL, in order to standardise approval in the EU, (6) European HyWays project dedicated to establishing a roadmap for deployment of hydrogen as a transport fuel, (7) European EIHP project (European Integrated Hydrogen Project) which laid the foundation for the development of Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, as amended by the current Regulation (EC) No 79/2009 of the European Parliament and of the Council of 14 January 2009 on type-approval of hydrogen-powered motor vehicles.
- The **National Renewable Energy Centre** (CENER): the CENER-CIEMAT Foundation began operating in 2002. The Ministry of Economy and Competitiveness, Energy, Environment and Technology Research Centre (CIEMAT), the Ministry of Industry, Energy and Tourism and the Government of Navarre are all represented on its board. This is a technology centre specialised in applied research and development and promotion of renewable energy.

IMPACT: This research infrastructure enables projects to conducted on the technological development of vehicles powered by alternative fuels.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

FIDi-7	INDUSTRIALISATION	PROMOTING INDUSTRIALISATION AND RDI	
Reindustrialisation and industrial competitiveness programme		Annual calls for funding Ministerial Order IET/10/2015 of 12 January 2015, published in the Official State Gazette on 16 January 2015.	Ministry of Industry, Energy and Tourism-Directorate-General for Industry and SMEs

AIM: Financial support for industrial investment to help strengthen the competitiveness of businesses and promote the development of industry, and particularly industry involving partial or full manufacture of new energy vehicles and components.

DESCRIPTION: The programme of financial support for industrial investment managed by the Secretariat-General for Industry and SMEs of the Ministry of Industry, Energy and Tourism finances, via ten-year loans with a three-year grace period, investments by manufacturers of vehicles and components working towards industrial production of technologies in Spain for alternative fuel vehicles powered, along with their components and additional parts, among other objectives.

IMPACT: This programme provides support for industrial businesses, improving their competitiveness in the production of vehicles powered by alternative fuels, along with additional parts and components.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

PRIORITY 'REGULATORY FRAMEWORK'

LEGISLATION

NR-1	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Charge managers Analysis of how the defined role meets market requirements		Royal Decree 647/2011 of 9 February 2011.	Ministry of Industry, Energy and Tourism
AIM: To analyse the role and activity of the 'charge manager'			
DESCRIPTION: The role of the 'charge manager' was introduced to the regulatory framework in the amendment of the Electricity Sector Act (Act 54/1997 of 27 November 1997) contained in Article 23 of *Royal Decree-Law 6/2010 of 9 April 2010 on measures to boost economic recovery and employment*. Subsequently, rules on the activity of 'charge managers' were laid down by *Royal Decree 647/2011 regulating the provision of charging services by charge managers*. This Royal Decree defines the activity of charge managers, which consists of providing charging services for electric vehicles. It also specifies and describes the rights and obligations applicable to charge managers. It also regulates the procedure and requirements necessary for the exercise of this activity, considering that this new position is a two-fold role: a charge manager is consumer, and at the same time a trader supplying electricity end customers, resembling an electricity sales company.			
IMPACT: Five years after the creation of this role, the possible need to amend the legislation to encourage its development — especially in the various segments of the tertiary sector (hotels, car parks, shopping centres, etc.) — is currently being analysed.			

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

NR-2	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Super-off-peak electricity tariff		Royal Decree 647/2011 of 9 February 2011.	Ministry of Industry, Energy and Tourism
AIM: Encouraging the charging of electric vehicles when demand on the system is lowest.			
DESCRIPTION: This measure consists of introducing a lower tariff for consumption in the hours when demand on the system is lowest (from 1 am to 7 am). Lower prices aim to encourage a shift in consumption from peak times to this period in order to flatten the demand curve. It is available to low-voltage consumers with contracted power up to 10 kW.			
IMPACT: This measure helps reduce the cost of charging EVs and encourages users to charge them at off-peak hours when demand for electricity is low.			

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

NR-3	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Electric vehicle charging infrastructure **Complementary Technical Instruction BT52**		Royal Decree 1053/2014 of 12 December 2014.	Ministry of Industry, Energy and Tourism
AIM: To regulate the efficient and safe supply of power to charging stations.			
DESCRIPTION: Complementary Technical Instruction BT52, *Special-Purpose Installations: Electric vehicle charging infrastructure* was added to Spain's Electrical and Technical Regulations for Low-Voltage Systems by Royal Decree 1053/2014. The purpose of this regulation is to ensure the safe and efficient supply of power to charging stations. On the subject of equipment and materials, Complementary Technical Instruction requires that the charging stations used should have standardised and technically safe connection facilities. Currently, work is being done on the development of its technical implementation guide in order to identify those aspects that require specific instructions.			
IMPACT: ITC-BT-52 regulates the technical framework necessary to facilitate the installation of charging facilities for electric vehicles.			

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

NR-4	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Analysis of tolls for charging points			Ministry of Industry, Energy and Tourism
AIM: To determine whether the tolls paid by these consumers are suitable.			
DESCRIPTION: Analysis of the tolls paid by these consumers against their load curve to determine their suitability, respecting the principles of sharing the costs of the electrical system and its economic sustainability.			
IMPACT: To be determined			

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

NR-5	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Authorisation to install charging stations in residential buildings (without the need for agreement by the commonhold association)		Act 49/1960 of 21 July 1960 Act 8/2013 of 26 June 2013	Ministry of Infrastructure and Transport
AIM: To simplify the installation of electric vehicle charging points in blocks of flats			
DESCRIPTION: Given the type of housing commonly found in Spain, it has been necessary to amend the Commonhold Act to simplify and facilitate the installation of electrical charge points so that there is no need to obtain approval from the commonhold association before installing charge points. This amendment is contained in Article 3 of the Rental Streamline and Building Energy Efficiency Act (Act 19/2009).			
IMPACT: Favours the installation of electric vehicle charging points in blocks of flats			

Natural gas	**Electricity**	LPG	Hydrogen	Biofuels

NR-6	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Exemption from limits for chauffeur-driven car hire permits		Amendment of Royal Decree 1211/1990 of 28 September 1990.	Ministry of Infrastructure and Transport
AIM: To exempt vehicles using alternative fuels from compliance with minimum power and length requirements, in order to encourage their use.			
DESCRIPTION: The Implementing Regulations for the Land Transport Act state that vehicles using alternative fuels are exempt from compliance with the minimum power and length requirements applicable to chauffeur-driven car hire permits.			
IMPACT: Facilitates the approval and use of new energy vehicles			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

NR-7	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Registration of urban short-haul public service vehicles authorised with higher gross vehicle weight ratings		Directorate-General for Road Transport to publish instruction	Ministry of Industry, Energy and Tourism- Directorate-General for Road Transport
AIM: To minimise the impact of excess weight on certain road vehicles caused by the incorporation of alternative fuel technologies by increasing their authorised weight up to a maximum of one tonne.			
DESCRIPTION: The use of alternative propulsion systems for heavy-duty vehicles (and specifically buses) results in excess weight. Such excess weight should not be counted as part of the payload of the vehicle, since this would financially penalise vehicles with alternative fuels. In this respect, under Directive (EU) 2015/719 of the European Parliament and of the Council of 29 April 2015 amending Council Directive 96/53/EC laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic, certain vehicles are permitted to increase their weight by up to one tonne through the incorporation of alternative fuel technologies. Following this line, the Directorate-General for Road Transport is working to establish a special framework allowing specific vehicles for public services in an urban environment to exceed the maximum gross vehicle weight under Article 14 of the National Vehicle Regulations passed by Royal Decree 2822/1998 of 23 December 1998. This measure prevents any competitive disadvantage to companies that incorporate clean vehicles into their fleets. In this framework and in accordance with the National Vehicle Regulations passed by Royal Decree 2822/1998 of 23 December 1998, the Ministry of Industry, Energy and Tourism may grant exceptions to certain vehicles from compliance with some of the technical conditions laid down, including maximum gross vehicle weight.			
IMPACT: Facilitates the approval and use of new energy vehicles			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

NR-8	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Permission to use high-occupancy vehicle (HOV) lanes			Directorate-General for Road Transport

AIM: To allow alternative fuel vehicles use high-occupancy vehicle lanes, thus rewarding and encouraging the use of such vehicles.

DESCRIPTION: In Spain, vehicles displaying the Directorate-General for Road Transport's 'zero local emissions' sticker can use high-occupancy vehicle (HOV) lanes even when only occupied by the driver, wherever this possibility is signposted. This affects:

- The lanes belonging to the central carriageway of the A-6, between kilometres 6 to 20, in the Autonomous Community of Madrid.
- On the GR-3211 in Granada, the outside lanes going in both directions between km 0 + 115 and km 1 + 410 in increasing order and between km 0 + 105 and km 1 + 530 in decreasing order.

IMPACT: This positive discriminatory measure allows cities to encourage the use of NEVs.

Natural gas	**Electricity**	LPG	**Hydrogen**	Biofuels

NR-9	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Mandatory biofuel targets		Royal Decree 1085/2015 of 4 December 2015.	Ministry of Industry, Energy and Tourism

AIM: To achieve the targets for renewable energy use established in EU legislation, the Spanish government has brought in sales or consumption targets for biofuel for transport purposes. Furthermore, the government is authorised to both amend the targets in place and establish additional ones based on trends in the fuels and biofuels sector and progress in the consumption of electricity from renewable sources in transport.

DESCRIPTION: Under Royal Decree 1085/2015 of 4 December 2015 on the promotion of biofuels, the minimum mandatory target for biofuels for 2016 is 4.3 % (calculated for the year as a whole). This figure is the result of weighting the target for the first half of 2016 of 4.1 % and the target for the second half of 2016 of 4.5 %. Targets for subsequent years are as follows:

	2017	**2018**	**2019**	**2020**
Mandatory biofuel targets (%)	5 %	6 %	7 %	8.5 %

IMPACT: Increased use of biofuels in road transport

Natural gas	Electricity	LPG	Hydrogen	**Biofuels**

NR-10	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Inclusion of environmental criteria in the tendering of public transport services			Ministry of Infrastructure and Transport- Autonomous Communities Local Authorities

AIM: Positive assessment of environmental efficiency measures in public passenger transport, including new energy vehicles.

DESCRIPTION: In the field of public service concessions for passenger transport, reductions in energy consumption and pollutant emissions associated with the introduction of new energy vehicles (NEV) will be taken into consideration.

In the terms and conditions of contracts to run public services for regular passenger transport on public roads, the Ministry of Infrastructure and Transport rewards tenderers for proposing the inclusion of measures aimed at optimising energy efficiency. Within this criterion, an explicit reference to new energy vehicles will be incorporated in the terms and conditions that will be used in the future.

IMPACT: The inclusion of environmental criteria in public tenders favours proposals for new energy vehicles for public services.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

NR-11	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Inclusion of new energy vehicles (NEVs) in the catalogue of vehicles for the Public Authority Fleet Replacement Agreement		Act 2/2011 of 4 October 2011	Prime Minister's Office

AIM: To promote the use of NEVs in public authorities' vehicle fleets.

DESCRIPTION: Spanish public authorities, in renewing their own fleets and public service fleets, will encourage tender criteria that prioritise new energy vehicles. In this regard, the Directorate-General for Procurement Streamlining and Centralisation has already included electric, hybrid and other vehicle subtypes in the Framework Agreement for Passenger Cars. Moreover, in the valuation criteria for other vehicles, it has included minimising CO_2 emissions and Institute for Energy Diversification and Saving's vehicle energy labels.

In addition, public authorities have at their disposal the Sustainable Economy Act (Act 2/2011), transposing Directive 2009/33, which internalises the energy and environmental costs in tenders for purchase of vehicles, so that higher scores will be awarded to suppliers with lower energy and environmental costs.

IMPACT: The inclusion of NEVs in the catalogue of the Framework Agreement allows public authorities to replace vehicles from their fleets with NEVs.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

NR-12	PRIORITY 'REGULATORY FRAMEWORK'	LEGISLATION	
Participation in technical committees on standardisation (ISO, CEN/CENELEC and AENOR).			Ministry of Industry, Energy and Tourism
AIM: To identify and overcome barriers to the deployment of alternative fuel infrastructure.			
DESCRIPTION: The Ministry of Industry, Energy and Tourism will continue to encourage the active participation in technical standardisation committees at the relevant standardisation organisations (ISO, CEN/CENELEC, AENOR, etc.) in order to identify and overcome barriers hampering the deployment of alternative fuel infrastructure. It also coordinates the development of infrastructure-related legislative with other European countries, and local and regional authorities.			
IMPACT: Standardisation to facilitate the deployment of NEV infrastructure			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

TAX INCENTIVES

IF-1	PRIORITY 'REGULATORY FRAMEWORK'	TAX INCENTIVES	
Road tax rebates		Local Taxation Act (consolidated by way of Royal Legislative Decree 2/2004 of 5 March 2004)	Ministry of Finance and Public Authorities Local authorities
Aim: To encourage the acquisition and use of new energy vehicles			
DESCRIPTION: Most Spanish town councils apply the option under the Local Taxation Act to award road tax rebates to new energy vehicles. In order to systematise the rebate criteria a working panel has been set up for analysis and subsequent incorporation into the Act.			
IMPACT: This measure will reduce the cost of acquisition and/or maintenance of an NEV and thus boost demand			
Natural gas	**Electricity**	**LPG**	**Hydrogen**	**Biofuels**

IF-2	PRIORITY 'REGULATORY FRAMEWORK'	TAX INCENTIVES	
Car registration tax rebates		Excise Taxes Act (Act 38/1992 of 28 December 1992 Air Quality and Atmospheric Protection Act (Act 34/2007 of 15 November 2007)	Ministry of Finance and Public Authorities Autonomous Communities

AIM: To encourage the acquisition and use of new energy vehicles

DESCRIPTION: In the Excise Tax on Certain Modes of Transportation, the registration of motor vehicles whose official CO_2 emissions do not exceed 120 g/km, with the exception of 'quad'-type vehicles, is taxed at a rate of €0.

The tax on registration of the other motor vehicles is generally calculated by applying a variable rate depending on $C0_2$ emissions to taxable income. The Autonomous Communities may, however, establish their own under Article 51 of the Autonomous Community and City Financing and Tax Law Amendment Act (Act 22/2009 of 18 December 2009). Generally speaking these are:

- 4 75 % for CO_2 emissions above 120 g/km and below 160 g/km.
- 9.75 % for CO_2 emissions equal to or more than 160 g/km and below 200 g/km.
- 14.75 % for CO_2 emissions equal to or more than 200 g/km.

IMPACT: This measure will reduce the cost of acquisition of NEVs and thus boost demand

Natural gas	Electricity	LPG	Hydrogen	Biofuels

IF-3	PRIORITY 'REGULATORY FRAMEWORK'	TAX INCENTIVES	
Personal income tax reduction applicable to benefits in-kind		Personal Income Tax Act with Partial Amendment of the Corporate Income Tax Act, the Non-Residents' Income Tax Act and the Wealth Tax (Act 35/2006 of 28 Novembe4 2006)	Ministry of Finance and Public Authorities

AIM: Promoting new energy vehicles as company and/or commercial vehicles

DESCRIPTION: Since 1 January 2015, the amount of benefits in-kind calculated in respect of company vehicles available to employees for private purposes in the employee's Personal Income Tax return has been eligible for reduction under Article 43(1)(1) of the Personal Income Tax Act (Act 35/2006 of 28 November 2006), the Non-Residents' Income Tax Act (consolidated by way of Royal Legislative Decree 5/2004 of 5 March 2004) and other tax legislation (Official State Gazette of 28 November) and Article 48 *bis* of the Personal Income Tax Regulations passed by Royal Decree 439/2007 of 30 March 2007 (BOE of 31 March).

This reduction is 15 per cent when the vehicle meets the Euro VI emission limits set out in Annex I to Regulation (EC) No 715/2007, its official CO_2 emissions do not exceed 120g/km, and its pre-tax market value if it were new would not exceed €25 000.

The reduction is 20 per cent when, as well as meeting the above criteria, the vehicle is a hybrid vehicle powered by internal combustion engines that can use alternative fossil fuels (LPG or natural gas). In this case, the vehicle's pre-tax market value if it were new should not exceed €35 000.

The reduction is 30 per cent for the following vehicle categories:

- Battery electric vehicles (BEVs)
- Extended-range electric vehicles (EREVs)
- Plug-in hybrid electric vehicles (PHEVs) with a minimum range of 15 kilometres. In this case, the vehicle's pre-tax market value if it were new should not exceed €45 000.

IMPACT: This measure encourages the use of alternative energy company cars by reducing personal income tax.

Natural gas	Electricity	LPG	Hydrogen	Biofuels

III.7. AUTONOMOUS COMMUNITY AND LOCAL MEASURES

ANDALUSIA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGIES			
1	**2020 ANDALUSIA ENERGY STRATEGY** Among the five programmes into which this strategy is divided, we note the following lines of action for their connection with alternative fuels in transport: Smart Energy Programme ▪ SE_9 Energy efficiency in vehicles ▪ SE_10 Development of infrastructure to improve mobility in urban environments Competitiveness Improvement Programme ▪ CI_5 Improving the industrial competitiveness of the alternative fuel sector ▪ CI_12 Roadmap for the development of biorefineries in Andalusia ▪ MC_14 Innovation in energy technologies and increasing the potential and use of indigenous energy resources ▪ MC_15 development of the hydrogen economy in Andalusia Energy Management Programme of the Andalusian Government ▪ MA_6 Promotion of mobility and sustainable transport in the Andalusian government authorities	Department of Employment, Enterprise and Trade-Directorate-General for Industry, Energy and Mines Andalusian Energy Agency	Decision of the Governing Council dated 27 October 2015	Natural gas Electricity LPG Hydrogen Biofuels
2	**PRELIMINARY BILL FOR THE ANDALUSIAN SUSTAINABLE MOBILITY ACT**	Department of Development and Housing	Pending approval Public consultation stage commenced in September 2016	Natural gas Electricity LPG Hydrogen Biofuels
	MARKET: VEHICLE ACQUISITION AND RAISING AWARENESS			
3	**EFFICIENT VEHICLE ACQUISITION PROGRAMME** The grants cover up to 15 % of the market price of the vehicle depending on the energy efficiency of the model and type of vehicle. Since 2012 (as no previous requests were made) to date 2 830 Andalusians have applied for grants to purchase more efficient vehicles and have been awarded €368 598. Within this programme, note the following actions related to transport and public services: ▪ Bus acquisition by municipal transport companies of Seville (natural gas buses), Malaga (electric and natural gas buses) and Cordoba (electric buses). ▪ Since 2009, 1 262 grants have been made for the purchase of alternative fuel taxis amounting to 2 795 612 Euros. The granting of this aid is expected to continue. ▪ The Andalusian Government is incorporating electric vehicles into its fleet of courier service for the various Departments. These vehicles cover urban and suburban routes and provide service to all the departments belonging to the Energy Network of the Government of Andalusia, which is coordinated by the Andalusian Energy Agency.	Andalusian Energy Agency	Order of 4 February 2009 establishing the terms and conditions of an Incentive Programme for Sustainable Energy Development of Andalusia and announcing the call for applications for 2009-2014 (Andalusian Official Gazette issue 30). Order of 7 December 2010 (Andalusian Gazette issue 244) partially amending the Order of 4 February 2009 This aid programme is expected to be prolonged until 2020 via the publication of a new call in the second half of 2016.	Natural gas Electricity LPG Hydrogen Biofuels

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
4	**PROJECT VICTORIA: ELECTRIC BUSES** Currently tests are being carried out on city bus line 16 of the city of Malaga to demonstrate that dual induction recharging is both technically and economically feasible. This measure is particularly relevant for its application to other Spanish cities since overground public transport is responsible for 30 % of emissions caused by traffic in cities. Electrifying these service networks, and especially buses, given their ability to transport hundreds of people every day, is essential for reduction of local pollution.	Private sector[129]	Partnership agreement	Electricity
5	**OUTREACH PROGRAMME TO BOOST ELECTRIC VEHICLES** Aimed at promoting electric mobility at the local level because municipalities have a key role in its development. Within this group the following working groups have been set up created: Group 0- 'Local Action'; Group 1: 'Roadmap to install a recharging point for public use'; Group 2: 'Roadmap to replace part of the municipal fleet by electric vehicles'; Group 3: 'Guidelines for preparation of technical specifications'; Group 4: 'Legislation templates' and Group 5: 'Tool for Analysis of the Feasibility of Performances'	Andalusian Energy Agency Private sector[130]	Partnership agreement	Electricity
6	**TECHNICAL MANUAL FOR THE USE OF BIOFUELS IN AUTOMOTIVE ENGINES** Since ignorance of biofuels is one of the main barriers to use this manual has been published in both print and digital editions. Presentation days have been held in different municipalities (Malaga, Seville, etc.).	Andalusian Energy Agency		Biofuels
	INFRASTRUCTURE			
7	**ANDALUSIA A+ PROGRAMME (**INVENTIVES FOR ENERGY DEVELOPMENT IN ANDALUSIA) ▪ Grants to municipal transport companies of Seville and Malaga for the installation of refuelling points for natural gas buses. ▪ Aid for the installation of charging points in: o Houses and/or blocks of flats o Car parks at private businesses o Premises managed by public authorities	Andalusian Energy Agency	Decision of 15 April 2015 (Andalusian Gazette issue 74, 20 April)	Natural gas Electricity
8	**ANDALUSIAN CLEAN FUEL SUPPLY MAP** The Andalusian Energy Agency's website has an application called the 'Andalusian Biofuel and Other Clean Fuel Map' with the aim of promoting regional market development of alternative fuels in the transport sector. The map is addressed both to the general public looking to acquire any of the products and to supply companies as a way to publicise their product and company.	Andalusian Energy Agency		Natural gas Electricity LPG Hydrogen Biofuels

[129] Consortium led by the company Endesa, also involving other companies (EMT, Conacon, Isotrol, Mansel, Innterconecta, MC2 and Omeca) and several research bodies (CIRCE, Malaga University and AICIA)

[130] ENDESA ENERGÍA, IBERDROLA, IBIL, N2S, ABB, ASOCIACIÓN AEDIVE , AYESA, INABENSA, TELVENT (SCHNEIDER), ATOS WORLD GRID, BLUEMOBILITY, ISOIN, GAMESA ELECTRIC, VEHÍCULOS ELÉCTRICOS RENOVABLES SL, SIMON, INDRA, ACTISA, E-MOBILITY CONSULTING EUROPE, GH ELECTROTERMIA, ACONFORT, BECHARGED, AUTOMOCIONA, Robert Bosch España, S.L.U. , FENIE ENERGÍA, ACE SERVICIOS ENERGÉTICOS SL, INNOVA, INARTEC, ALFASEL SL, RENAULT SYRSA, RENAULT ESPAÑA, TOYOTA, PEUGEOT, CITROËN, ECOBIKE ZERO ANDALUCÍA SL, NISSAN, MITSUBISHI, MOVECO, COMARTH, BMW, VELMUS IDI, TECNICA SOLAR GRANADINA, EVSHOP ELECTRIC VEHCLES SHOP, RONDAMÓVIL, COCHELE, ANIACAM, ALPHABET CAR LEASE ESPAÑA, MCE BANK, APREAN (ASOCIACIÓN DE PROMOTORES Y PRODUCTORES DE EERR DE ANDALUCÍA), TEXLA RENOVABLES, ANDEL SA, SOLAR DEL VALLE and ALAMEDA CIS.

ARAGON

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGIES			
1	**III ARAGONESE HYDROGEN MASTERPLAN 2016-2020** This is the continuation of two previous Aragonese Hydrogen Masterplans (2007-2011 and 2011-2015).	Department of Economy, Industry and Employment-Government of Aragón Foundation for the Development of New Hydrogen Technologies in Aragon		Hydrogen
2	**ARADON ENERGY PLAN 2013-2020** Among the various measures envisaged, the greater connection with the promotion of alternative energies in transport are as follows:[131] ▪ modal shift towards more efficient transport ▪ drive towards sustainable mobility ▪ integration of renewable energy in transport	Department of Economy, Industry and Employment-Government of Aragón		Electricity Hydrogen (masterplan)
	MARKET: VEHICLE ACQUISITION			
3	**TENDER FOR ELECTRIC VEHICLE RENTAL FOR PUBLIC SERVICES** In the first phase electric vehicles will be rented until April 2017, for the staff of the municipal cemetery of Torrero, with a budget of €132 400.	Zaragoza City Council	Award by public tender	Electricity
	INFRASTRUCTURE			
4	**H2PiyR-2020: CROSS-BORDER CORRIDOR ARAGON-CATALONIA-ANDORRA- FRANCE** Installation of 3 new hydrogen station in Aragon (Zaragoza, Huesca city and Fraga-Huesca) that generate hydrogen from renewable energy sources (a 4th hydrogen station is to be installed in Tarragona).	Government of Aragon Government of Catalonia Andorra France	INTERREG V Spain-France Andorra European Territorial Cooperation programme (POCTEFA 2014-2020)	Hydrogen

[131] Since 2011 no aid has been given for the purchase of vehicles or to boost supply infrastructure of the following alternative fuels: electricity, natural gas, LPG and biofuels.

BALEARIC ISLANDS

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGY			
1	**RENEWABLE ENERGY AND ENERGY EFFICIENCY IN THE BALEARIC ISLANDS: STRATEGIES AND LINES OF ACTION 2020**	Department of Land, Energy and Climate Change	Adopted by the Advisory Board of Energy on 18 September 2014[132]	Natural gas Electricity LPG
	MARKET: VEHICLE ACQUISITION			
2	**AID TO PROMOTE SUSTAINABILITY IN ROAD TRANSPORT** ▪ The acquisition and/or conversion of **passenger cars and/or vans**. ▪ The acquisition and/or conversion of **taxis**. ▪ The acquisition and/or conversion of **industrial vehicles for public use**.	Department of Economy and Competitiveness	Decision of the Head of the Department of Economy and Competitiveness of 9 April 2015, published in the Balearic Official Gazette issue 56 of 18 April 2015. Expected to continue in coming years.	Natural gas Electricity LPG
	INFRASTRUCTURE			
3	**AID FOR ESTABLISHING COMPRESSED NATURAL GAS REFUELLING POINTS**	Department of Economy and Competitiveness	Decision of the Head of the Department of Economy and Competitiveness of 9 April 2015 Expected to continue in coming years.	Compressed natural gas.
4	**AID FOR THE INSTALLATION OF CHARGING POINTS** Incentives for all types of charging (slow, semi-fast and fast) and for different types of beneficiaries (businesses and public authorities).	Department of Land, Energy and Mobility	Balearics Official Gazette issue 135, 09.12.2015 — Budget of €85 000 for slow and semi-fast charging points for businesses. Balearics Official Gazette issue 116, 01.08.2015 — Budget of €589 000 for slow and semi-fast charging points for public authorities. Balearics Official Gazette issue 56, 18.04.2015 — Budget of €30 000 for motorcycles for public authorities. Balearics Official Gazette issue 104, 02.08.2015 — Budget of €200 000 for fast charging points for businesses. Balearics Official Gazette issue 96, 17.07.2014 — Budget of €150 000 for slow and semi-fast charging points for businesses. Expected to continue in coming years.	Electricity
5	**FAST-CHARGING CAR CLUB (E-CAR)** Commercial development of a network of **6 fast charging points** (80 % of the battery in less than 30 minutes) laid out in such a way that any electric vehicle is able to travel freely around the entire island of Mallorca.	Private business (Endesa)	Cofinanced by the ERDF	Electricity

[132] http://www.caib.es/sacmicrofront/archivopub.do?ctrl=MCRST5325ZI190898&id=190898

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
6	**AID FOR THE INSTALLATION OF CNG REFUELLING POINTS** Support has been granted for the installation of a CNG refuelling point in Palma de Mallorca.	Department of Land, Energy and Mobility	Balearics Official Gazette issue 56, 18.04.2015 -- Budget of €120 000 Expected to continue in coming years.	Compressed Natural Gas

CANARY ISLANDS

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGY			
1	**SPECIFIC STRATEGY TO ENCOURAGE LATERNATIVE FUELS IN THE CANARY ISLANDS** The Canary Islands are shaping their strategy which will focus on electric propulsion, as well as hydrogen in the medium term.	Directorate-General of Industry and Energy	Adoption planned in the first half of 2017.	Electricity Hydrogen
	MARKET: RAISING AWARENESS			
2	**PLATFORM FOR ELECTRIC VEHICLE DEVELOPMENT IN THE CANARY ISLANDS** This aims to be a meeting point for all organisations linked to electric vehicles, with the aim of: (1) minimising existing barriers as much as possible and enhancing the benefits of electric vehicles, (2) generating demand in society by promoting and explaining electric mobility, (3) adapting the energy, automotive, information and communications technology sectors, and the new sectors that are emerging in relation to electric vehicles, (4) establishing the necessary synergies between efficient modes of transport and EVs and (5) ensuring sustainable development of electric vehicles in the Canaries.	Department of Employment, Industry and Trade	Partnership agreement	Electricity

CASTILE-LEON

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGY			
1	**SPECIFIC STRATEGY TO ENCOURAGE LATERNATIVE FUELS IN CASTILE-LEON 2016-2020** This new strategy is being developed in order to extend the main lines of action contained in the Regional Electric Vehicle Strategy for Castile and Leon 2011-2015 to all alternative energy sources.	Government of Castile-Leon	Adoption planned in the second half of 2016.	Natural gas Electricity LPG Biofuels Hydrogen
	MARKET: VEHICLE ACQUISITION AND RAISING AWARENESS			
2	**PROMOTING AND SUPPORTING LPG USE** The public-private partnership agreement involved the conversion of four official vehicles of the Government of Castile and Leon (located in Avila, Burgos, Soria and León) in order to monitor and analyse this technology to discover the advantages and disadvantages of this technology in the fleet of the regional authorities. Also, the Department of Economy and Employment has made a commitment to: ▪ Include LPG in the development of measures to promote the	Department of Economy and Employment Private business (Repsol Butano S.A)	Collaboration agreement signed in 2014	LPG

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	use of alternative fuels and vehicles based on their environmental qualities in terms of reducing urban pollution (nitrogen oxides, particulates and noise). ▪ Promote the use of LPG-powered vehicles with other alternative vehicles and fuels in the fleets of vehicles of Castile-Leon, whether these vehicles are owned directly by the authorities or by public concession-holders. ▪ Include LPG within outreach and training actions carried out by the Department of Economy and Employment on alternative fuels and vehicles. ▪ Study the development of a line of public grants for conversion of private and/or fleet vehicles powered by LPG.			
3	**DIPLOMA IN VEHICLE ELECTROMECHANICS**	Department of Education	Decree 27/2011 of 9 June 2011 establishing the syllabus to be studied for the Diploma in Vehicle Electromechanics in the Autonomous Community of Castile-Leon	Electricity
4	**ELECTRIC MOBILITY WEBSITE, GUIDE AND CONFERENCES** • Creation of Castile-Leon's electric vehicle web portal: http://www.vehiculoelectrico.jcyl.es/ • A Guide to Electric Vehicles has been published and organised ten conferences held to raise awareness. • Since 2014 there has been a specific section in http://www.vehiculoelectrico.jcyl.es/ for members of the Network of Municipalities, where information and best practices are exchanged and direct contact is maintained with other representatives of the municipalities of the Network of Municipalities.	Department of Economy and Employment Directorate-General of Industry and Technological Innovation City Councils of the Network of Municipalities of Castile-Leon Regional Energy Agency		Electricity
5	**CLEAN MUNICIPAL VEHICLE PLAN**[133] Addition of electric buses for AUVASA (Valladolid City Bus), electric taxis, commercial vehicles and passenger cars for the municipal fleet.	Valladolid City Council	Approved in December 2014 with a budget for 2015 of €2 million for vehicle replacement and €100 000 for innovative public procurement. Expected to continue.	Electricity
	INFRASTRUCTURE			
6	**AID FOR DEVELOPING CHARGING INFRASTRUCTURE** For individuals, local authorities and private companies (large companies, SMEs and sole traders). Funds both private points (€200 per point installed in homes and €1 200 per point installed at businesses and local authorities) and points accessible by the public (€1 600 per point installed)	Department of Economy and Finance	ORDER EYH/1143/2015 of 23 December 2015 announcing the 2016 call for applications for public subsidies for the development of electric vehicle charging infrastructure in Castile-Leon. Expected to continue.	Electricity

[133] When vehicles from the municipal fleet of the City of Valladolid, made up of 460 passenger cars and commercial vehicles and 150 buses, are to be replaced, priority will be given to new energy vehicles.

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
7	**CLEAN MUNICIPAL VEHICLE PLAN**[134] Expansion of charging infrastructure to reach 63 stations, requiring the construction of 29 new points. Specifically: ▪ 1 fast charging station at the premises of AUVASA (Valladolid City Bus) with 4 points/sockets. ▪ 1 fast charging station for last-mile commercial vehicles and electric taxis. ▪ 4 semi-fast charging stations for taxis. ▪ 20 new semi-fast recharging points in public car parks of hotels, shopping centres and major supermarkets.	Valladolid City Council	Approved in December 2014 Expected to continue.	Electricity

CASTILE-LA MANCHA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	MARKET: VEHICLE ACQUISITION			
1	**AID FOR THE ACQUISITION OF NEW ENERGY VEHICLES AND THE CONVERSION OF EXISTING VEHICLES**	Department of Infrastructure (grants up to 2015) Department of Economy, Business and Employment-Directorate-General for Industry, Energy and Mines (grants from 2015 onwards)	Order of 30 November 2011 (Castile-La Mancha Official Gazette issue 236, 2011) Order of 16 April 2014 (Castile-La Mancha Official Gazette issue 84, 2014) Order of 29 December 2015 (currently in force)	Natural gas Electricity LPG Biofuels Hydrogen
	INFRASTRUCTURE			
2	**AID FOR THE INSTALLATION OF ELECTRIC VEHICLE CHARGING POINTS**	Department of Economy, Business and Employment	Order of 29 December 2015 (currently in force)	Electricity

CATALONIA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	MARKET: VEHICLE ACQUISITION AND RAISING AWARENESS			
1	**AID FOR THE ACQUISITION OF LOW-EMISSION VEHICLES FOR TAXI SERVICES** Aid aimed at taxis operating in Catalonia's special air protection areas.	Department of Land and Sustainability	Decision TES/110/2015 of 21 January 2015, opening the calls for applications for grants aiding the purchase of low-emission vehicles for taxi services operating in special air protection areas. Expected to continue.	Natural gas Electricity LPG

[134] When vehicles from the municipal fleet of the City of Valladolid, made up of 460 passenger cars and commercial vehicles and 150 buses, are to be replaced, priority will be given to new energy vehicles.

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
2	**AID FOR THE PURCHASE OF ELECTRIC MOTORCYCLES AND SCOOTERS** The beneficiaries may be private companies, families, foundations, local authorities, consortia of municipalities and Catalan government authorities.	Catalan Energy Institute	Resolution EMO/1986/2015 of 2 September 2015, establishing the terms and conditions for awarding grants for improving energy saving and efficiency under Catalonia's Energy and Climate Change Plan for 2012-2020 and opening the 2015 call for applications (Catalan Official Gazette of 9 September 2015).	Electricity
3	**LIVE PLATFORM** Created in 2011 to promote electric mobility in Barcelona. In 2015 its scope of action was broadened to incorporate natural gas vehicles and its geographical scope to all of Catalonia. Its steering members are: (1) Barcelona City Council, (2) the Catalan Government, through the Catalan Energy Institute, the Directorate General of Industry and the Directorate General of Environmental Quality, (3) the Metropolitan Area of Barcelona and (4) the companies B:SM, TMB, SEAT, Gas Natural Fenosa, ACS, Nissan, Renault and Volkswagen-Audi España. Its aim is to coordinate and support its members in carrying out projects and promoting strategic policies and new business models, as well as establishing a network of local and international know-how.	Government of Catalonia Town and city councils from the metropolitan area of Barcelona Private sector		Natural gas Electricity
	SUPPLY INFRASTRUCTURE			
4	**ELECTRIC VEHICLE CHARGING INFRASTRUCTURE ACTION PLAN** **CATALAN COMMITTEE FOR THE DEVELOPMENT OF CHARGING INFRASTRUCTURE ('TIRVEC')** This seeks to be a forum for dialogue to strengthen cooperation of both public and private Catalan organisations linked to electric mobility. It was set up in June 2016.	Catalan Energy Institute	TIRVEC: Partnership agreement	Electricity
5	**GRANTS FOR INSTALLING PUBLIC FAST CHARGING STATIONS FOR ELECTRIC VEHICLES**	Catalan Energy Institute	Resolution EMO/1986/2015 of 2 September 2015, establishing the terms and conditions for awarding grants for improving energy saving and efficiency under Catalonia's Energy and Climate Change Plan for 2012-2020 and opening the 2015 call for applications (Catalan Official Gazette of 9 September 2015).	Electricity
6	**CATALAN SUPPLY POINT MAP** Electricity: https://www.google.com/maps/d/edit?mid=z4xnIt9uT66s.kxkW7LH1hZ_w Natural gas: https://www.google.com/maps/d/edit?hl=ca&authuser=0&mid=z4xnIt9uT66s.kuGVFWgWagXU	Catalan Energy Institute		Natural gas Electricity
7	**INSTALLATION OF FAST CHARGING POINTS IN THE BARCELONA METROPOLITAN AREA** Installation in the city of Barcelona of 15 50kW DC-AC-43kW, TRIO points (CHAdeMO, CCSCombo2 and Mennekes). 13 of these have now been installed. Installation in other municipalities in the metropolitan area of Barcelona of ten TRIO points (CHAdeMO, CCSCombo2 and Mennekes). One has now been installed.	Town and city councils from the metropolitan area of Barcelona		Electricity
8	**INSTALLATION OF CHARGING POINTS AT RAILWAY STATIONS** Installation of five charging stations in car parks at transport hubs at the stations of Volpelleres, Martorell, Igualada, Sant Quirze del Valles and Sant Cugat del Valles.	Catalan Energy Institute Ferrocarrils de la Generalitat (Catalan railway authority)	Collaboration agreement signed in 2015	Electricity

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
		Private sector[135]		
LEGISLATION				
9	**ECOVIAT: MOTORWAY TOLL DISCOUNTS**	Government of Catalonia		Electricity Hydrogen

AUTONOMOUS COMMUNITY OF VALENCIA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
SPECIFIC AUTONOMOUS COMMUNITY STRATEGY				
1	**VALENCIAN ENERGY PLAN 2020: ACTION PLAN FOR ENERGY SAVINGS AND EFFICIENCY IN TRANSPORT**	Department of Sustainable Economy Department of Housing, Public Works and Land Planning Valencian Institute of Business Competitiveness Provincial Councils Town and City Councils	Awaiting publication	Electricity Natural gas Biofuels
	MARKET: VEHICLE ACQUISITION AND RAISING AWARENESS			
2	**GRANTS FOR THE PURCHASE OF NEW ENERGY VEHICLES** Incentives for different types of vehicles (private cars, commercial, bus, lorries, etc.) and beneficiaries (companies, individuals, sole traders, foundations, municipal councils, public entities, etc.) This programme specifically supports the use of electric vehicles for public transport or public services.	Valencian Institute of Business Competitiveness	Decision of 23 December 2015 announcing the 2016 grant scheme for sustainable mobility and energy efficiency in transport (12/30/2016 DOCV No 7 688). Action: T27A. These aid schemes have been running since 2011 and are expected to continue in coming years. Line cofinanced by the ERDF	Electricity Natural gas
INFRASTRUCTURE				

[135] SIMON, DTES, RAILGRUP, VOLTOUR, IMESAPI and EMPARK

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
3	**SUPPORT FOR ELECTRICITY, NATURAL GAS AND HYDROGEN SUPPLY POINTS** This scheme promotes the installation of points, both accessible to the public and for private fleets.	Valencian Institute of Business Competitiveness	Decision of 23 December 2015 announcing the 2016 grant scheme for sustainable mobility and energy efficiency in transport (12/30/2016 DOCV No 7 688). Actions T29A and T29B. These aid schemes have been running since 2011 and are expected to continue in coming years. Line cofinanced by the ERDF	Electricity Natural gas Hydrogen
4	**INCENTIVES FOR BIOFUEL REFUELLING INFRASTRUCTURE** ▪ Installing pumps at service stations to supply pure biofuels or those covered by a specific labelling obligation. While both biodiesel and bioethanol blends are supported, projects related to bioethanol are given a higher score in the adjudication process. ▪ Adaptation of existing pumps to supply biodiesel or bioethanol blends with specific labelling obligations. ▪ Warehousing facilities for distribution of biofuels.	Valencian Institute of Business Competitiveness	Decision of 28 May 2015 by the chair of the Valencian Institute of Business Competitiveness (IVACE) calling for applications for incentives relating to renewable energy and biofuels for the year 2015. These aid schemes have been running since 2013 and are expected to continue in coming years.	Biofuels

EXTREMADURA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	MARKET: RAISING AWARENESS			
1	**ENCOURAGING ELECTRIC MOBILITY** Creation of the website http://www.conectateameridaybadajoz.es. Identification of charging points established with public initiatives in Extremadura.	Department of Industry, Energy and Environment	Partnership agreements between Department of Industry, Energy and Environment of the Government of Extremadura and the companies Endesa and Ibredrola signed in 2011.	Electricity
	INDUSTRIALISATION			
2	**EXTREMADURA BIOENERGY PLAN 2015-2020 (PBEX)** This includes actions related to providing advice at biofuel production plants, and promoting R & D and public-private partnerships for the development of biofuels.	Governing Council, Government of Extremadura	PBEX aid scheme linked to the use of biofuels in transport is awaiting publication.	Biofuels

AUTONOMOUS COMMUNITY OF MADRID

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGY			
1	**PLAN BLUE +:** AIR QUALITY AND CLIMATE CHANGE STRATEGY OF THE AUTONOMUS COMMUNITY OF MADRID (2013-2020). This includes specific measures for the promotion of alternative fuels in the transport sector	Department of Environment, Local Government and Planning-Directorate-General of Environment	Decision passed by the Governing Council of the Autonomous Community of Madrid	Natural gas Electricity LPG

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	MARKET: VEHICLE ACQUISITION AND RAISING AWARENESS			
2	**INCENTIVE PLAN FOR LIGHT EFFICIENT COMMERCIAL, AUXILIARY AND SERVICES VEHICLES IN THE AUTONOMOUS COMMUNITY OF MADRID (PIVCEM-MADRID))** Aid to sole traders and SMEs for the purchase of light commercial vehicles (category N1).	Department of Environment, Local Government and Planning- Directorate-General of Environment	ORDER 3222/2014 of 22 December 2014 issued by the head of the Department of Environment and Planning, establishing the terms and conditions for the granting of aid for the purchase of efficient, light commercial, auxiliary and service vehicles. ORDER 1384/2016 of 18 July 2016 issued by the Department of Environment and Planning, announcing the call for applications for 2016 for the granting of aid for the purchase of efficient, light commercial, auxiliary and service vehicles. Measure included in Plan Blue+	Natural gas Electricity LPG
3	**AID FOR TAXI MODERNISATION** 2016 budget of €1 million	Department of Environment, Local Government and Planning	These aid schemes have been running since 2013 **and are expected to continue until 2020**. Measure included in Plan Blue+	Natural gas Electricity LPG
4	**2016 AID SCHEME FOR CONVERTING VEHICLES TO RUN ON LPG AND CNG** Grant of €400 per petrol vehicle converted to LPG or CNG, of which €200 is transferred directly to the owner of the vehicle by the Autonomous Community of Madrid and is discounted from the bill issued by accredited repair garages. €250 000 budget line for conversion of vehicles from petrol to LPG and €170 000 budget line for the conversion of petrol vehicles to CNG. Conversion of 1000 of each type of vehicle is expected.	Department of Economy, Employment and Finance	Partnership agreement between the Department of Economy, Employment and Finance and the Energy Foundation of the Autonomous Community of Madrid (FENERCOM).	Compressed natural gas (CNG) LPG
5	**FLEET OF PUBLIC BUSES RUNNING ON NATURAL GAS** Plans have been adopted to purchase 200 new buses in 2016 of which 85 % (170) will run on natural gas. This will bring the share of natural gas in the overall Madrid municipal bus fleet from 43 % to 50 %. In addition, €225 000 is to be invested in adapting 15 buses to the dual fuel system for simultaneous gas supply.	Madrid City Council	2016 municipal budget Measure included in Plan Blue+	Natural gas
	INFRASTRUCTURE			
6	**SECTOR MAP FOR LOCATION OF FAST CHARGING POINTS IN THE AUTONOMOUS COMMUNITY OF MADRID** the Autonomous Community of Madrid and Madrid City Council are working on a map of the areas in which charging points should be placed, based on the premise that a point should never be more than ten minutes' drive away.	Autonomous Community of Madrid Madrid City Council	In preparation	Electricity
7	**MADRID-CASTILE-LA MANCHA-VALENCIA GAS CORRIDOR** Installation of a strategic network of gas supply points encouraging the circulation of vehicles powered by natural gas or LPG, especially heavy goods vehicles, on the A3 (Madrid-Valencia) motorway. In urban areas with a distribution network for piped natural gas, natural gas supply points will preferably use compressed natural gas (CNG), while in the interurban area liquefied natural gas (LNG) supply stations will be built.	Central government authorities, Autonomous Community of Madrid Government of Castile-La Mancha Government of Valencia Private sector	Measure included in Plan Blue+ In preparation	Natural gas LPG

BASQUE COUNTRY

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGIES			
1	**PROGRAMME OF GRANTS FOR INVESTMENT IN EFFICIENT TRANSPORT AND MOBILITY**[136]	Basque Energy Agency	Decision by the Director-General of the Basque Energy Agency Expected to continue in coming years.	Natural gas Electricity LPG Biofuels Hydrogen
	MARKET: VEHICLE ACQUISITION AND RAISING AWARENESS			
2	**MEASURE 1 AID SCHEME FOR INVESTMENTS IN EFFICIENT TRANSPORT AND MOBILITY: Purchase of electric, mobile or new energy vehicles and material.** — LINE 1.1: Pure, plug-in hybrid or extended-range electric vehicles — LINE 1.2: electric scooters and motorcycles — LINE 1.3: Flexible bioethanol E-85 vehicles — LINE 1.4: Natural gas vehicles — LINE 1.5: Conversion of vehicles to natural gas — LINE 1.6: Hydrogen vehicles — LINE 1.7: Pure and hybrid plug-in electric heavy-duty vehicles — LINE 1.8: Non-plug-in hybrid electric heavy-duty vehicles — LINE 1.9: Heavy-duty hydrogen fuel cell vehicles — LINE 1.10: Natural gas (CNG or LNG) heavy-duty vehicles — LINE 1.11: Conversion of heavy-duty vehicles to natural gas — LINE 1.12: Electric and natural gas rolling stock	Basque Energy Agency	Decision by the Director-General of the Basque Energy Agency Expected to continue in coming years.	Natural gas Electricity LPG Biofuels Hydrogen
	INFRASTRUCTURE			
3	**MEASURE 2 AID SCHEME FOR INVESTMENTS IN EFFICIENT TRANSPORT AND MOBILITY: Electric vehicle charging infrastructure and alternative fuel supply.** — LINE 2.1: Charging points linked to vehicle fleets — LINE 2.2: Charging points linked to residential parking spaces — LINE 2.3: Charging points for public use — LINE 2.4: Supply installations for biofuels, natural gas or hydrogen.	Basque Energy Agency	Decision by the Director-General of the Basque Energy Agency Expected to continue in coming years.	Natural gas Electricity LPG Biofuels Hydrogen
	PROMOTING INDUSTRIALISATION AND RDI			
4	**AZKARGA PROJECT:** FAST, SMART, FLEXIBLE AND MANAGEABLE ELECTRIC VEHICLE CHARGING	Department of Economic Development and Competitiveness Private sector		Electricity

LA RIOJA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	SPECIFIC AUTONOMOUS COMMUNITY STRATEGY			

[136] http://www.eve.eus/CMSPages/GetFile.aspx?guid=8beaf9c7-fb78-4921-80d6-4a7919c04b03

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
1	**REGIONAL STRATEGY TO ENCOURAGE ALTERNATIVE FUELS IN LA RIOJA** The Government of La Rioja plans to carry out various actions to encourage alternative fuels in transport within the Energy Plan of La Rioja 2015-2020.	Directorate-General for Innovation, Employment, Industry and Trade	In preparation	Not yet specified

CEUTA

No	MEASURE	BODY RESPONSIBLE	LEGISLATION	FUEL
	MARKET: VEHICLE ACQUISITION			
1	**ACQUISITION OF TWO ELECTRIC VEHICLES FOR THE CEUTA LOCAL GOVERNMENT**	Department of Environment and Sustainability, Government of Ceuta		Electricity
	SUPPLY INFRASTRUCTURE			
2	**INSTALLATION OF TWO CHARGING POINTS FOR THE ELECTRIC VEHICLES USED BY THE CEUTA LOCAL GOVERNMENT**	Department of Environment and Sustainability, Government of Ceuta		Electricity

IV. SEA TRANSPORT

IV.1. NATURAL GAS

IV.1.1. INTRODUCTION

Spain is in a unique position to develop the new shipping-oriented LNG market. This is due firstly to its strategic location at the crossroads of the most important transoceanic routes, a meeting point between the Mediterranean, North Africa and the Atlantic, which positions it as a logistics platform in Southern Europe. Secondly, Spain has infrastructure and experience gained over the last 45 years in LNG storage and supply both nationally and internationally.

It is also important to note that Spain has the longest coastline (8 000 km) of any EU country, as a result of which a comprehensive system of State-owned ports has developed, with 43 'ports of general interest' [a defined concept under Spanish law covering the country's major ports of strategic or geographical importance], managed by 28 Port Authorities, in operation in June 2016. Thirteen of these are part of the core TEN-T network.

Figure IV-1. Map of ports of general interest and membership of the Trans-European Transport Network (TEN-T)

Source: National Ports Authority (based on Regulation (EU) No 1315/2013 on the trans-European transport network)

Table IV-1. Map of State-owned ports and membership of the Trans-European Transport Network (TEN-T)

PORT AUTHORITY	PORT	CORE TEN-T NETWORK		CORE TEN-T NETWORK (SEA PORTS)	NON-TEN-T PORTS
		SEA PORTS	INLAND PORTS		
A Coruña	A Coruña	A Coruña			
Alicante	Alicante			Alicante	
Almeria	Almeria Carboneras			Almeria Carboneras	
Avilés	Avilés			Avilés	
Bahía de Algeciras	Bahía de Algeciras Tarifa	Bahía de Algeciras			Tarifa[137]
Bahía de Cádiz	Bahía de Cádiz			Bahía de Cádiz	
Balearic Islands	Palma de Mallorca Alcudia Mahón Ibiza La Savina	Palma de Mallorca		Mahón Ibiza La Savina	Alcudia
Barcelona	Barcelona	Barcelona			
Bilbao	Bilbao	Bilbao			
Cartagena	Cartagena	Cartagena			
Castellón	Castellón			Castellón	
Ceuta	Ceuta			Ceuta	
Ferrol-San Cibrao	Ferrol San Cibrao			Ferrol San Cibrao	
Gijón	Gijón	Gijón			
Huelva	Huelva	Huelva			
Las Palmas	Las Palmas Arrecife Puerto Rosario	Las Palmas		Arrecife Puerto Rosario	
Malaga	Malaga			Malaga	
Marín y Ría de Pontevedra	Marín-Pontevedra				Marín-Pontevedra
Melilla	Melilla			Melilla	
Motril	Motril			Motril	
Pasajes	Pasajes			Pasajes	
Santa Cruz de Tenerife	Santa Cruz de Tenerife Los Cristianos Santa Cruz de La Palma San Sebastián de La Gomera La Estaca	Santa Cruz de Tenerife		Santa Cruz de La Palma San Sebastián de La Gomera La Estaca	Los Cristianos[138]
Santander	Santander			Santander	
Seville	Seville		Seville		
Tarragona	Tarragona	Tarragona			
Valencia	Sagunto Valencia Gandía	Valencia		Sagunto	Gandía
Vigo	Vigo			Vigo	

[137] Expected to be added to the comprehensive TEN-T network soon.
[138] Expected to be added to the comprehensive TEN-T network soon.

PORT AUTHORITY	PORT	CORE TEN-T NETWORK		CORE TEN-T NETWORK (SEA PORTS)	NON-TEN-T PORTS
		SEA PORTS	INLAND PORTS		
Vilagarcía de Arousa	Vilagarcía de Arousa				Vilagarcía de Arousa
TOTAL	**43**	**12**	**1**	**24**	**6**

Source: National Ports Authority (based on Regulation (EU) No 1315/2013 on the trans-European transport network) Information available as at September 2016.

In considering LNG as a fuel for shipping, the starting point was to consider all ports of general interest as possible refuelling points, taking into account the need to promote smart, sustainable and inclusive development of the internal market, and safeguard the efficiency of the system.

LNG AS AN ALTERNATIVE MARINE FUEL

One of the main factors encouraging the use of LNG as a shipping fuel is environmental law. Therefore, we have compared the different solutions and technologies available today to reduce emissions of sulphur oxides (SO_X), nitrogen oxides (NO_X) and particulate matter (PM) in order to comply with two sets of rules: firstly the limits set by the International Maritime Organisation (IMO) in emission control areas (ECAs); and secondly, with Directive 2016/802/EU of the European Parliament and of the Council of 11 May 2016 on reducing the sulphur content of certain liquid fuels.

Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL) establishes the limits on SO_X and NO_X emissions from ship exhausts and prohibits deliberate emissions of ozone-depleting substances. The rules also establish ECAs where limits on emissions of SO_X, NO_X and PM are even stricter, and Sulphur Emission Control Areas (SECAs) where only restrictions on SO_X emissions are in place.

The emission control areas (ECAs) for sulphur oxides (SO_X), nitrogen oxides (NO_X) and particulate matter (PM) established by the IMO as at May 2016 are as follows:

- The east and west coasts of Canada and the United States as defined in Appendix VII of Annex VI to the MARPOL convention (SO_X, NO_X and PM).
- The Hawaii area (US Caribbean Sea) as defined in Appendix VII of Annex VI to the MARPOL convention.

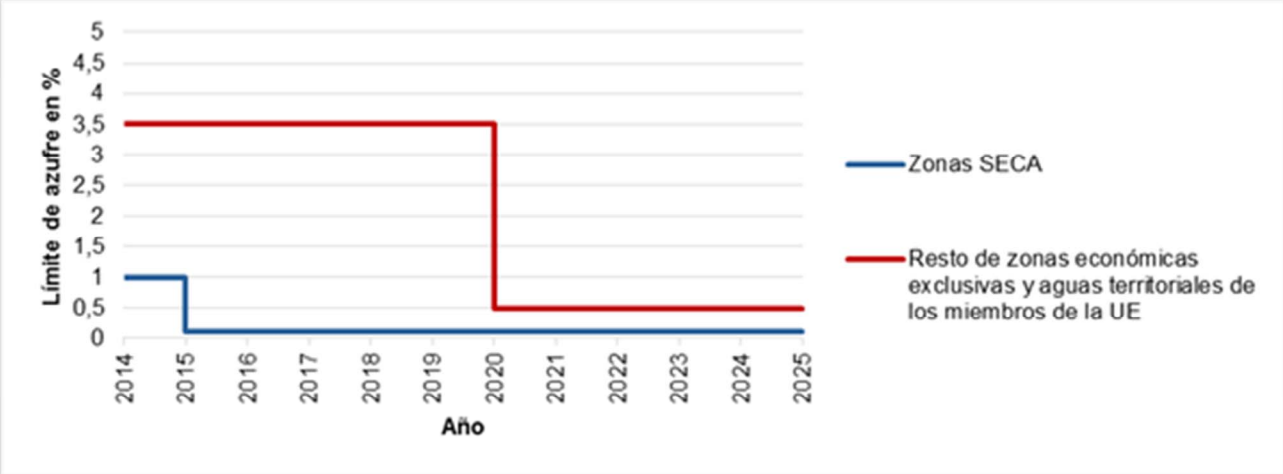
Meanwhile, the emission control areas established for sulphur oxides (SO_X) (SECAs) are:

- The Baltic Sea area as defined in Annex I to the MARPOL convention.
- The North Sea and English Channel area as defined in Annex V to the MARPOL convention.

Listing the Mediterranean Sea as a SECA is being considered for future revisions of the MARPOL convention.

Directive 2016/802/EU transposes MARPOL limit values for sulphur content of marine fuel to EU jurisdiction, reducing the limits from 1.0 % to 0.1 % as of 2015 in SECA areas, and from 3.5 % to 0.5 % as of 2020 in the other exclusive economic zones and territorial waters of the members of the EU.

Figure IV-2. Sulphur limits for marine fuels in EU waters[139]



Source: Directive 2016/802/EU.

The Directive also sets a limit of 1.5 % on the sulphur content in marine fuels used by passenger vessels on regular services to or from any EU port, and a limit of 0.1 % for ships at berth in EU ports (except those vessels that are berthed for less than two hours and turn off all engines and connect to shore-side electricity while at berth). Both limits are currently in force.

Ship-owners are therefore facing a number of major investment decisions in terms of the viability of their activity in SECAs and areas affected by Directive 2016/802/EU.

Conventional fuels exist in various markets for maritime use, but not all meet the environmental standards for sailing in certain waters. Generally these fuels differ from each other by the quality of the crude oil used and the refining process (detailed technical specifications can be found in ISO 8217: 2010). They can be grouped as follows:

- Heavy fuel oil (HFO), also known as 'fuel oil', is cheaper and thicker.
- Intermediate fuel oil (IFO) is made by mixing HFO with marine gas oil (MGO).
- Marine diesel oil (MDO) is a distillate fuel mixed with heavier fuel. It contains residual components and is therefore cheaper.
- Marine gas oil (MGO) is a light distillate, free of residue, and more expensive.

To comply with the emission limits for SECAs while using HFO, an additional exhaust purification system known as a 'scrubber' must be used. This system uses water to remove SO_X, as well as some particulate matter (PM) and other gases, from ship exhaust fumes. Three main technological solutions are used:

- Open-loop scrubbers. These systems use seawater to wash exhaust gases. The seawater used is then filtered to separate the heavy metals and particulate matter and discharged directly back into the sea, containing all the SO_X separated in the washing process. These are the simplest systems, but sometimes ports do not allow discharge into waters in the event of failure to meet the quality criteria

[139] Does not apply to the waters of the outermost regions of the EU.

laid down in Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

- Closed-loop scrubbers. This technology uses seawater that is cooled and chemically treated, usually by injection of caustic soda. Most of the treated water is recycled and only a fraction is discharged back into the sea. These systems avoid the problems of wastewater discharges but are more complex, more expensive and need space on board for the storage and subsequent treatment of the resulting waste. Directive 2016/802/EU states that these systems should be used with fuels with a sulphur content over 3.5 %.

- Hybrid scrubbers. These are a combination of open-loop and closed-loop systems, offering the benefits of both solutions with greater flexibility. They can therefore operate in closed-loop mode when necessary due to restrictions on wastewater discharging, and in open-loop mode when such restrictions do not apply.

Liquefied natural gas (LNG) is also available alongside conventional shipping fuels. To assess the feasibility of using each of the options presented as a possible solution to the limitations on sulphur emissions (SECAs), HFO is taken as a reference. The different possibilities are listed below.

Table IV-2. Comparison of the different technologies available for compliance with the SO_X emission limit

	STRENGTHS OF THE FUEL ITSELF	WEAKNESSES OF THE FUEL ITSELF	OPPORTUNITIES PRESENTED BY THE USE OF THE FUEL IN SEA TRANSPORT	THREATS PRESENTED BY THE USE OF THE FUEL IN SEA TRANSPORT
MGO (MARINE GAS OIL)	■ Reduces SO_X emissions ■ Technically viable with today's engines	■ Does not eliminate NO_X ■ Does not eliminate greenhouse gases (GHGs) ■ More expensive than HFO	■ Negligible investment cost for the shipping industry ■ Developed logistics chain in place at numerous ports ■ No legislative or regulatory barriers ■ More cost-effective than treatment systems for exhaust gases (scrubbers) if less time is spent in SECAs, and increases engine efficiency	■ Preserves dependency on oil prices ■ Higher fuel prices to sail in SECAs, resulting in a loss of competitiveness compared to other modes of transport such as road haulage ■ Insufficient fuel supply if demand at ports increases significantly

	STRENGTHS OF THE FUEL ITSELF	WEAKNESSES OF THE FUEL ITSELF	OPPORTUNITIES PRESENTED BY THE USE OF THE FUEL IN SEA TRANSPORT	THREATS PRESENTED BY THE USE OF THE FUEL IN SEA TRANSPORT
USE OF MGO TO SAIL IN SECAS AND HFO IN OTHER WATERS[140]	■ Reduces SO_X emissions ■ Technically viable with today's engines ■ Cheaper than MGO	■ Does not eliminate NO_X ■ Does not eliminate GHGs ■ Need to adapt the ship to dual-fuel use ■ Need for training in dual-fuel use	■ Cheaper than sailing with MGO alone ■ Developed logistics chain in place at numerous ports ■ No legislative or regulatory barriers ■ More cost-effective than scrubbers if less time is spent in SECAs, and increases engine efficiency	■ Needs medium investment by the shipping industry ■ The need to have two separate tanks (MGO and HFO) reduces load capacity ■ Increased maintenance expenses due to having two fuel tanks and the system for switching between fuels ■ Preserves dependency on oil prices ■ Increased fuel price, though cheaper than using MGO alone ■ Higher fuel prices to sail in SECAs, resulting in a loss of competitiveness compared to other modes of transport such as road haulage ■ Insufficient fuel supply if demand at ports increases significantly ■ Investment may not be recouped if the ship does not sail in SECAs (unnecessary investment and loss of load capacity)
HFO (HEAVY FUEL OIL) COMBINED WITH SCRUBBER SYSTEMS	■ Reduces SO_X to virtually zero ■ Reduces particulate matter emissions	■ Does not eliminate GHGs ■ Produces polluting sludge whose treatment involves high maintenance costs and poses a risk to workers due to its high sulphur content ■ Causes engine erosion and corrosion due to the high sulphur content ■ Does not eliminate NO_X; another specific scrubbing system for NO_X is also needed ■ Space is lost on board the ship	■ High collection efficiency for a wide range of particles ■ Can be installed in new or existing ships ■ Allows the ship to continue running on HFO ■ Developed logistics chain in place at numerous domestic and international ports ■ No legislative or regulatory barriers	■ Needs high investment by the shipping industry ■ Increased maintenance expenses related to the management of polluting sludge ■ Load capacity is lost due to equipment installed ■ Investment may not be recouped if the ship does not sail in SECAs as often (unnecessary investment as MGO would have sufficed)
LNG	■ Eliminates NO_X, SO_X, PM and significantly GHGs ■ Most viable option for meeting requirements if the Mediterranean Sea is declared a SECA in the future	■ Greater technical complexity due to cryogenic supply system, although Spain has relevant experience ■ Needs engine to be replaced or converted to LNG	■ Would not require any adaptations to meet the 0.1 % limit on sulphur in fuel ■ Reduces engine maintenance costs	■ Needs high investment by the shipping industry ■ Possible risk of failure to recover investment depending on the price difference between LNG and HFO/MGO ■ Installing new tanks in existing ships may not be a viable option as, depending on their location, they could compromise the stability of the ship ■ Installing tanks can cause loss of capacity: at least twice the volume of LNG is needed to generate the same power as HFO ■ The use of LNG as a marine fuel and its supply at ports may be met with reluctance due to a subjective perception of the inherent security risk, although in Spain there is experience and training ■ The regulation of the gas sector in Spain is aimed at an end use as fuel and not as a marine fuel ■ There may be restrictions on routes due to a lack of supply points

[140] This option reflects the possibility of using MGO when the ship sails through SECAs and HFO on all other routes. At no time are the two fuels mixed. The ship is fitted with dual fuel tanks and both fuels (HFO and MGO) are kept on board. That way the ship can run on either fuel depending on where it is sailing and the applicable emissions limits.

Source: National Ports Authority

Based on this analysis, we can reasonably consider that deciding whether or not LNG is an attractive alternative to exhaust purification systems or MGO will depend on the following key aspects:

- The time spent in SECA areas up to 2020, as well as new limits on the sulphur content in marine fuels in other territorial and international waters after 2020.
- The price of LNG compared to traditional fuels and pricing trends, with traditional fuel prices closely linked to oil price fluctuations.
- The investment required to install LNG systems on the ship compared with the cost of other alternative technologies.
- The useful life of the ship.
- The availability of supply points at ports.

Given these factors, the following are different options for meeting the requirements of navigation in the short and medium term, depending on the age of the vessel and its navigation routes:

- MGO can offer an appropriate solution for ships nearing the end of their useful lives and/or that spend limited amounts of time in SECAs.
- HFO combined with a scrubber system is a useful option for ships with a medium useful life that spend long periods in SECAs.
- For new ships or ships with a long remaining useful life, the most sensible option seems to be the transition to LNG.

LNG is therefore a realistic and viable long-term option to meet environmental restrictions.

EMISSIONS BY LNG USED IN SHIPPING[141]

LNG emits no sulphur or particulate matter. It also emits 85 % less NO_X and 30 % less greenhouse gases than traditional fuels (HFO). Its use enables compliance with environmental regulations in both ECAs and SECAs.

TAXATION OF LNG AS A MARINE FUEL

Under the Excise Taxes Act (Act 38/1992 of 28 December 1992), the use of natural gas as fuel for sailing, including fishing, other than private pleasure boating is exempt from taxation.[142]

AVERAGE CONSUMPTION OF AN LNG-POWERED SHIP

The average consumption of a vessel propelled by LNG depends on multiple factors, such as engine power, age, how the ship is operated, etc. The generally accepted conversion factor used to compare the fuels is 0.8 tonnes of LNG to 1 tonne of HFO per day per vessel in terms of mass.[143][144]

[141] Source of all information in this section: *Study of the technical and economic aspects of the use of LNG as a marine fuel* conducted by the Senate's Committee on the Environment and Climate Change (2014).

[142] Exemption under Article 51(2.b) of the Excise Taxes Act (Act 38/1992 of 28 December 1992.

[143] Source: *LNG-fuelled deep sea shipping*, Lloyd's Register (2012).

[144] LNG is less dense than HFO. A larger tank is therefore needed on board to carry the same amount of energy in the form of LNG.

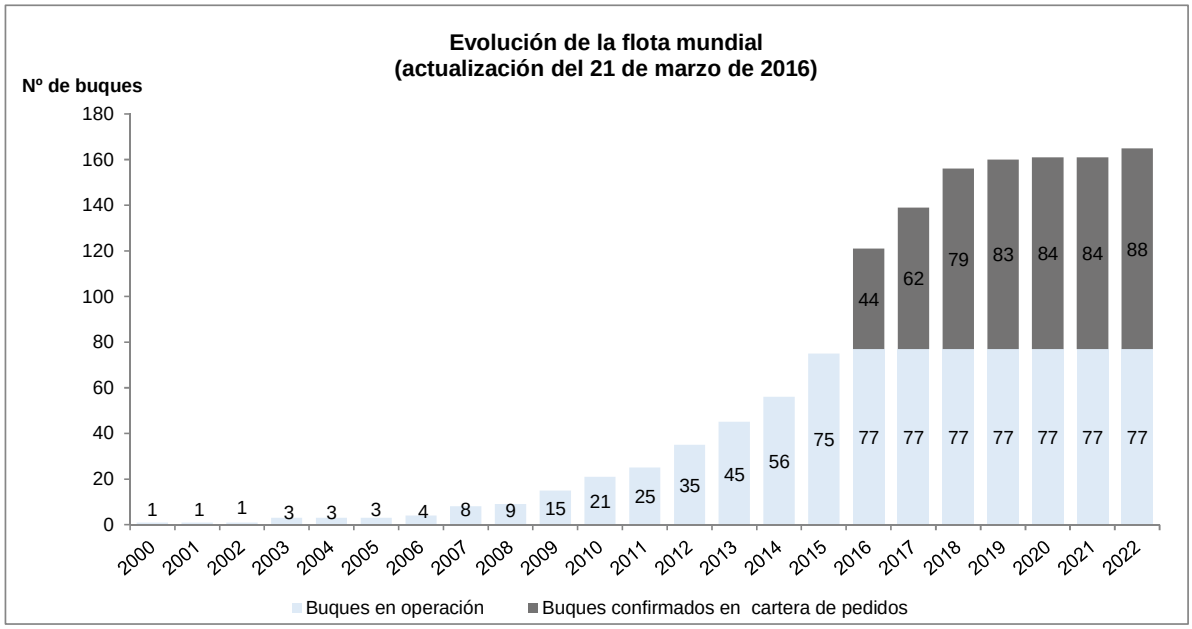
IV.1.2. CURRENT SITUATION

NUMBER OF LNG-POWERED SHIPS

The number of LNG-powered ships operating worldwide is still very low. As at 21 March 2016, 77 vessels were operating, most of them manufactured at European shipyards (65-70 %). The chart below shows the trend in ship numbers between 2000 and 2016 as well as confirmed orders up to 2022 (excluding LNG tankers and inland waterway vessels powered by LNG). Ferries and container ships are the vessel types most likely to be run on LNG.

The existing fleet is mainly concentrated in the Baltic Sea, the North Sea and the English Channel, as they are currently the EU's only SECAs. However, shipyard orders up to 2022 are dominated by vessels operating in the rest of Europe.

Figure IV-3. Number of LNG-powered ships worldwide (already operating and confirmed orders) based on data available as at March 2016



Source: DNV GL[145]

While it is true that, given the international nature of maritime transport, any analysis should be approached from a global perspective, in Spain the use of LNG is limited to the Abel Matutes, a ro-pax ferry operated by Balearia on the Barcelona-Palma de Mallorca route. While this ship is the first in Spain to be converted, it has only been fitted with a gas-powered auxiliary engine (not the main engines). It will be trialled in the third quarter of 2016 and is expected to be in service in 2017.

Balearia also expects to begin operating a new ferry with LNG-powered main engines on the Balearic lines in 2019. Moreover, the Fred Olsen ferry Bencomo Express, which covers the Tenerife-Las Palmas de Gran Canaria route, will start sailing with an LNG-powered engine in 2018. This last project is co-funded by the

[145] Confirmed orders are added to total figures on an accumulative basis using the date of entry into service as forecast on 21 March 2016.

European Commission under the Connecting Europe Facility (Project 2014-ES-TM-0593-S: GAINN 4 Ship Innovation).

CONSTRUCTION OF LNG-POWERED SHIPS IN SPAIN

Spanish shipyards are well-positioned in the construction of ships powered by LNG. The following were in progress in July 2015:

- CNN La Naval de Sestao:
  - A ferry for Balearia, with the option to build a second sister ship under consideration. In this case four dual propulsion engines will be used and four dual auxiliary generators, using natural gas or traditional liquid fuel.
  - A cable-layer for the DEME Tideway group.
  - An agreement has been signed with Balearia to build two new LNG-powered ferries with a length of 225 m and a beam of 30.4 m, involving an investment of around €350 million.
- Gondán Shipyards: three tugs for Østensjø Rederi.

The Spanish shipyards won these contracts following intensive work on RDI, resulting in natural gas technology that set them apart from the competition. Some of the projects have been awarded public financing by the Directorate-General of Industry and SMEs under the cross-cutting aid scheme for shipbuilding approved by the European Commission, as detailed in the table below.

Table IV-3. LNG-related RDI aid granted to shipyards

NO	SHIPYARD	YEAR OF COMPLETION	PROJECT	DESCRIPTION
1	CNN	2014	New developments in engine rooms of ships powered by natural gas other than gas tankers.	Development of a new specific engine room design for vessels other than gas tankers with generation and propulsion fuelled by natural gas.
2	CNN	2014	Ground-breaking new LNG delivery and storage terminal.	Design of a new type of LNG delivery and storage terminal.
3	CNN	2015	Gas tanker propulsion design.	
4	MURUETA	2015	Development of a hybrid dual-fuel tug prototype fuelled by natural gas.	
5	MURUETA	2015	New prototype of a dual-fuel ship for ship-to-ship LNG bunkering	Design of a next-generation gas bunkering vessel
6	GONDÁN	2011	Feasibility study on the use of dual-fuel systems in platform supply vessels (PSVs)	Analysis of the criteria for the provision and installation of main and auxiliary engines fuelled with natural gas, aiming to provide an equivalent level of integrity.

Source: Directorate-General for Industry and SMEs (Ministry of Industry, Energy and Tourism)

LNG BUNKERING OPERATIONS BY SPANISH COMPANIES

LNG demand in Spanish ports by vessels, either for propulsion or auxiliary engines, is limited to occasional supplies that have been taking place since July 2012. All these bunkering operations have taken place using tanker lorries (truck-to-ship or TTS supply).

Five of the world's 77 LNG-powered vessels have berthed in Spanish ports a total of 13 times, requesting LNG bunkering on only seven occasions, with the service being provided successfully on all those occasions. The Spanish company HAM has taken part in an operation to bunker the FA Gauthier with LNG at the port of Naples using tankers filled at Spanish regasification plants.

The main features of bunkering operations carried out to date at the facilities operated by the Algeciras Bay, Cartagena and Vigo Port Authorities, as well as at the port of Naples, are shown below.

Table IV-4. LNG bunkering operations by Spanish traders up to October 2015

DATE	PORT	SHIP	TYPE	SIZE (LENGTH X BEAM IN M)	GROSS TONNAGE (GT)	LNG LOAD CAPACITY LNG (M^3)	SELLER	AUTHORISED CARRIER	BUNKERING (M^3)	NUMBER OF TANKS	BUNKERING TIME (H)	REGASIFICATION PLANT FROM WHICH LNG WAS SOURCED
August 2015	Cartagena	Kvitnos	Ro-Ro[146]	120 x 22	9 132	400	Repsol	ESK	308	7	17	Cartagena
March 2015	Cartagena	Kvitbjørn	Ro-Ro	120 x 21	9 132	400	Repsol	Molgas	313	7	14	Cartagena
March 2015	Naples	F.A. Gauthier	Ro-Pax	133 x 22	15 901	500	HAM	HAM	450	10	15	Barcelona
May 2014	Vigo	Bokn	Tug	35 x 15	764	80	Repsol	Molgas	45	2	4	Ferrol
May 2014	Cartagena	Bokn	Tug	35 x 15	764	80	Repsol	Molgas	45	2	4	Cartagena
Februar y 2014	Vigo	Borgøy	Tug	35 x 15	764	80	Repsol	Molgas	45	2	4	Ferrol
Februar y 2014	Cartagena	Borgøy	Tug	35 x 15	764	80	Repsol	Molgas	66	2	4	Cartagena
July 2012	Algeciras	Høydal	General cargo	70 x 16	2 616	90	Cepsa	Naftran	85	2	4	Cartagena

Source: National Ports Authority based on information provided by Cepsa, HAM, Molgas, Repsol as at October 2015

These ships stopped at these Spanish ports for LNG not only because Spain was conveniently placed on the way from the shipyards to the areas in which they operate, but also because we are a leader in LNG technology. However, in view of the areas in which these vessels operate, they are unlikely to return to the Spanish ports for further LNG bunkering services.

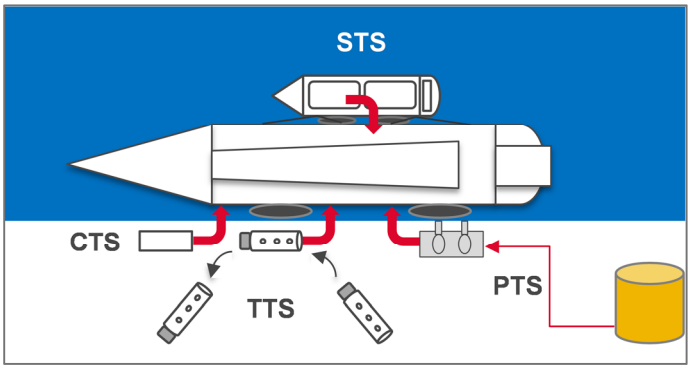
[146] Roll-On/Roll-Off: term used for all ships that transport road vehicles, both cars and lorries.

EXISTING LNG BUNKERING POINTS AT PORTS

The Directive not only cites ports with accessible storage terminals as possible sources of LNG supply to ships, but also ports at which ships can be bunkered using tanker lorries, mobile containers and/or tanker ships or barges that transport LNG from gas tankers or from storage terminals.

Thus, today there are four possible systems to supply LNG to ships in port, as reflected in the figure below. They are listed below in order of delivery rate, from highest to lowest. The facilities to be established at the port, procedures to follow and security measures will be determined by the supply system used.

Figure IV-4. LNG bunkering systems



Source: National Ports Authority

- Ship-to-ship (STS) bunkering

  LNG is supplied by vessels moored alongside the ship to be bunkered, which can either be moored along the quayside or at anchor, allowing LNG to be delivered at other locations within the port itself or its waters.

  No LNG storage facilities are needed at the port itself, provided that the supply vessel is designed to sail in open waters and there is a storage point relatively close by. This type of bunkering is often closely linked to major LNG import/export and storage terminals.

- Pipeline-to-ship (PTS) bunkering

  LNG is supplied to the ship from a permanent facility comprising an LNG storage tank, a quay and a pipeline running from the tank to the quay.

  This delivery system is conditioned by the distance from the storage tanks to the ship, which, in since the LNG has to be kept at a low temperature, cannot be too far (currently maximum distance is between 150 and 250 metres, depending on insulation).

- Truck-to-ship (TTS) bunkering

  The vessel is supplied with LNG by a tanker lorry.

  This is the most versatile bunkering system as it requires no specific facilities at the port. The LNG can be supplied from any quay provided that certain safety conditions are met. Bunkering is performed through flexible hoses connecting the ship's storage tank to the tanker lorry (the pumping system can be either external or built into the tanker lorry itself).

  Transport distances for tanker lorries can easily reach 250-300 km in Spain (equivalent to 3-6 hours' travel). Maximum distances and times depend on the insulation of the tanker lorry, meaning that the TTS

system is virtually free from the constraints of storage facility availability at the port where the bunkering operation is to take place.

- Container-to-ship (CTS) bunkering

  The ship is supplied with mobile cryogenic ISO-standard LNG containers with a capacity between 20 and 45 m³ each.

  The equipment and facilities needed for this supply system are very similar to those for standard cargo loading/unloading/handling operations. In fact, most of the patents of this type of container use standardised sizing following the same dimensions as general cargo containers (20 or 40 feet, i.e., 1 or 2 TEUs).

  Containers are loaded at a specific LNG supply facility or directly at a regasification plant. Once the ship has berthed, the empty tank is unloaded and replaced by a full one. This operation can even be performed with the ship's own crane, if available.

As a guideline, the following table lists the most suitable LNG supply systems for each type of traffic according to Danish Maritime Authority , ordered from highest to lowest delivery rate:[147]

Table IV-5. Features of four possible LNG bunkering systems

BUNKERING SYSTEM	MAXIMUM FLOW	VOLUME	AVERAGE TIME NEEDED FOR AUXILIARY OPERATIONS[148]	ADVANTAGES	DISADVANTAGES
STS Ship-to-ship bunkering (bunker barge)	2 000 m³/h	>100-1 000 m³	2.5 h	■ Extensive capacity (up to 2 000 m³/h) ■ No LNG storage and bunkering facilities need to be installed ■ Flexibility: bunkering anywhere in the port (or outside the port)	■ High investment and operation costs: offshore LNG barges need to be available ■ Linked to import terminals (regasification plants)
PTS Pipeline-to-ship bunkering	400 m³/h (200 m³/h for 'type C' tanks)	>100-1 000 m³	1 h	■ Speed of bunkering operation ■ Can be used for all volumes and ships	■ High investment: LNG storage and bunkering facilities need to be installed ■ Uses up space in the port terminal ■ Limited flexibility: limited number of berths
TTS Truck-to-ship bunkering	60 m³/h	<100 m³	1.5-2 h	■ Low investment and operation costs ■ No LNG storage and bunkering facilities need to be installed ■ Flexibility: bunkering anywhere in the port	■ Limited capacity (30-60 m³/h). ■ Limited application: small bunkering volumes (between 100 and 200 m³) ■ LNG storage tank cannot be too far from the point of supply
CTS Container-to-ship bunkering	-	20 - 45 m³ per container	0.5 h	■ Medium investment: ports only need to have container-handling equipment ■ Quicker than other systems ■ No LNG storage and bunkering facilities need to be installed ■ Flexibility: bunkering anywhere in the port	■ Limited application: only for ships that use this type of container as a fuel storage tank ■ LNG storage facility (storage tank and loading system) cannot be too far from the point of supply

Source: Danish Maritime Authority

[147] Source: *North European LNG Infrastructure Project. A feasibility study for an LNG filling station infrastructure and test of recommendations.* Danish Maritime Authority (2012).

[148] Tasks carried out in relation to the bunkering operation (preparatory and completion tasks for coupling, compliance with safety protocols, etc.).

As mentioned in section II, Spain enjoys unique position in the development of the LNG market for shipping thanks to its existing infrastructure and the experience gained over the last 45 years in the storage and transfer of LNG, both at home and internationally.

LNG satellite plants provide the system with enough capacity to deal with potential increases in demand for natural gas due to its use in shipping without the need for additional investment in basic gas infrastructure.

This storage and distribution capacity is complemented by the flexibility afforded by the use of tanker lorries, making it possible for LNG to reach any point across Spain and even across its borders.

We can therefore say that it is currently possible to supply LNG to ships throughout the State-owned port system by tanker lorry, meaning that we are already in compliance with Article 6(1) (supply of LNG to maritime ports of the basic TEN-T network) and Article 6(2) (LNG supply in inland ports of the basic TEN-T network) of Directive 2014/94/EU. Spain can also supply LNG to other European countries thanks to our small-scale domestic network and our experience.

However, the limitations presented by supplying LNG by tanker lorry, particularly operating times, may discourage their use in certain types of vessel providing a regular service with short berth times, such as ferries. The use of this type of vessel travelling short distances and the progressive introduction of emission control areas are likely to mean that tanker lorries are insufficient to meet the expected demand for LNG.

For any future revisions of this National Policy Framework we would have to assess the supply situation and the logistics of the supply chain in relation to the expected growth in demand, in order to find out whether the supply solutions guaranteed at the time were effective or instead needed to be adapted to ensure the efficiency of supply operations, taking the constraints of demand into account.

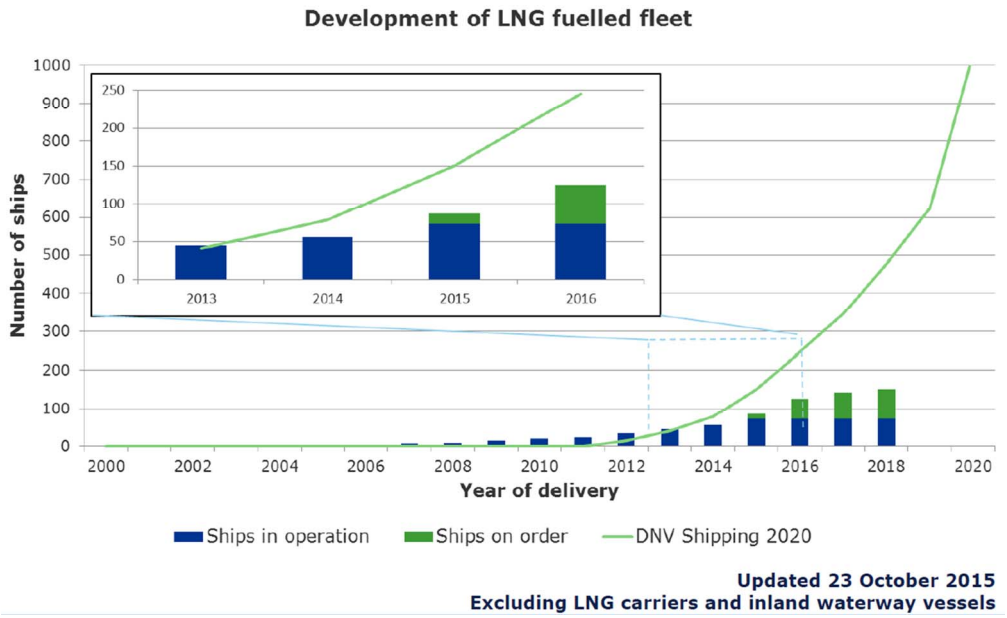
IV.1.3. MARKET FORECASTS AND OBJECTIVES

ESTIMATED NUMBERS OF LNG-POWERED SHIPS

It is up to the shipping operators to decide whether to use LNG to power ships, either by converting existing vessels or building new ones. They will take the decision that is right for their fleet in view of different factors such as fuel prices, limits on emissions, different technological options, shipping regulations, the existence of supply infrastructure, etc. Therefore, the reality is that today there is uncertainty surrounding future trends in demand.

In fact, fewer LNG-powered ships are currently in operation around the world than estimated in the demand projections made in 2012 and updated in 2015, as shown in the figure below.

Figure IV-5. LNG-powered ships: market trend and demand forecasts



Source: DNV GL.

In 2012 the consultancy firm DNV GL studied the expected trend in the number of LNG-powered ships worldwide. It considered several scenarios based on parameters such as: economic growth (high-low); fuel prices (high-low); environmental regulations (stringent-less stringent); LNG prices decoupled from fuel prices; or low HFO prices but high MGO prices. The latest update released in October 2015 shows that the initial estimates made in 2012 were very optimistic and that the number of LNG-powered ships is around half the figure initially forecast.

In 2016 global economic growth is still fragile. This — coupled with uncertainty as to the international legal situation, an absence of measures to encourage the use of LNG in ships, the lack of a developed bunkering service market and the decline in oil prices — will doubtlessly be causing shipping operators to hesitate in making decisions on major investments in their fleets, whether these concern new ships or the conversion of vessels already in operation.

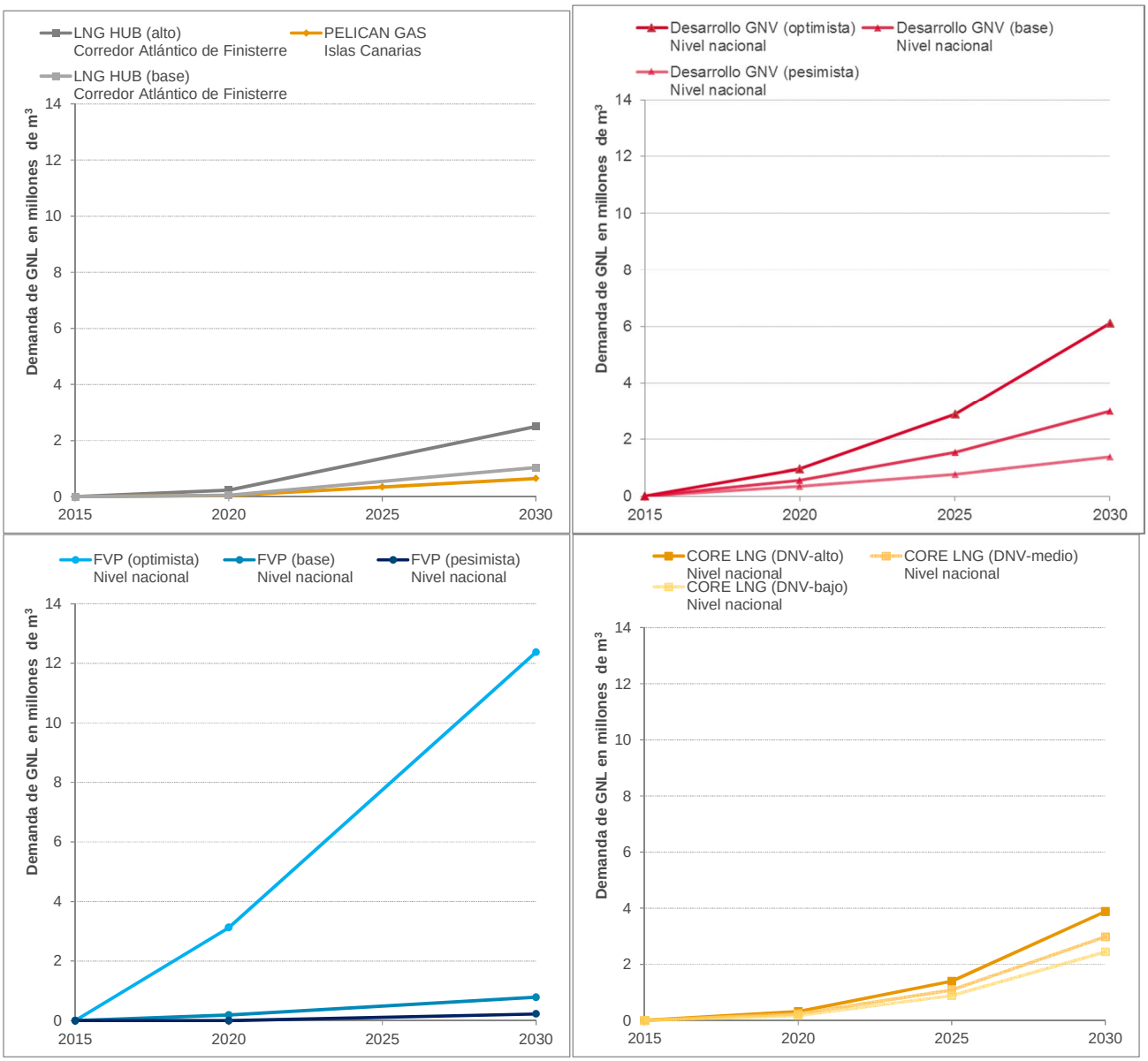
The reality today is that the number of LNG-powered vessels operating worldwide is increasing at an annual rate of between 15 and 25 %, according to the graph shown above. If this trend continues unchanged, we can expect the global figure to rise to between 300 and 700 ships by 2025 and 615-2 150 ships by 2035.

However, classification societies have begun to use additional notation to single out new-build ships that, although initially powered by traditional fuels, can be converted to LNG quickly and cheaply in the future in order to meet environmental regulations. These vessels are not included in the global totals of LNG-powered vessels but could quickly boost their number in the event of conversion.

It is therefore necessary to continue to perform market analysis in a way that is streamlined with this National Policy Framework, thus lessening the uncertainty surrounding the development of demand for LNG at Spanish ports, taking into account the various potentially critical factors influencing this demand (fluctuations in the prices of various fuels, the cost of investment in each technological option, the useful life of the ship, the regulatory framework itself, etc.).

Different demand studies conducted in Spain between 2014 and 2016, with different geographical areas and methods, have yielded somewhat mixed forecasts on the use of LNG as a fuel for shipping. This further highlights the uncertainty existing today.

Figure IV-6. Main results of studies into potential domestic demand for LNG in shipping



Source: PELICAN GAS[149], LNG HUB[150], development of natural gas for vehicles in Spain[151], FVP[152], CORE LNGas Hive[153].

[149] *PELICAN GAS: The excellence of a Project called PelicanGas.* José Rafael Díaz Hernández (May 2016).
[150] *LNG HUB: Definition an analysis of the different scenarios of LNG demand.* DNV GL (July 2014).
[151] *Development of natural gas for vehicles in Spain: analysis of benefits and potential contribution to the national economy.* Deloitte, for GASNAM (October 2014).
[152] FVP: *Update and rescoping of the CORE LNGas Hive project following the results of 'Feasibility of LNG as fuel for the SSS Mediterranean fleet: profitability, facts and figures', drawn up as part of the European COSTA project.* Valenciaport Foundation (July 2016).
[153] CORE LNGas Hive DNV: Preliminary Forecasts. DNV GL (July 2016).

Based on these results, and depending on the scenario considered, between 0 and 22 % of the conventional fuel bunkering that took place in 2015 could be replaced by LNG bunkering by 2020, and 2-87 % by 2030. These figures have a direct impact on Spanish demand for natural gas: total domestic demand could be 0-7 % up on the 2015 figure (315 TWh) by 2020 and 0.5-27.0 % up by 2030.

As is evident, these estimates vary significantly depending on the underlying assumptions and calculation methods, so, although there is significant potential, more work must be done on the methodological aspects and the assumptions backed up by fieldwork in order to reach more accurate results on the horizon established by Directive 2014/94/EU, taking into account the level of uncertainty associated with this type of market research.

THE CORE LNGAS HIVE PROJECT

To ensure that supply devlops in line with demand, the Ministry of Infrastructure and Transport (through the National Ports Authority and the Directorate-General for the Merchant Navy) has been the driving force behind a project entitled CORE LNGas Hive, working closely with public and private organisations from the sector. A detailed description of this project, funded by the Connecting Europe Facility (CEF), is provided in section IV.1.4.

A market study conducted as part of this project is looking into demand — the preliminary results of this analysis are outlined in the previous section — and the development of services offered at ports and the logistics supply chain with a view to meeting this projected demand.

The completion of this project will leave us with a tool that will make it easier to monitor and revise this National Policy Framework. The project will also make it possible to set up an observatory organisation mandated with laying the groundwork for future evaluations of the LNG market in shipping, establishing the structure, methods, and tools needed to (among other things) systematically track changes in demand for the purpose of future revisions of this National Policy Framework.

In any case, demand for LNG supply at Spanish ports is not expected to become significant before 2019, which is when the first revision of this National Policy Framework is due to take place, with still be a year to go before the 0.5 % limit on sulphur content in marine fuel in the European Union comes into force (which will help reduce the current market uncertainty).

By then, the present market uncertainty is hoped to have died down. We will also have access to an analysis tool that uses agreed-upon methodology and is supported by fieldwork validating the trend assumptions with the greatest impact on demand levels. It will therefore be easier to assess the extent to which current supply capacity and the initiatives being carried out or studied (many of them within the Project itself as pilot initiatives) will be sufficient to meet future demand. This in turn will allow us to plan for the development of supply in a way that is consistent with forecast demand, all with a view to meeting the Directive's requirements for 2025 and 2030.

LNG BUNKERING POINTS AT PORTS AND TARGETS

Within the CORE LNGas Hive Project, 11 pilot initiatives are to be conducted between 2015 and 2020 at a cost of €24.4 million. They will be used to study the efficiency and the economic, technical and commercial viability of the different solutions and technologies for bunkering ships at various ports. We can therefore expect new infrastructure for bunkering operational ships to be installed at the ports of Ferrol (PTS bunkering), Bilbao (PTS and STS bunkering), Barcelona (PTS and STS bunkering) and Cartagena (PTS bunkering) by 2020. The bunkering services currently offered by the fleet of 250 tanker lorries will thus be complemented by specific port-based supply infrastructure and equipment allowing higher loading rates (and therefore fewer operational constraints), suited to addressing more favourable rates of growth in demand. Other feasibility studies are exploring the possibility of expanding the supply from the Sagunto and Huelva regasification plants (PTS bunkering).

Other initiatives have also been proposed beyond the scope of the CORE LNGas Hive Project, such as developing bunkering operations from the terminal at the port of Algeciras, STS bunkering in the port of Valencia and STS bunkering in Ferrol.

The LNG bunkering points existing today at Spain's 'ports of general interest' [a defined concept under Spanish law covering the country's major ports of strategic or geographical importance], as well as the pilot initiatives expected to expand this offer by 2020, are detailed in the table below. Current projections indicate that the PTS and STS systems will be favoured in future infrastructure development.

Table IV-6. Existing LNG bunkering infrastructure and pilot projects underway at Spanish ports[154]

BUNKERING SYSTEM	EXISTING	PLANNED
TTS Truck-to-ship bunkering <100 m³	Supply on demand, depending on the volume, discharge rate and geographic availability via the current fleet of 250 tanker lorries	▪ **Port of Barcelona**: Construction of a skid[155] so that several LNG tanks can bunker a ships simultaneaously.
STS Ship-to-ship bunkering (bunker barge) >100-1 000 m³	None	▪ **Port of Barcelona**: Adaptation of an existing ship for LNG bunkering services for large-scale vessels (capacity: four tanks totalling 1 300 m³ LNG)[156]. ▪ **Port of Bilbao:** Adaptation of a ship of LNG bunkering on the Cantabrian coast (capacity: 600 m³ LNG at the initial stage, with the possibility of extending to 1 000 m³ LNG)[157]. ▪ **Port of Valencia**[158]: Adaptation of an existing ship for LNG bunkering services (capacity: between 800-1 000 m³ LNG). ▪ **Port of Ferrol**[159]: Design of an LNG bunkering ship for STS operations along Spain's Atlantic coast, both to intermediate storage terminals at other ports and to ships fuelled by LNG, which can be supplied which they operate.
PTS Pipeline-to-ship bunkering >100-1 000 m³	None	▪ **Port Barcelona**: Installation of specific hoses for LNG bunkering on existing dock. ▪ **Port of Cartagena**: Adaptation of dock at the Enagas regasification plant at Escombreras for bunkering services. ▪ **Port of Bilbao**: Adaptation of large dock at the regasification plant for bunkering services to ships or barges. ▪ **Port of Ferrol**: Adaptation of large dock at the regasification plant for bunkering services to ships.
CTS Container-to-ship bunkering 20 - 45 m³ per container	Supply on demand, depending on the volume and geographic availability via the 27[160] containers currently in place	No plans

Source: National Ports Authority

To ensure proper market development, it will not be enough to have sufficient infrastructure or supply equipment in place. In fact, the future development of LNG supply activities may be affected by potential barriers relating to:

[154] Not including initiatives currently at the design and/or study stage lacking firm commitment to proceed.
[155] System of tanks mounted on a wheeled frame for easier handling.
[156] To enter service by the end of 2020.
[157] To enter service by the end of 2020.
[158] According to information provided by the project coordinator, GAINN4MOS.
[159] Source: Reganosa. Project conducted by the Government of Galicia and Reganosa against the backdrop of work and studies carried out to create the Northwest Iberian Peninsula LNG Hub. Design completed in September 2016. Entry into service planned in 2020.
[160] Compiled from data provided by various economic operators.

- The use of regulated infrastructure. As the use of gas in liquid form to bunker ships is a new activity for the Spanish gas system, this activity needs to be defined and treated in such a way as to ensure consistent and balanced market development that is compatible with the basic principles of regulation of the gas system and the port system. In any case, it is understood that the sale of LNG to ships must take place in a free market.

- The definition and standardisation of technical specifications for the design and operation of LNG supply infrastructure and equipment, including risk assessment, aiming to ensure the safety and efficiency of supply activities and the definition of requirements for the granting of bunkering permits and licences in line with the rules on the provision of services laid down in the existing port legislation.

- The definition, standardisation and assurance of the quality standards to be met by the LNG.

- Providing training, identifying skills, and designing authorisation processes for the personnel performing LNG bunkering activities at the port, guaranteeing the safety and efficiency of operations and ensuring consistency with existing training requirements along the supply chain, thus making it easier to validate qualifications.

- Resistance to the change represented by developing LNG bunkering infrastructure at port and the sailing of LNG-fuelled ships due to a subjective view on the hazard involved.

- End consumers' uncertainty regarding the market price of LNG. This could present an obstacle to the investment required for it to be used as a marine fuel, so a mechanism that boosts price transparency should be considered.

Considering the current capacity to supply LNG to any point throughout Spain using the 250 existing tanker lorries, all 'ports of general interest' should be able to offer LNG bunkering to ships, so they will all be able to begin doing so in the coming years. It may also, of course, be necessary to adapt the type of supply to future demand requirements (evolving towards STT or PTS).

In any case, the target set in the Directive is a quantitative one — supply points at ports — which does not necessarily concern the type of supply, an area which requires more thorough market analysis in agreement with the sector, so any such developments will mainly come from the private sector. Therefore, and although it is currently possible to specify certain ports at which more types of bunkering activity (other than tanker lorry) can be expected, we consider it prudent to refrain from setting targets concerning type of supply until we have a better understanding of market trends.

Looking ahead to the next revision of this National Policy Framework, scheduled for 2019, and based on the market studies being conducted under the CORE LNGas Hive Project, progress in the identification of supply points by type is foreseeable by the deadlines of 2025 (seaports) and 2030 (inland ports) established by the Directive.

The tables below list the quantitative targets set for 'ports of general interest', namely the identification of ports at which LNG bunkering (by tanker lorry if nothing else) can be established by the deadline established by the Directive.

Table IV-7. Targets for LNG bunkering points at ports on the core TEN-T network: 2025 and 2030

YEAR	AREA	PORTS

2025	Sea ports in the core TEN-T network	A Coruña Bahía de Algeciras Barcelona Bilbao Cartagena Gijón Huelva Las Palmas Palma de Mallorca Tarragona Santa Cruz de Tenerife Valencia
2030	Inland ports in the core TEN-T network	Seville

Source: National Ports Authority

Table IV-8. Targets for LNG bunkering points at ports on the comprehensive TEN-T network: 2025 and 2030

YEAR	AREA	PORTS

2025	Sea ports in the comprehensive TEN-T network	Alicante Almeria Arrecife Avilés Bahía de Cádiz La Savina (Formentera) Carboneras Castellón Ceuta El Hierro (La Estaca) Ferrol Fuerteventura (Pto. del Rosario) Ibiza Santa Cruz de La Palma Mahón (Menorca) Malaga Melilla Motril Pasajes Sagunto San Cibrao San Sebastián de la Gomera Santander Vigo Los Cristianos[161] Tarifa[162]

Source: National Ports Authority

Table IV-9. Targets for establishing additional LNG bunkering points at 'ports of general interest'

YEAR	AREA	PORTS
2025	Sea ports	Alcudia Gandía Marín-Pontevedra Vilagarcía de Arousa

Source: National Ports Authority

IV.1.4. MEASURES

As required by Article 3 of the Directive, this National Policy Framework includes the necessary measures to ensure that objectives and targets are achieved. Since developments in supply activity will be closely linked to

[161] The ports of Tarifa and Los Cristianos are expected to be included in the comprehensive TEN-T network on completion of the ongoing revision of the Annex to 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 and repealing Decision No 661/2010/EU. The revised text is expected to be approved in 2016 and enter into force in 2017.

[162] See previous footnote.

the existence of sufficient demand, we have taken into account a wide range of possible options for boosting the LNG market in Spain, from direct aid for investments, tax incentives and financial support, to legislative and strategic measures aimed at each sector (naval, port and gas), etc.

Table IV-10. Measures to support the use of LNG as a shipping fuel

CATEGORY	NO	MEASURE	BODY RESPONSIBLE	LEGISLATION
Strategic measures	1	**Project CORE LNGas Hive:** Core Network Corridors and Liquefied Natural Gas 2014-2020 budget: €33 million *with co-funding for 50 %*	National Ports Authority and Directorate-General for the Merchant Navy (Ministry of Infrastructure and Transport) Private sector	Connecting Europe Facility (approved in 2014)
Tax incentives	2	**Port fee rebate** for vessels powered by LNG or that use LNG in their auxiliary engines (LNG tankers are excluded)	Ministry of Infrastructure and Transport	National Ports and Merchant Navy Act (consolidated version published as Royal Legislative Decree 2/2011 of 5 September 2011), as amended by the seventeenth final provision of the 2015 Budget Act (Act 36/2014 of 26 December 2014)
Promotion of bunkering infrastructure and equipment and consumption of LNG at ports	3	**Adaptation and development of LNG bunkering infrastructure and equipment at ports** through the actions of the CORE LNGas Hive Project and other projects currently under development.	National Ports Authority and Directorate-General for the Merchant Navy (Ministry of Infrastructure and Transport) Private sector	Connecting Europe Facility
	4	**Encouraging the participation of Spanish organisations in projects to develop LNG supply and demand** at ports, co-financed by EU programmes	Ministry of Infrastructure and Transport Ministry of Economy and Competitiveness Directorate-General for EU Funds	Connecting Europe Facility Horizon 2020 ERDF
Legislative developments	5	**Training programmes for crews of ships using LNG**	Ministry of Infrastructure and Transport	IMO Resolutions MSC.396(95) and MSC.397(95)
	6	**Analysis of LNG consumption:** LNG bunkering within present gas sector regulation	Ministry of Industry, Energy and Tourism National Ports Authority (Ministry of Infrastructure and Transport)	Hydrocarbons Act (Act 34/1998 of 7 October 1998) Royal Decree 1434/2002 of 27 December 2002 regulating the transmission, distribution, sale and supply of natural gas and the authorisation of natural gas facilities
	7	**Standardisation of various LNG bunkering procedures**	AENOR	
	8	Definition of procedures for the LNG bunkering at ports and establishing the minimum qualification requirements	National Ports Authority (Ministry of Infrastructure and Transport) Directorate-General for the Merchant Navy (Ministry of Infrastructure and Transport)	
Promoting industrialisation and RDI	9	**Government-backed financing** for building low-emission ships and converting existing ships Annual budget of €40 million	Ministry of Infrastructure and Transport	Annual National Budget Act
	10	**RDI grants to shipyards** for the construction of innovative ships and new shipbuilding processes	Ministry of Industry, Energy and Tourism	Royal Decree 442/1994 of 11 March 1994 on shipbuilding grants and financing
	11	**Credit facilities for shipowners:** subsidising the interest rate on loans obtained by shipowners from financial institutions for shipbuilding in Spain.	Ministry of Industry, Energy and Tourism	Royal Decree 442/1994 of 11 March 1994 on shipbuilding grants and financing

Source: authors' own

STRATEGIC MEASURES

1. Project CORE LNGas Hive: Core Network Corridors and Liquefied Natural Gas

The CORE LNGas Hive — Core Network Corridors and Liquefied Natural Gas Project, which is funded by the European Commission through the Connecting Europe Facility (2014-EU-TM-0732-S), is the most important strategic measure from an institutional point of view aimed at promoting the development of LNG bunkering infrastructure at ports and facilitating market development.

This project is designed and structured to meet the requirements of the Directive, particularly with a view to developing this National Policy Framework, monitoring its implementation and conducting future revisions in accordance with the Directive and the recommendations contained in the 'Study of the technical and economic aspects of the use of LNG as a marine fuel' conducted by the Senate's Committee on the Environment and Climate Change (2014).

The project is led by the Ministry of Infrastructure and Transport, through the National Ports Authority and the Directorate General of the Merchant Navy, in close collaboration with public and private entities representing the sectors affected and coordinated by Enagas. More specifically, the Project involves 42 international, national and regional organisations from the gas, port and shipping industries. It is to be carried out between 2014 and 2020, has a budget of €33 million (mainly private investment), and is co-funded at 50 % by the CEF mechanism for aid for TEN-T projects.

The aim of this project is to develop a logistics chain that facilitates a more widespread use of LNG as a fuel for shipping. The activities conducted within this project include various studies and pilot projects on adapting existing infrastructure to allow bunkering services to be provided to ships. The developments that are taking place within this project will also support the development and subsequent revisions of this National Policy Framework.

One of the main objectives to be achieved by the project is the identification of the barriers that must be overcome to promote the use of LNG as a marine fuel. To this end, in addition to direct contact with affected organisations and interaction between the industrial and institutional project participants, a working panel, comprising industry associations and government representatives, has been set up not only with the aim of identifying barriers but also to discuss the possible options for overcoming the difficulties encountered in developing the market.

It is therefore important to ensure, as required by the Directive, that the parts of this National Policy Framework concerning the use of LNG as a marine fuel, including the national goals and targets and measures to promote market development (including setting up the necessary infrastructure) be developed in close cooperation with the relevant industry. Similarly, the Directives recommendation that countries work together is reflected in the fact that REN (the technical manager of the Portuguese gas system) is involved in this Project.

The Project also includes drawing up a plan for extending the innovative technologies used in the pilot projects to all 'ports of general interest'. This plan will serve as a basis for identifying the financing needed for the new infrastructure to be developed.

The Project also tackles issues that go beyond infrastructure development but are crucial for encouraging market development. Some examples of these issues are: developing technical specifications that allow, as far as possible, the standardisation of operations, infrastructure and equipment design, the training and qualification of the staff providing bunkering services, or examining regulatory aspects to ensure that the development of this new activity is consistent with applicable gas, maritime and port regulations.

Other issues that are directly or indirectly related to the achievement of the objectives and targets set and with the requirements of the Directive are also to be addressed by the Project. Among other things, these include

setting up an observatory that will facilitate the monitoring and review of the National Policy Framework with regard to the use of LNG as a shipping fuel.

In the CORE LNGas Hive project itself work has been developing to identify barriers to penetration of LNG as marine fuel that may affect the achievement of objectives and goals, consistently and by consensus evaluating the need to propose and develop specific measures to overcome these barriers, for example through incentives (direct, fiscal or financial) improvement or development of technical and administrative procedures, adapting legislation, etc.

Aspects that affect, for example, training or the development of technical specifications, due to their impact on the safety and efficiency of bunkering activities and administrative procedures for approval have been identified as potential barriers to market development. As the study of these issues progresses under the CORE LNGas Hive Project, more specific measures may be proposed.

Reluctance among the port sector to use LNG as a fuel has been identified as a possible barrier, motivated by a subjective perception of the risk associated with the unique characteristics of this fuel. Government and port authorities and the operators involved must therefore make a major effort to raise awareness. In this connection, training aspects are again essential, so as to ensure that all personnel involved in logistics and the supply chain operating in maritime and ports activities are suitably qualified for their day-to-day work and able to respond not only to usual circumstances but also deal with possible emergencies.

In this regard, the Project includes specific activities, both to identify training needs, and to develop a communication strategy that identifies those sectors likely to need more information about the use of LNG as a marine fuel. On the target audience is identified, a specific information campaign will be established and launched for each representative group, aimed at disseminating and sharing the benefits of using LNG as fuel with the general public. These issues will be examined in more depth over the course of the CORE LNGas Hive Project in order to then develop more specific measures.

TAX INCENTIVES

2. Port fee rebate for vessels that use LNG

Under the National Ports and Merchant Navy Act (consolidated version published as Royal Legislative Decree 2/2011 of 5 September 2011), as amended by the seventeenth final provision of the 2015 Budget Act (Act 36/2014 of 26 December 2014), ships fuelled by natural gas for propulsion in the high seas and berthed vessels using natural gas to power their auxiliary engines — provided that they are not gas tankers — are entitled to a 50 % reduction in the entry and berthing fees for Zone I (within port waters) and/or Zone II (outside port waters).

PROMOTION OF BUNKERING INFRASTRUCTURE AND EQUIPMENT AND CONSUMPTION OF LNG AT PORTS

3. Adaptation and development of LNG bunkering infrastructure and equipment at ports through the actions of the CORE LNGas Hive Project and other projects currently under development.

The ongoing CORE LNGas Hive project contains specific initiatives to establish pilot LNG bunkering infrastructure at Spanish ports. These are —mainly private — investment projects for the development of bunkering infrastructure and equipment and the adaptation of port service machinery and vessels to allow the use of LNG. The project also includes drawing up a plan for the widespread deployment of this infrastructure.

There are also other projects and initiatives complementing the CORE LNGas Hive[163] that will increase the number of LNG vessels in operation, helping to generate greater demand, while at the same time improving bunkering equipment by increasing the number of refuelling points.

4. Encouraging the participation of Spanish organisations in projects to develop LNG supply and demand at ports, co-financed by EU programmes

The National Ports Authority, the State Secretariat for RDI and the Directorate-General for EU Funds will together encourage the participation of the Spanish private sector in various European programmes such as the CEF, the Horizon 2020 programme and the various ERDF programmes through which co-financing can be obtained for the installation of LNG bunkering infrastructure and equipment for ports and the adaptation of equipment and vessels to LNG.

LEGISLATIVE DEVELOPMENTS

5. Training programmes for crews of ships using LNG

The Directorate-General of the Merchant Navy will oversee the incorporation into Spanish law of the points applicable to LNG terminal operators of the training programmes for crews of vessels using LNG as a fuel established by the IMO in Resolutions MSC.396(95) and MSC.397(95).

6. Analysis of LNG consumption for bunkering services within current gas sector regulation

Since the use of LNG for bunkering ships is a relatively new activity, an in-depth and cost-based analysis of its implications for the current regulation of the gas sector is needed. This analysis will then allow us to assess the feasibility of this activity being carried out through the shared use of existing storage infrastructures belonging to the Spanish gas transmission system (subject to third-party access to the network).

From this point of view, we need to examine the financial rules governing the use of storage infrastructure belonging to the system, particularly the tolls payable by small ships for loading (less than 9 000 m^3) from this infrastructure, whether for bunkering purposes or to use it themselves, and consider how to adapt such tolls to the small volumes of LNG required for consumption.

7. Standardisation of various LNG bunkering procedures

AENOR[164] has created a working panel (AEN/CTN 27/GT2, 'Natural gas as a marine fuel') to standardise various procedures for the bunkering of LNG vessels. This panel is in charge of analysing and studying the different procedures involved in providing ships with LNG bunkering and proposing how these may be standardised.

During 2014-2015 this working panel developed a draft standard (PNE 27005) on the supply of LNG as fuel for ships, laying down common rules on the (human and material) resources and procedures (protocols) required for the supply of LNG to ships for use as a marine fuel[165] can take in conditions of sufficient quality and safety. This draft standard is undergoing the internal publication procedure at AENOR, but will not become official in Spain until ISO DIS 20519 Ships and marine technology Specification for bunkering of gas fuelled ships has been published.

[163] Project GAINN4SHIP INNOVATION (2014-ES-TM-0593-S): Conversion to LNG of the Fred Olsen ship 'Bencomo Express'.
Project CLEANPORT (2014-ES-TM-0711-S): Conversion to LNG of the Balearia ship 'Abel Matutes'.
Project GAINN4MOS (2014-EU-TM-0698-M): Adaptation of a supply vessel to provide LNG bunkering services.

[164] AENOR is the body responsible for the development and dissemination of technical standards in Spain ('UNE standards'), and also for developing its own domestic standards. It is in charge of adapting and implementing mandatory ISO and EN standards in Spain.

[165] Not applicable to gas tanker loading procedures.

The next activity of this working panel will be to develop three possible bunkering options (TTS, STS and PTS), to be added as annexes to this standard.

8. **Definition of procedures for the LNG bunkering at ports and establishing the minimum qualification requirements**

This measure relates to the *Proposal for a Regulation of the European Parliament and of the Council establishing a framework on market access to port services and financial transparency of ports*. Under this proposed Regulation, bunkering (including LNG bunkering) will be considered a port service, meaning that port authorities will be required to regulate the provision of the service by drawing up the specific terms and conditions, which the Spanish national ports authority is legally bound to report. As at October 2016 this Regulation is at the 'trilogue' stage (discussion between the Commission, Parliament and Council) and is expected to be passed this year.

As for the drawing-up of procedures, and as part of the experience gained by Spain's State-owned ports during LNG bunkering operations carried out since 2012, some port authorities (Cartagena, Valencia, Vigo and Huelva) have developed their own procedures for providing this service on public port territory. These procedures, together with the analysis of the technical requirements for LNG supply operations currently being carried out within the CORE LNGas Hive Project, may be used as a foundation for the drawing-up of recommendations or guidelines to be used when drafting terms and conditions in order to ensure that LNG is being used in a way that is compatible with the necessary safety standards, including when goods are being loaded/unloaded and/or passengers are embarking/disembarking.

In the interests of safety, it is also necessary to the establish minimum qualifications required of the personnel involved in bunkering operations at ports, in accordance with the analysis being carried out as part of the CORE LNGas Hive Project.

PROMOTING INDUSTRIALISATION AND RDI

9. Government-backed financing for building low-emission ships and converting existing ships

Since 1999, Spanish national budgets have included a line of €40 million to be used to extend government guarantees underpinning Spanish shipping companies' investments in ships. The use of this sum was previously limited to underwriting the acquisition of merchant ships via 'purchase, lease with a purchase option or finance lease with a purchase option'.

Under the 2016 budget, these government guarantees can be used to underwrite the investments necessary to meet new emissions requirements, including the cost of converting vessels to run on LNG or of installing exhaust gas purification systems (scrubbers). The amount available is the same (€40 million) as in previous years.

These guarantees may be used for financing relating to used vessels and to new vessels built both in Spain and abroad. Vessels may be up to 15 years of age and up to 70 % of the investment can be guaranteed, though the guarantee is limited to 35 % of the vessel value in the case of ship acquisitions.

10. RDI grants to shipyards for the construction of innovative ships and new shipbuilding processes

Spanish shipyards can access aid for RDI projects under a scheme authorised by the European Commission and regulated by Royal Decree 442/1994, of 11 March 1994 on shipbuilding grants and financing. This scheme can be used to obtain support for the construction of state-of-the-art LNG-fuelled ships and for the introduction of new manufacturing processes to shipyards.

11. Credit facilities for shipowners

A grant can be obtained from the Ministry of Industry, Energy and Tourism that subsidises the interest on loans granted under OECD conditions by banks to shipowners for construction at Spanish shipyards,

including the construction of LNG-powered vessels. This grant is governed by Royal Decree 442/1994 of 11 March 1994 on shipbuilding grants and financing.

IV.2. ELECTRICITY

IV.2.1. CURRENT SITUATION

By connecting ships to the electrical mains network when they are in berth, the auxiliary engines that generate energy for different purposes on board (e.g. heating and air conditioning for passengers) can be switched off, offering an alternative to burning fuel for power and eliminating local emissions and noise.

As well as eliminating the impact on the environment of keeping the engines running while the ship is berthed, this option has two other major advantages for the operator: on-board vibration is eliminated and there is less wear on the aforementioned auxiliary engines.

This system is being tested in Spain, with a power point for docked vessels installed at the passenger terminal of the Port of Melilla. Moreover, feasibility studies are being conducted at the ports of Barcelona, Valencia, Palma de Mallorca, Ibiza, Santa Cruz de Tenerife, La Gomera and La Palma.

The National Ports Authority has estimated that more than 100 000 tonnes of conventional fuel— fuel oil, marine gas oil, etc. — used while ships are berthed in Spain could theoretically be replaced by around 600 GWh of electricity.

The possibility of using this replacement must be taken into account when drawing up local action plans for port cities or areas where there is a risk of surpassing one or more of the alert thresholds laid down in Article 24 of Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe. By way of illustration, the following table shows estimated emissions at the Port of La Luz (Las Palmas).

Table IV-11. Estimated emissions from the Port of Las Palmas based on actual berthing data and other information

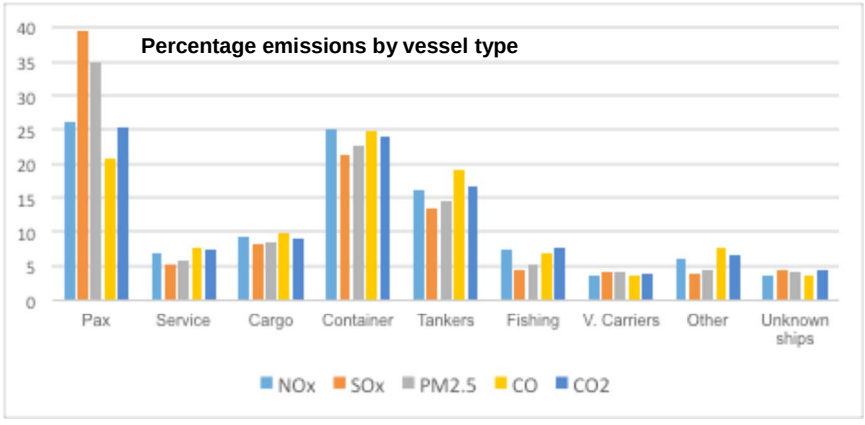
PORT OF LAS PALMAS 2011		EXHAUST EMISSIONS					TIME OPERATING			
		NO_X (tonnes)	SO_X (tonnes)	PM2.5 (tonnes)	CO (tonnes)	CO_2 (tonnes)	H (h)	M (h)	C (h)	T (h)
Type of traffic	Passenger ships	1 063	536	113	99	50 426	22 109	597	4254	26 960
	Services ships	283	72	19	37	14 500	26 583	338	316	27 237
	General cargo ships	373	112	27	47	17 700	59 444	2 121	3 861	65 426
	Container ships	1 019	288	73	119	48 000	63 889	1 648	2 712	68 249
	Tankers	667	186	47	91	33 300	65 833	2 889	3 028	71 750
	Other	241	52	15	37	13 300	78 889	4 500	2 361	85 750
	Fishing vessels	296	59	17	33	15 100	43 611	229	349	44 188
	Car carriers	153	56	13	17	7 479	8 583	245	699	9 528
	Unknown	143	58	13	18	8 892	90 833	3 667	5972	100 472
TOTAL		**4 237**	**1 420**	**338**	**497**	**208 697**	**459 776**	**16 233**	**23 551**	**499 560**

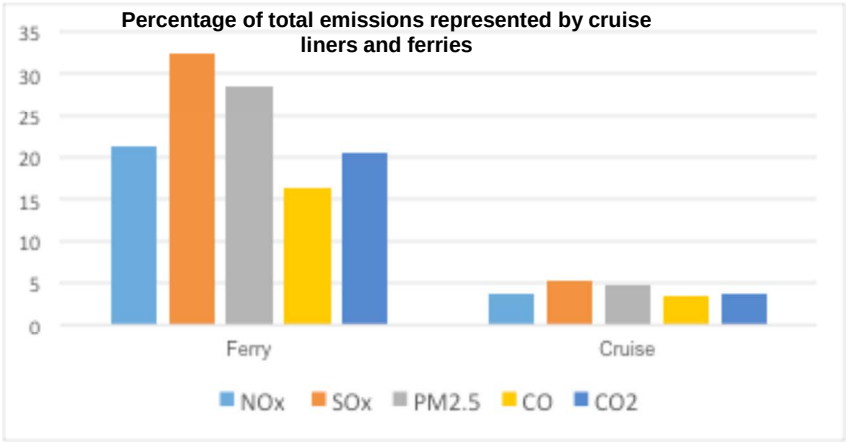
PORT OF LAS	EXHAUST EMISSIONS	TIME OPERATING

PALMAS 2011		NO_X (tonnes)	SO_X (tonnes)	PM2.5 (tonnes)	CO (tonnes)	CO_2 (tonnes)	H (h)	M (h)	C (h)	T (h)
Cruise liners	GT < 4kt	2	1	0	0	96	10	1	3	14
	GT 4-10 kt	9	2	0	1	96	1 575	4	17	1 596
	GT 10-20 kt	3	1	0	0	133	55	2	10	67
	GT 20-30 kt	7	2	0	1	355	148	6	29	183
	GT 30-45 kt	26	10	2	2	1 261	371	13	50	433
	GT 45-60 kt	22	9	2	2	1 003	195	9	32	236
	GT 60-80 kt	74	39	8	9	3 529	1 002	31	179	1 212
	GT > 80 kt	16	13	3	3	831	301	15	63	379
TOTAL CRUISE LINERS		**158**	**75**	**16**	**18**	**7 683**	**3 657**	**79**	**384**	**4 120**
Ferries	GT < 4kt	0	0	0	0	21	199	1	1	202
	GT 4-10 kt	57	13	3	6	2 590	3 046	45	593	3 685
	GT 10-20 kt	588	316	65	47	27 446	10 854	329	2 433	13 616
	GT 20-30 kt	259	132	28	29	12 686	4 352	143	843	5 338
	Total ferries	905	461	97	81	42 744	18 452	517	3871	22 840
TOTAL PAX		**1 063**	**536**	**113**	**99**	**50 426**	**22 109**	**597**	**4254**	**26 960**

Source: ***Essays on vessel emissions and externality cost in Las Palmas Port***

Figure IV-7. Estimated emissions from the Port of Las Palmas based on berthing data





Source: ***Essays on vessel emissions and externality cost in Las Palmas Port***

Moreover, supplying electricity to ships at berth is a way for the shipping industry to contribute towards meeting the target set by Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, namely that 10 % of the energy consumed in transport come from renewable sources. In fact, the National Ports Authority has estimated that this could potentially remove up to 200 000 tonnes of CO_2 emissions in Spain.

However, to plug in a berthed ship, not only must the dock be suitably equipped, but the ship itself has to be adapted. To date most ships have only been fitted with one emergency electrical connection for maintenance and repair operations at shipyards. However, it is increasingly common for modern ships to be fitted with high-voltage connectors.[166] This is particularly prevalent on cruise ships , as cruise operators have recognised this option as a ways of boosting their reputation, suggesting on-board comfort and care for the environment.

In any case, the decision to opt for electrical power while berthed is influenced first and foremost by the difference in prices between the two sources of energy and the cost of the investment required both on board and on the quayside. The supply of electricity to ships at berth is, however, a technologically mature option in the market.

Merchant ships are supplied with electricity at 400 V, 6.6 kV and 11 kV. The latter two voltages are international standards and are also applicable at EU level: under Article 4(6) of Directive 2014/94/EU shore-side electricity supply installations must comply with the IEC/ISO/IEEE 80005-1 standard as of 18 November 2017.

In technological terms, high-voltage supply is recommended whenever the ship's average power requirements — bearing in mind that ships can consume several MWh per year while in port — go above 1 MW. Most ships need to be supplied at 60 Hz, requiring transformers to adapt the general grid frequency of 50 Hz. Moreover, the connection can be made by running a cable from the dock to the ship or using a cable attached to the ship itself and lowered to the dock. In any case, once the physical connection is made, the power supply to the ship is gradually transferred from its own auxiliary engines to the general electricity grid. Although this transfer takes just a few minutes, when a vessel is connected for the first time in a berth, a series of checks need to take place that can last up to an hour. These checks follow an established procedure and will have been previously agreed following the notification from the broker that the ship's captain intends to request the supply of electricity.

The ships most suitable for connecting to the grid are those that make frequent journeys and dock near the most populated areas of the port, i.e. ferries that spend more than 1 500 hours per year in berth and cruise liners.[167]

Table IV-12. Ship traffic at 'ports of general interest' managed by Port Authorities (2013)

PORT AUTHORITY	TANKERS		BULK CARRIERS		FREIGHTERS		CONTAINER SHIPS	
	No	GT	No	GT	No	GT	No	GT
A Coruña	283	6 204 927	108	2 234 361	520	2 364 918	61	453 283
Alicante	19	73 046	71	791 423	94	517 845	438	4 122 686
Almeria	8	26 137	131	3 116 347	142	649 765	102	861 141

[166] Providing shore-side power to large cruise liners at Spanish ports is not currently a technically viable option given the large amount of electricity required.

[167] See note 154.

PORT AUTHORITY	TANKERS		BULK CARRIERS		FREIGHTERS		CONTAINER SHIPS	
	No	GT	No	GT	No	GT	No	GT
Avilés	92	649 756	152	1 688 626	565	3 042 270	3	13 065
Bahía de Algeciras	2 230	44 410 378	606	21 476 263	389	3 262 561	3 342	125 199 428
Bahía de Cádiz	32	501 253	93	1 822 945	145	944 350	210	3 239 283
Balearic Islands	167	1 732 198	212	862 403	187	684 382	1	3 338
Barcelona	836	12 042 126	123	2 825 984	661	3 012 733	1 979	71 142 850
Bilbao	529	14 094 742	542	4 174 476	674	5 347 407	708	6 197 190
Cartagena	750	22 739 670	398	4 233 863	151	614 166	280	2 215 715
Castellón	296	6 391 122	344	2 401 266	178	710 966	444	6 279 168
Ceuta	871	5 389 031	264	3 940 204	2 960	13 256 641	120	643 605
Ferrol-San Cibrao	181	7 964 843	273	5 348 258	584	2 451 096	4	35 392
Gijón	74	894 028	273	10 031 473	412	1 990 228	290	2 222 965
Huelva	1 265	22 003 163	234	3 447 993	353	1 841 045	-	-
Las Palmas	731	22 174 432	1 067	35 827 103	1 526	11 041 841	1 418	33 472 371
Malaga	33	200 275	49	469 015	130	401 763	238	7 618 598
Marín y Ría de Pontevedra	-	-	26	540 293	333	2 195 413	79	1 044 508
Melilla	36	166 903	5	13 125	-	-	112	796 991
Motril	96	1 064 013	26	355 409	134	609 966	56	406 067
Pasajes	-	-	157	426 190	515	1 714 280	-	-
Santa Cruz de Tenerife	1 013	25 778 076	366	17 426 584	223	2 053 289	584	5 683 785
Santander	70	357 239	64	1 327 063	602	2 617 007	12	159 701
Seville	91	380 195	16	160 229	634	2 082 844	121	814 450
Tarragona	1 091	17 816 739	200	4 583 992	782	4 882 804	270	5 692 208
Valencia	224	6 792 130	161	1 286 952	1 510	12 475 568	3 014	120 844 652
Vigo	26	174 034	47	205 092	208	2 149 621	478	5 597 528
Vilagarcía	41	544 316	19	157 439	123	325 648	52	514 176
Total	**11 085**	**220 564 772**	**6 027**	**131 174 371**	**14 735**	**83 240 417**	**14 416**	**405 274 144**

PORT AUTHORITY	RO-RO, FERRIES		CRUISE LINERS						OTHER PAX
	No	GT	No	Passengers on	Passengers off	Transit	Total	Average pax	No
A Coruña	1	14 162	108	423	155 701	156 890	156 890	1 453	-
Alicante	230	3 817 171	32	40	119	41 701	41 860	1 308	-
Almeria	906	14 397 603	28	-	-	16 971	16 971	606	-
Avilés	4	38 112	4	-	-	655	655	164	-
Bahía de Algeciras	296	2 372 276	2	-	-	85	85	43	17 900
Bahía de Cádiz	184	3 994 745	311	784	1 236	373 114	375 134	1 206	-
Balearic Islands	701	12 411 098	699	245 440	246 994	1 042 240	1 534 674	2 196	25 300
Barcelona	3 284	100 613 745	837	754 038	752 248	1 092 946	2 599 232	3 105	-

PORT AUTHORITY	RO-RO, FERRIES		CRUISE LINERS						OTHER PAX
	No	GT	No	Passengers on	Passengers off	Transit	Total	Average pax	No
Bilbao	152	3 562 085	44	6 725	6 303	44 324	57 352	1 303	114
Cartagena	9	83 218	115	71	79	134 075	134 225	1 167	-
Castellón	111	2 189 378	3	-	-	1 514	1 514	505	-
Ceuta	629	3 985 333	3	-	-	2 527	2 527	842	6 368
Ferrol-San Cibrao	23	386 184	9	46	6	10 801	10 853	1 206	-
Gijón	11	486 373	11	5	5	14 281	14 291	1 299	167
Huelva	-	-	2	-	-	294	294	147	55
Las Palmas	3 828	64 381 720	445	120 906	121 052	588 266	830 224	1 866	-
Malaga	781	12 270 963	249	34 224	36 707	326 167	397 098	1 595	-
Marín y Ría de Pontevedra	-	-	-	-	-	-	-	-	-
Melilla	1 199	24 902 062	7	-	-	3 248	3 248	464	147
Motril	585	13 509 424	27	-	-	15 231	15 231	564	-
Pasajes	202	3 876 175	-	-	-	-	-	-	-
Santa Cruz de Tenerife	4 365	68 643 933	525	83 346	84 028	626 969	794 343	1 513	4 985
Santander	563	16 417 103	12	-	172	16 575	16 747	1 396	-
Seville	135	1 525 500	58	8 274	8 521	2 708	19 503	336	-
Tarragona	100	3 505 297	3	-	-	1 394	1 394	465	-
Valencia	1 955	54 420 785	223	35 782	38 566	398 766	473 114	2 122	-
Vigo	426	13 632 421	83	1 337	1 655	168 808	171 800	2 070	-
Vilagarcía	-	-	6	-	-	2 199	2 199	367	-
Total	**20 680**	**425 436 866**	**3 846**	**1 291 441**	**1 453 392**	**5 082 749**	**7 671 458**	**1 995**	**55 036**

Source: National Ports Authority

Whereas a large number of vessels fitted out for electrical connection are already calling at certain ports in the United States and Asia, the situation in Europe is different and this option is not yet widespread. The Port of Gothenburg (Sweden) is a pioneer in supplying shore-side power to ships because the Baltic Sea has been declared a SECA area (sulphur emission control area under the IMO Marpol Convention). Of the ports of the well-known 'Le Havre-Bremen range' in the North Sea, this option has only materialised in the form of initiatives at specific terminals for cruise ships in Hamburg, ro-ro ships in Zeebrugge, container vessels in Antwerp and passenger vessels in Rotterdam.

Table IV-13. Ports worldwide with shore-side power supply

YEAR INTRODUCED	PORT	COUNTRY	POWER (MW)	FREQUENCY (HZ)	VOLTAGE (KV)	VESSEL TYPE
2000-2010	Gothenburg	Sweden	1.25-2.5	50- 60	6.6 and 11	Ro-Ro, Ro-Pax
2000	Zeebrugge	Belgium	1.25	50	6.6	Ro-Ro
2001	Juneau	U.S.A.	7-9	60	6.6 and 11	Cruise liner
2004	Los Angeles	U.S.A.	7.5-60	60	6.6	Container ship, cruise liner

YEAR INTRODUCED	PORT	COUNTRY	POWER (MW)	FREQUENCY (HZ)	VOLTAGE (KV)	VESSEL TYPE
2004	Pitea	Sweden	1.0	50	6	Ro-Ro
2005-2006	Seattle	U.S.A.	12.8	60	6.6 and 11	Cruise liner
2006	Kemi	Finland		50	6.6	Ro-Pax
2006	Kotka	Finland		50	6.6	Ro-Pax
2006	Oulu	Finland		50	6.6	Ro-Pax
2008	Antwerp	Belgium	0.8	50 - 60	6.6	Container ships
2008	Lübeck	Germany	2.2	50	6	Ro-Pax
2009	Vancouver	Canada	16	60	6.6 and 11	Cruise liner
2010	San Diego	U.S.A.	16	60	6.6 and 11	Cruise liner
2010	San Francisco	U.S.A.	16	60	6.6 and 11	Cruise liner
2010	Karlskrona	Sweden	2.5	50	11	Ro-Pax
2011	Long Beach	U.S.A.	16	60	6.6 and 11	Container ship
2011	Oslo	Norway	4.5	50	11	Cruise liner
2011	Prince Rupert	Canada	7.5	60	6.6	
2012	Rotterdam	Netherlands	2.8	60	11	Ro-Pax
2012	Ystad	Sweden	6.25	50 and 60	11	Ro-Pax
2013	Trelleborg	Sweden	3.5-4.6	50	11	Ro-Pax
2015	Hamburg	Germany	12	50 and 60	6.6 and 11	Cruise liner

Source: International Association of Ports and Harbours (IAPH) — World Ports Climate Initiative.

From an EU policy perspective, the supply of electricity to berthed ships is considered as a way to meet the requirement imposed by Directive 2012/33/EC (which itself amends Directive 1999/32/EC) and by Annex VI to the IMO's MARPOL Convention, namely to limit the sulphur content of fuels used by ships while they are berthed in port to 0.1 % by mass.

IV.2.2. MARKET FORECASTS AND OBJECTIVES

Spanish port authorities are willing to facilitate the provision of electrical connection points on the docks of the 'ports of general interest'. The initiative for this service can be taken either by the shipping company itself when it has own terminal or holds a concession for a passenger terminal, or by electricity companies.

The private company taking the initiative would have to apply to the port authority in question for a concession for the occupation of the publicly owned port territory through which the electricity lines will run, whether in tunnels or trenches. This concession will be granted subject to the terms and conditions and the requirement to pay the occupation and activity rates established in the Ports Act (National Ports and Merchant Navy Act, consolidated version published as Royal Legislative Decree 2/2011 of 5 September 2011).

There is no obligation for port authorities to provide a commercial service in the absence of private enterprise, as only the services legally defined as 'port services' in the Ports Act are subject to such an obligation. However, according to the *Proposal for a Regulation of the European Parliament and of the Council establishing a framework on market access to port services and financial transparency of ports*, which is at an advanced stage of the EU legislative process, the supply of power is, like bunkering, to be considered a port service, in which case the port authority will be required to provide it if requested in the absence of private initiative.

The aims for 2020 under this National Framework, based on the best estimate of demand at the date of publication hereof (October 2016), are detailed in the table below.

Table IV-14. Spanish ports expected to have shore-side electricity supply by 2020

PORT	TERMINAL	NUMBER OF CONNECTIONS	VOLTAGE (V)	TYPE OF SHIP SERVICED	COMMENTS
Melilla *Comprehensive TEN-T network*	Passenger terminal	1	400	Ferries	Testing stage
La Luz - Las Palmas *Core TEN-T network*	Main dock	2	400	Ferries	Project 2015-EU-TM-0417-S, selected for CEF 2015 funding. Conditional on definitive co-financing
Santa Cruz de Tenerife *Core TEN-T network*	Passenger terminal	2	400	Ferries	Project 2015-EU-TM-0417-S, selected for CEF 2015 funding. Conditional on definitive co-financing
Palma de Mallorca *Core TEN-T network*	Paraires dock, extension of Poniente and Poniente Sur docks	3	400 and 6 600	Ferries	Project 2015-EU-TM-0417-S, selected for CEF 2015 funding. Conditional on definitive co-financing
Pasajes *Comprehensive TEN-T network*	Lezo dock	1	11 000[168]	Car carriers	Project 2015-EU-TM-0417-S, selected for CEF 2015 funding. Conditional on definitive co-financing

Source: National Ports Authority

IV.2.3. MEASURES

[168] The plan here is to supply medium voltage (11 kV as per IS0 80005) for these types of vessel. This type of supply is suitable because Pasajes has a ro-ro terminal with frequent stops.

Table IV-15. Measures to support the provision of shore-side electricity supply

CATEGORY	No	MEASURE	BODY RESPONSIBLE	LEGISLATION
Tax incentives	1	**50 % reduction** in the berthing fee charged to ships docked in port when connected to mains electricity	National Ports Authority (Ministry of Infrastructure and Transport)	National Ports and Merchant Navy Act (consolidated version published as Royal Legislative Decree 2/2011 of 5 September 2011), as amended by the seventeenth final provision of the 2015 Budget Act (Act 36/2014 of 26 December 2014)
	2	**Creation of a working group** to analyse the possible future demand for shore-side electricity for ships docked at our ports and the feasibility of bringing fees into line with market conditions.	National Ports Authority (Ministry of Infrastructure and Transport) Ministry of Finance and Public Authorities	
Promotion of supply infrastructure	3	**Encouraging the participation of Spanish organisations** projects to develop electricity supply infrastructure at ports	National Ports Authority (Ministry of Infrastructure and Transport)	Connecting Europe Facility Horizon 2020 ERDF
	4	**Monitoring shipping companies' plans** in order to meet the foreseeable demand for shore-side electricity supply	National Ports Authority (Ministry of Infrastructure and Transport)	
Legislative developments	5	Analysis of a possible revision of the rules applicable shore-side electricity supply	National Ports Authority State Secretariat for Energy (Ministry of Industry, Energy and Tourism)	
Promoting industrialisation and RDI	6	Studies on the applicability of smart grids to shore-side electrical connections	National Ports Authority (Ministry of Infrastructure and Transport)	
	7	Participation in innovative projects to ensure on-site power generation from renewable sources	National Ports Authority (Ministry of Infrastructure and Transport)	
Awareness-raising	8	Creation of a website providing information about the ports that provide shore-side electricity	National Ports Authority (Ministry of Infrastructure and Transport) REE	

Source: authors' own

TAX INCENTIVES

1. 50 % reduction in the berthing fee charged to ships docked in port when connected to mains electricity

Under the National Ports and Merchant Navy Act (consolidated version published as Royal Legislative Decree 2/2011 of 5 September 2011), as amended by the seventeenth final provision of the 2015 Budget Act (Act 36/2014 of 26 December 2014), ships that use shore-side electricity while berthed are entitled to a 50 % reduction in the entry and berthing fees for Zone I or within port waters.

This measure is designed, in accordance with the European Commission Recommendation COM 2006/339/EC, to encourage the shore-side supply of electricity to ships. It is also in line with Action 8 of the European Commission which aims to encourage a more consistent application of environmentally differentiated port infrastructure charges.

This measure helps to mitigate the higher annual cost currently involved in connecting a ship to the electricity mains rather than burning fuels to keep the auxiliary engines running; the measure also helps defray the initial investment required for said connection.

2. Creation of a working group to analyse the possible future demand for shore-side electricity for ships docked at our ports and the feasibility of bringing fees into line with market conditions.

Since the shore-side supply of electricity to vessels is a new activity and it will help to reduce air pollution at ports, we need an in-depth cost-based analysis of the implications of this activity for the current tax system. We therefore need to perform a more detailed prior study into the future demand for this service and its impact.

This measure could find a legal framework in Article 19 of Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity. It is also in line with the intention expressed by the European Commission in Communication COM(2007) 575 on an Integrated Maritime Policy for the European Union to bring the tax on shore-side electricity supply into line with market conditions. A working panel will be created to this end, composed by the Directorate-General for Taxation and the National Ports Authority.

PROMOTION OF SUPPLY INFRASTRUCTURE

3. Encouraging the participation of Spanish organisations projects to develop electricity supply infrastructure at ports

Through the CEF, the H2020 Programme (Mobility for Growth and Blue Growth initiatives) and the ERDF (multiregional operating programmes for sustainable growth, the development of the Atlantic area and the development of the Mediterranean area), the National Ports Authority will encourage the investment plans necessary for the development of shore-side electricity supply.

4. Monitoring shipping companies' plans in order to meet the foreseeable demand for shore-side electricity supply

The National Ports Authority will encourage cooperation with foreign ports through the European Ports Association (ESPO) and the EU's ESSF (European Sustainable Shipping Forum) to jointly monitor the fleets whose plans include the adaptation of their ships for shore-side power supply, with the subsequent aim of knowing in advance just how large the demand for electrical connection at Spanish ports will be.

LEGISLATIVE DEVELOPMENTS

5. Analysis of a possible revision of the rules applicable shore-side electricity supply

The State Secretariat for Energy and the National Ports Authority are analysing the legal arrangements applicable to the shore-side supply of electricity to ships to see if regulatory changes are required for this activity.

PROMOTING INDUSTRIALISATION AND RDI

6. Studies on the applicability of smart grids to shore-side electrical connections

The National Ports Authority and the individual Spanish port authorities, through the R&D sections of their respective investment plans, will boost research into the possibility of berthed ships connected to the electrical system joining smart grids.

7. Participation in innovative projects to ensure on-site power generation from renewable sources

The National Ports Authority and the individual Spanish port authorities plan to take part in innovative projects promoting the application of technology based on hydrogen as an energy source.

AWARENESS-RAISING

8. Creation of a website providing information about the ports that provide shore-side electricity

Red Electrica de España (the Spanish grid operator) and the National Ports Authority will publish information on the shore-side supply of electricity to berthed ships, including a list of connection points and their characteristics and other relevant information, on their respective websites.

In the same vein, the National Ports Authority, through the individual port authorities, will work to have these connection points publicised through the International Association of Ports and Harbors' World Ports Climate Initiative.

V. AIR TRANSPORT

V.1. ELECTRICITY

V.1.1. INTRODUCTION

AIRCRAFT AUXILIARY POWER UNITS (APUS)

In addition to the main engines, most aircraft have an auxiliary power unit (APU), which is usually located in the tail of the plane. This turbine has two basic functions: it is responsible for supplying electric power to all aircraft systems for ground operations; and the bleed air extracted from the APU's compressor is used for the aircraft's air conditioning system and for starting the main engines. If the APU is not used for starting the main engines, the compressed air needed for this operation has to be obtained using a pneumatic starter or air starter unit (ASU).

In flight, the APU is usually switched off. It only switched on in special circumstances, such as landing operations when the aircraft engines are at low speeds and extra power is needed, or where increased power is needed during the flight for cabin air conditioning or for the de-icing system. In general, the main engines are responsible for supplying the energy needed for all systems during flight.

Therefore, the operation of the APU is usually limited to times when the aircraft is taxiing to and from the parked position, or is stationary next to the terminal building. The APU is often disconnected immediately after the ignition of the main engines and is usually connected after landing when the aircraft is approaching the parking bay in the terminal area.

It may also be necessary to connect the APU in the event that one or more of the main engines is switched off during taxiing. Several airports have established maximum APU usage times in order to minimise noise and emissions in the terminal area.

Moreover, where local climate conditions mean that air conditioning is used on an aircraft for a large part of the year, there may be little or no economic justification for a fixed installation only supplying 400 Hz, as the APU would also have to be operating during that period for the air conditioning. In these cases, the installation of a 400-Hz fixed system must be considered along with another system for air conditioning, which increases costs, and the economic justification needs to be based on the consideration of both systems simultaneously. These fixed air conditioning systems (PCA or 'pre-conditioned air') can replace the power supply on the ground provided by the aircraft's APU or by mobile air climate units (ACUs).

V.1.2. CURRENT SITUATION

EXISTING SUPPLY INFRASTRUCTURE

TYPES OF EQUIPMENT

There are three categories of solution depending on the location of the transformer and the system of supply to the aircraft:

- Ground-mounted transformer with cable reel attached to the jet bridge

  This is the type most frequently found at Aena airports because past preference was to avoid impeding runway operations with any maintenance of auxiliary equipment. The ground-mounted equipment is located close to the bridge pivot and, as well as the 400 Hz transformer, usually also includes the low-voltage cabinet and PCA system.

- Transformer and cable reel attached to the jet bridge

  As mean time between failures (MTBF) of equipment gets longer, installing it on the jet bridge itself is no longer a major problem. Most of these systems are all-in-one transformer and cable reel fittings.

- Ground-mounted transformer with supply via ground pits

  This system brings more flexibility as it is independent of jet bridge use and provides 400 Hz services.

  As for the power requirements of the installation, depending on the type of aircraft that stop over in each bay, one or more standard 90 KVa sets will be installed:

Table V-1. Power requirements depending on the aircraft (fleet)

AIRCRAFT TYPE	NUMBER OF 90 KVA TRANSFORMERS
C and D	1
E	2
F (A380)	4

Source: AENA.

There are some specific requirements: the B767-400, B747-800 and MD-11 need two units, and the B787 requires three.

GROUND POWER SUPPLY EQUIPMENT FOR AIRCRAFT

Modern aircraft, when parked at terminal gates or in remote stand positions, require three-phase power at 200/115 V — 400 Hz.

Since the 1990s, systems to supply electricity at 400 Hz have been installed at most terminal-side bay, either to complement the systems available in those bays or during delivery with installation of jet bridges and ground services equipment.

These systems supply electric power to stationary aircraft, allowing any other systems, whether exterior or on-board the aircraft, to be switched off. Moreover, in combination with the air conditioning system, it is possible to avoid using the APU, except for the supply of compressed air needed to start the engines.

Having this system available allows airlines to make significant savings, as well as bringing operational benefits in the tasks involved in ground services and environmental benefits (drastic reduction in emissions and noise levels at the airport).

SPANISH AIRPORTS ON THE CORE TEN-T NETWORK THAT SUPPLY POWER TO STATIONARY AIRCRAFT

In Spain, Aena, following its plan for quality of service to users and in line with its environmental and energy policy, installs jet bridges that allow easy access for embarking and disembarking operations, ensuring passenger safety and comfort, and aircraft servicing equipment that allows operations around the aircraft to be performed more quickly, meaning that airport infrastructure is more effectively utilised and work on the ground is safer (because vehicle and passenger traffic on the ground is reduced or eliminated). These jet bridges can be equipped with power outlets and equipment to provide air conditioning to stationary aircraft.

Based on these policies, Aena has made a major effort to equip its airports with infrastructure providing fixed 400 Hz ground power supply for aircraft. This process has been carried out in line with the needs of airports, coinciding at times with the expansion of terminal buildings and, increasingly frequently, with the replacement

of equipment (jet bridges) that has reached the end of its operational life. Another major reason for installing 400 Hz equipment is that, to be able to introduce procedures restricting the use of APUs, AENA must have sufficient infrastructure in place to provide airlines with certain services. This infrastructure may include PCA (pre-conditioned air) systems providing air conditioning to aircraft, which involve high investment and operation costs.

The units in place at various airports, differentiating between airports belonging to the core and comprehensive networks of the Trans-European Transport Network (TEN-T), are detailed below.[169]

Table V-2. Spanish airports on the core TEN-T network that supply power to aircraft

AIRPORT (ICAO CODE)	NUMBER OF FIXED UNITS	NUMBER OF COMBINED UNITS
Adolfo Suárez Madrid-Barajas (LEMD)	139	9
Alicante-Elche (LEAL)	16	-
Barcelona-El Prat (LEBL)	77	-
Bilbao (LEBB)	6	-
Gran Canaria (GCLP)	15	-
Málaga-Costa del Sol (LEMG)	29	1
Palma de Mallorca (LEPA)	37	-
Seville (LEZL)	-	-
Tenerife Sur (GCTS)	8	-
Valencia (LEVC)	6	-
Total	**333**	**10**

Source: AENA.

SPANISH AIRPORTS ON THE COMPREHENSIVE TEN-T NETWORK THAT SUPPLY POWER TO STATIONARY AIRCRAFT

Table V-3. Spanish airports on the comprehensive TEN-T network that supply power to aircraft

AIRPORT (ICAO CODE)	NUMBER OF FIXED UNITS	NUMBER OF ALL-IN-ONE UNITS
A Coruña (LECO)	2	-
Almería (LEAM)	-	-
Asturias (LEAS)	3	-
Badajoz (LEBZ)	-	-
Burgos (LEBG)	-	-
Fuerteventura (GCFV)	13	-
Girona-Costa Brava (LEGE)	-	-
FGL Granada-Jaén (LEGR)	-	-

[169] http://ec.europa.eu/transport/themes/infrastructure/index_en.htm

Hierro (GCHI)	-	-
Ibiza (LEIB)	-	4
Jerez (LEJR)	-	-
La Gomera (GCGM)	-	-
La Palma (GCLA)	7	-
Lanzarote (GCRR)	6	-
León (LELN)	-	-
Melilla (GEML)	-	-
Menorca (LEMH)	5	-
Murcia-San Javier (LELC)	-	-
Pamplona (LEPP)	-	-
Reus (LERS)	-	-
Salamanca (LESA)	-	-
San Sebastián (LESO)	-	-
Santiago (LEST)	12	-
Seve Ballesteros-Santander (LEXJ)	2	-
Tenerife Norte (GCXO)	10	-
Valladolid (LEVD)	-	-
Vigo (LEVX)	-	3
Vitoria (LEVT)	-	-
Zaragoza (LEZG)	-	-
Total	**60**	**7**

Source: AENA.

There are 410 fixed and all-in-one electric power supply units for aircraft in total at Spain's TEN-T network airports. Except for Seville, practically all Spanish airports that make up the core TEN-T network have 400 Hz fixed power supply infrastructure at aircraft parking bays. As for the airports making up the comprehensive TEN-T network, the following have power supply units for aircraft: A Coruña, Asturias, Fuerteventura, Ibiza, La Palma, Lanzarote, Menorca, Santiago, Seve Ballesteros Santander, Tenerife Norte and Vigo.

Therefore, 90 % of Spanish airports forming part of the core TEN-T network, and 38 % of the airports belonging to the comprehensive TEN-T network, have units to supply electricity to aircraft.

V.1.3. MARKET FORECASTS AND OBJECTIVES

FINANCIAL ESTIMATES

Although costs vary widely depending on how many units are to be acquired, whether the airport location is on an island, and whether the unit is to be grouped together with other systems, we can give a rough estimate for the three types of system:

Table V-4. Estimated financial data on aircraft electricity supply units

EQUIPMENT	INSTALLATION COST	ANNUAL MAINTENANCE

		COST[170]
Ground-mounted transformer with cable reel under jet bridge	€68 000.00	€2 500.00
All-in-one transformer and cable reel under jet bridge	€58 000.00	€2 000.00
Ground-mounted transformer and ground pit	€71 000.00	€1 500.00

Source: AENA.

Based on an estimated energy cost of €0.13 per kWh (this varies per airport) and Aena's fee for the 400 Hz service of €11.135092 per quarter-hour or fraction thereof, the investment would be recovered very quickly: within two to four years depending on the daily usage rate of the stand.

Although this 400 Hz equipment is installed at the same time as other aircraft assistance systems, we must also consider the cost of the electrical power it uses (current from the closest transformer stations and corresponding fitting-out of the low-voltage cabinet), of reporting and inclusion in the SCADA system (operated by SIGMA) used for the management and, notably, automatic billing of services, and the need to install PCA equipment and supply systems to be able to demand that APUs be switched off.

PCA equipment requires considerable investment. An estimation is given below:

Table V-5. Estimated financial data on PCA equipment

PCA	Narrow-body	Wide-body	Jumbo
Installation cost (estimated)	€175 000.00	€186 000.00	€219 000.00
Annual maintenance cost (estimated)	€1 800.00	€2 100.00	€2 600.00
Energy consumption (in operation), kVA	85	109	190

Source: AENA.

EXPECTED TRENDS IN POWER SUPPLY TO STATIONARY AIRCRAFT AT AIRPORTS

According to Recital No 20 of Directive 2014/94/EU, the guidelines of the Trans-European Transport Network (TEN-T) require the airports in the core TEN-T network established by Regulation (EU) No 1315/2013 to provide for the availability of clean alternative fuels. Article 2 includes electricity among said alternative fuels, and, according to Article 3, the National Policy Framework should include an examination of the potential need to establish electricity supply to stationary aircraft at airport.

Investment in 400 Hz equipment takes place in connection with three main factors:

- Apron remodelling/reorganisation. This is when parking bays are redesigned, giving rise to new needs 400 Hz equipment (e.g. remodelling at Barajas Terminals 1, 2 and 3 to become a hub).

[170] Estimated cost per equipment unit. These costs are also highly variable, depending on the use of connectors and cables by the ground-handling staff responsible for the connection.

- Terminal expansion/remodelling. In this case, new jet bridge contact positions and other assistance systems are created (remodelling of terminal and ramp 15 in Barcelona, future expansion of Palma de Mallorca).

- Replacement due to obsolescence. This occurs when equipment has reached the end of its useful life, estimated at fifteen years.

A forecast of equipment installations and investments by airport, based on the three aforementioned factors, is provided below.

Table V-6. Forecast investment in 400 Hz supply facilities in 2016-2030 (thousands of Euros)

AIRPORT	Barcelona	Gran Canaria	Vigo	Madrid-Barajas	Palma de Mallorca	Tenerife Sur	Bilbao
UNITS	20.00	4.00	1.00	110.00	36.00	6.00	6.00
2016	1 016.00			190.50	762.00		
2017					1 524.00		
2018							
2019							
2020	444.50	190.50					
2021	444.50						
2022						381.00	
2023			63.50	254.00			
2024				381.00			
2025					571.50		381.00
2026				889.00			
2027							
2028				317.50			
2029	381.00	63.50		2 540.00			
2030				2 603.50			
Total investment	2 286	254	63.5	7 175.5	2 857.5	381	381

AIRPORT	Lanzarote	A Coruña	Tenerife Norte	Fuerteventura	Asturias	Santander	Total
UNITS	7.00	2.00	7.00	2.00	3.00	1.00	**205.00**
2016			444.50				**2 413.00**
2017	444.50						**1 968.50**
2018							**0.00**
2019							**0.00**
2020							**635.00**
2021							**444.50**
2022				127.00			**508.00**
2023		127.00	381.00				**825.50**
2024						63.50	**444.50**
2025					190.50		**1 143.00**

2026							**889.00**
2027							**0.00**
2028							**317.50**
2029							**2 984.50**
2030							**2 603.50**
Total investment	444.50	127.00	825.50	127.00	190.50	63.50	**15 176.50**

Source: AENA. Estimates performed in October 2015.

The above forecasts are based on the information available on new investments underway, although for the bulk of installations expected to take place in the long term, due mainly to the replacement of obsolete units, it has been assumed that the investment will coincide with the replacement of the jet bridge, also due to obsolescence.

This forecast is subject to revision since the working life of the jet bridges currently in use is 22 years.

ANEXO A. BUSINESS ASSOCIATIONS AND OTHER ORGANISATIONS INVOLVED IN DRAWING UP THIS NATIONAL POLICY FRAMEWORK

Annex table A-1. Business associations and other organisations and other associations involved in drawing up this National Policy Framework

BUSINESS ASSOCIATIONS AND OTHER ORGANISATIONS INVOLVED IN DRAWING UP THIS NATIONAL POLICY FRAMEWORK
ACETA — Asociación de Compañías Españolas de Transporte Aéreo (Spanish Association of Air Transport Companies)
AEBIG — Asociación Española de Biogás (Spanish Biogas Association)
AECA — Asociación Española de Compañías Aéreas (Spanish Airline Association)
AECOC — Asociación Española de Codificación Comercial (Spanish Commercial Codification Association)
AEDIVE — Asociación Empresarial para el Desarrollo e Impulso del Vehículo Eléctrico (Business Association for Electric Vehicle Development and Promotion)
AeH2 — Asociación Española del Hidrógeno (Spanish Hydrogen Association)
AEUTRANSMER — Asociación Española de Usuarios de Transportes de Mercancías y Asimilados (Spanish Association of Haulage Users and Similar Services)
AENOR — Asociación Española de Normalización y Certificación (Spanish Standardisation and Certification Association)
AFBEL — Asociación de Fabricantes de Bienes de Equipos Eléctricos (Association of Electrical Equipment Manufacturers)
AFME — Asociación de Fabricantes de Material Eléctrico (Association of Electrical Material Manufacturers)
ALA — Asociación de Líneas Aéreas (Airline Association)
AMETIC — Asociación de Empresas de Electrónica, Tecnologías de la Información, Telecomunicaciones y Contenidos Digitales (Association of Electronics, Information Technology, Telecommunications and Digital Content)
ANAVE — Asociación de Navieros Españoles (Spanish Shipowners Association)
ANESCO — Asociación Nacional de Empresas Estibadoras y Consignatarias de Buques (National Association of Stevedoring Companies and Ship Brokers)
ANFAC — Asociación Española de Fabricantes de Automóviles y Camiones (Spanish Association of Automobile and Lorry Manufacturers)
AOC — Comité de Aerolíneas Operadoras (Airline Operators Committee)
AOLPG — Asociación de Operadores de GLP (LPG Operators Association)
AOP — Asociación Española de Operadores de Productos Petrolíferos (Spanish Association of Oil Product Operators)
APPA — Asociación de Empresas de Energías Renovables (Biocarburantes) (Renewable Energy (Biofuel) Association)
APPICE — Asociación Española de Pilas de Combustible (Spanish Fuel Cell Association)
ASEATA — Asociación de Empresas de Servicios de Asistencia en Tierra en Aeropuertos (Association of Airport Ground Service Companies)
CDTI — Centro para el Desarrollo Tecnológico Industrial (Industrial Technology Development Centre)
CEOE — Confederación Española de Organizaciones Empresariales (Spanish Confederation of Business Organisations)

BUSINESS ASSOCIATIONS AND OTHER ORGANISATIONS INVOLVED IN DRAWING UP THIS NATIONAL POLICY FRAMEWORK
CITET — Centro de Innovación para la Logística y Transporte de Mercancías (Logistics and Haulage Innovation Centre)
Shipping industry cluster
Haulage Department of the National Road Transport Committee
Passenger Department of the National Road Transport Committee
Foundation for the Development of New Hydrogen Technologies in Aragon
GASINDUSTRIAL- Association of industrial gas companies
GASNAM — Natural Gas for Mobility Association of Spain and Portugal
MIBGAS — Gas Market of Spain and Portugal
PTE-HPC platform — Spanish Hydrogen and Fuel Cell Technology Platform
SEDIGAS - Asociación Española del Gas (Spanish Gas Association)
SERCOBE — Asociación Nacional de Fabricantes de Bienes de Equipo (National Association of Capital Equipment Manufacturers)
SERNAUTO- Association of Spanish Automotive Equipment and Component Manufacturers
TRANSPRIME — Spanish Association of Private Haulage Companies with Major Public Sector Users
TRANSVEGAS — Association of Converters of Vehicles to Gas
UNESA — Spanish Electricity Industry Association
UNO — Logistics and Transport Business Organisation

ANEXO B. EXISTING ALTERNATIVE FUEL SUPPLY INFRASTRUCTURE FOR ROAD TRANSPORT IN SPAIN

Annex table B-1. LNG-only, CNG-only and mixed CNG/LNG refuelling points open to the public in Spain as at June 2016

AUTONOMOUS COMMUNITY	PROVINCE	TOWN	COMPANY	TYPE
Andalusia	Seville	Alcalá de Guadaira	HAM SEVILLA	LNG
		Seville	GAS NATURAL FENOSA	CNG
Aragon	Zaragoza	Zaragoza	VÍA GAS	MIXED
Castile-La Mancha	Cuenca	Motilla del Palancar	GAS NATURAL FENOSA	MIXED
	Guadalajara	Alovera	GAS NATURAL FENOSA	MIXED
		Guadalajara	GAS NATURAL FENOSA	CNG
		Torremocha del Campo	HAM TORREMOCHA	MIXED
	Toledo	Toledo	CEPSA	CNG
Castile-Leon	Burgos	Rubena	BEROIL, S.L.	LNG
Catalonia	Barcelona	Abrera	HAM	LNG
		Abrera	GALP	CNG
		Barcelona	GAS NATURAL FENOSA	CNG
		Barcelona	GAS NATURAL FENOSA	CNG
		Hospitalet de Llobregat	GALP	CNG
		Hospitalet de Llobregat	GAS NATURAL FENOSA	CNG
		Igualada	HAM IGUALADA	CNG
		S. Sadurni d'Anoia	GALP	MIXED
		Santa Perpetua de Mogoda	MARINÉ	MIXED
		Viladecans	GAS NATURAL FENOSA	CNG
	Tarragona	Tarragona	HAM BIONET	MIXED
Valencia	Alicante	San Isidro	GAS NATURAL FENOSA	MIXED
	Valencia	Riba-Roja de Turia	GAS NATURAL FENOSA	MIXED
		Valencia	TAXCO	CNG

Galicia	A Coruña	Fene	HAM VILAR DO COLO	LNG
	Ourense	San Cibrao Das Viñas	GAS NATURAL FENOSA	CNG
Madrid	Madrid	Alcorcón	GAS NATURAL FENOSA	CNG
		Madrid	GAS NATURAL FENOSA	CNG
			GAS NATURAL FENOSA	CNG
			GAS NATURAL FENOSA	CNG
			GAS NATURAL FENOSA	CNG
			GAS NATURAL FENOSA	CNG
			GAS NATURAL FENOSA	CNG
			HAM TRES CANTOS	LNG
		Parla	GAS NATURAL FENOSA	CNG
Murcia	Murcia	Era Alta	GAS NATURAL FENOSA	CNG
Navarre	Navarre	Villava O Atarrabia	GAS NATURAL FENOSA	CNG
Basque Country	Alava	Nanclares de la Oca	GAS NATURAL FENOSA	MIXED
	Guipuzcoa	Olaberria	AVIA	MIXED
	Vizcaya	Bilbao	HAM BILBAO	MIXED

Source: Geoportal of the Ministry of Industry, Energy and Tourism

Annex table B-2. LNG-only, CNG-only and mixed CNG/LNG refuelling points with varying degrees of public accessibility as at June 2016

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
1	ANDALUSIA	Alcalá de Guadaira (Seville)	2013	ESTACIÓN MÓVIL	HAM		LNG	OPEN TO THE PUBLIC
2		Seville	Planned	ES Alcalá de Guadaira	Galp		CNG, LNG	OPENING TO THE PUBLIC SOON
3		Seville	2014	TUSSAM Ext.	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
4		Seville			TUSSAM		CNG	PRIVATE
5		Seville			PEPSI (HAM)		CNG	PRIVATE
6		Santa Fe (Granada)	2016	Airport Granada	GNF		CNG, LNG	OPENING TO THE PUBLIC SOON
7		Algeciras (Cádiz)	2016	ENDESA Algeciras	Endesa		CNG, LNG	OPENING TO THE PUBLIC SOON
8		Puerto Sta. María (Cádiz)			FCC		CNG	PRIVATE
9		Malaga			EMTSAM		CNG	PRIVATE
10	ARAGON	Zaragoza	2013	VIA AUGUSTA GAS	VIA AUGUSTA	1 CNG, 1 LNG	CNG, LNG	OPEN TO THE PUBLIC
11		Alfajarín (Zaragoza)	Planned	HAM Zaragoza	HAM		CNG	OPENING TO THE PUBLIC SOON
12		Zaragoza		ENDESA Zaragoza	ENDESA		CNG	OPENING TO THE PUBLIC SOON
13	ASTURIAS	Gijón (Asturias)	2016	EDP Gijón	EDP		CNG	OPEN TO THE PUBLIC
14		Gijón (Asturias)			EDP NATURGÁS		CNG	CLOSED
15		Oviedo (Asturias)			FCC		CNG	PRIVATE
16		Llanera (Asturias)			FCC		CNG	PRIVATE

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
17	BALEARIC ISLANDS	Palma de Mallorca	2012	CA TRESOR ENDESA	ENDESA	2 CNG	CNG	PUBLIC ACCESS MAY BE LIMITED[171]
18		Palma de Mallorca			EMT Palma		CNG	PRIVATE
19	CASTILE-LA MANCHA	Torremocha del Campo (Guadalajara)	2011	HAM TORREMOCHA	HAM		CNG, LNG	OPEN TO THE PUBLIC
20		Alovera (Guadalajara)	2012	J. SANTOS	GNF	2 CNG, 1 LNG	CNG, LNG	OPEN TO THE PUBLIC
21		Guadalajara	2013	Guadalajara	GNF	6 CNG	CNG	OPEN TO THE PUBLIC
22		Toledo	2011	Sta. Bárbara	SERPAUT O ALPÍ		CNG	OPEN TO THE PUBLIC
23		Toledo			UNAUTO (Grupo Ruiz)		CNG	PRIVATE
24		Motilla del Palancar (Cuenca)	2013	MONEGAS	GNF	2 CNG, 1 LNG	CNG, LNG	OPEN TO THE PUBLIC
25	CASTILE-LEON	Rubena (Burgos)	2015	BEROIL RUBENA	Beroil		LNG	OPEN TO THE PUBLIC
26		Burgos			SMAUB		CNG	PRIVATE
27		Burgos			JOHNSON CONTROLS (HAM)		CNG	PRIVATE
28		Burgos			BENTELER		CNG	PRIVATE
29		Salamanca			Salamanca de Transportes		CNG	PRIVATE
30		Salamanca			FCC		CNG	PRIVATE
31		Almazán (Soria)			PURINES		CNG	PRIVATE

[171] This refuelling point is not listed as open to the public in the Ministry of Industry, Energy and Tourism's 'Geoportal'.

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
32	CATALONIA	Barcelona	Planned	ES Cornellà	Galp		CNG, LNG	OPENING TO THE PUBLIC SOON
33		Barcelona	2009	URBASER Bon Pastor ext.	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
34		Barcelona	2012	MARENOSTRUM	GNF	3 CNG	CNG	OPEN TO THE PUBLIC
35		Barcelona		LLULL	GNF		CNG	OPENING TO THE PUBLIC SOON
36		Barcelona			FCC		CNG	PRIVATE
37		Barcelona			CEPSA		CNG	PRIVATE
38		Barcelona			URBASER		CNG	PRIVATE
39		Barcelona			TMB		CNG	PRIVATE
40		Barcelona			Cobega (CocaCola)		CNG	PRIVATE
41		Barcelona			DAMM		CNG	PRIVATE
42		Barcelona			CLD corporation		CNG	PRIVATE
43		Barcelona			Industrias García		CNG	PRIVATE
44		Port of Barcelona	Planned	ES Calle Y	Galp		CNG, LNG	OPENING TO THE PUBLIC SOON
45		Abrera (Barcelona)	2008	HAM ABRERA	HAM		CNG, LNG[172]	OPEN TO THE PUBLIC
46		Sta. Perpetua de Mogoda (Barcelona)	2014	TRANSPORTS MARINÉ	GNF	2 CNG, 1 LNG	CNG, LNG[173]	OPEN TO THE PUBLIC

[172] According to the Ministry of Industry, Energy and Tourism's Geoportal, this is an LNG-only station.
[173] According to the Ministry of Industry, Energy and Tourism's Geoportal, this is a CNG-only station.

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
47		Sant Sadurní d'Anoia (Barcelona)	2011	HAM SANT SADURNÍ	HAM		CNG, LNG	OPEN TO THE PUBLIC
48		L´Hospitalet de Llobregat (Barcelona)	2010	HAM Hospitalet	HAM		CNG	OPEN TO THE PUBLIC
49		L´Hospitalet de Llobregat (Barcelona)	2011	BOTANICA	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
50		L´Hospitalet de Llobregat (Barcelona)			Town council / FCC		CNG	PRIVATE
51		Igualada (Barcelona)	2011	HAM Igualada	HAM		CNG	OPEN TO THE PUBLIC
52		Viladecans (Barcelona)	2015	GNF Viladecans	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
53		Viladecans (Barcelona)			URBASER		CNG	PRIVATE
54		Vacarisses (Barcelona)			HERA AMASA		CNG	PRIVATE
55		El Prat (Barcelona)			URBASER		CNG	PRIVATE
56		Girona	Planned	HAM Girona	HAM		CNG, LNG	OPENING TO THE PUBLIC SOON
57		La Junquera (Girona)	Planned	ES Junquera Tramuntana	Galp		CNG, LNG	OPENING TO THE PUBLIC SOON
58		Salt (Girona)	2011	SSTT GNF Salt	GNF	2GNC	CNG	OPEN TO THE PUBLIC[174]
59		Tarragona	2011	HAM BIONET	HAM		CNG, LNG	OPEN TO THE PUBLIC
60		Tarragona			FCC		CNG	PRIVATE
61		Reus (Tarragona)			FCC		CNG	PRIVATE

[174] This point is not listed as open to the public in the Ministry of Industry, Energy and Tourism's 'Geoportal'.

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
62		Lleida			KNAUF (HAM)		CNG	PRIVATE
63	GALICIA	Fene (A Coruña)	2014	EST. MÓVIL VILAR DO COLO	HAM		LNG	OPEN TO THE PUBLIC
64		A Coruña			CEPSA		CNG	PRIVATE
65		San Cibrao das Viñas (Ourense)	2014	SAN CIBRAO	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
66		Vigo (Pontevedra)			FCC		CNG	PRIVATE
67		Vigo (Pontevedra)			FAURECIA		CNG	PRIVATE
68		Vigo (Pontevedra)			GKN		CNG	PRIVATE
69		Vigo (Pontevedra)			Puerto Pesquero CNG IBÉRICA		CNG	PRIVATE
70		Vigo (Pontevedra)			BENTELER		CNG	PRIVATE
71		Vigo (Pontevedra)			GESTAMP		CNG	PRIVATE
72	MADRID	Tres Cantos (Madrid)	2013	ESTACIÓN MÓVIL	HAM		LNG	OPEN TO THE PUBLIC
73		Valdemoro (Madrid)	2016	ENDESA AISA VALDEMORO	Endesa		CNG, LNG	LIMITED ACCESS TO THE PUBLIC[175]
74		S.Sebastián de los Reyes (Madrid)	2016	ES Jarama	Galp		CNG, LNG	OPENING TO THE PUBLIC SOON
75		Madrid	2011	EMT SANCHINARRO ext.	GNF	5 CNG	CNG	OPEN TO THE PUBLIC
76		Madrid	2011	CTM	GNF	4 CNG	CNG	OPEN TO THE PUBLIC

[175] This point is not listed as open to the public in the Ministry of Industry, Energy and Tourism's 'Geoportal'.

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
77		Alcorcón (Madrid)	2014	MIGENO	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
78		Madrid	2013	SAN BLAS	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
79		Madrid	2015	GNF-Vicálvaro	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
80		Parla (Madrid)	2012	SERPARLA	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
81		Madrid		GNF-Villaverde	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
82		Madrid		GNF-Aravaca	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
83		Madrid	2017	Calle Portomarín	ALIARA ENERGIA SA		CNG	OPENING TO THE PUBLIC SOON
84		Madrid	2016	Calle Fuembellida	GNF		CNG	OPENING TO THE PUBLIC SOON
85		Madrid	2016	Avda. de la Democracia	To be awarded		CNG	OPENING TO THE PUBLIC SOON
86		Madrid	2017	Avda. de Córdoba	ALIARA ENERGIA SA		CNG	OPENING TO THE PUBLIC SOON
87		Madrid	2016	Avda. de los Poblados	ALIARA ENERGIA SA		CNG	OPENING TO THE PUBLIC SOON
88		Madrid	2017	Calle Fuente de Lima	ALIARA ENERGIA SA		CNG	OPENING TO THE PUBLIC SOON
89		Madrid		Madrid Entrevías	EMT		CNG	PRIVATE
90		Madrid		Madrid Carabanchel	EMT		CNG	PRIVATE
91		Madrid		Madrid Fuencarral	EMT		CNG	PRIVATE
92		Madrid		Madrid Sanchinarro int/GNF	EMT		CNG	PRIVATE
93		Madrid			FCC		CNG	PRIVATE

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
94		Madrid			Linde		CNG	PRIVATE
95		Madrid			CEPSA		CNG	PRIVATE
96		Madrid			AENA		CNG	PRIVATE
97		Madrid			Ground Force (Air Europa)		CNG	PRIVATE
98		Madrid			MARTIN (Grupo Ruiz)		CNG	PRIVATE
99		Madrid			HERRANZ		CNG	PRIVATE
100		Madrid		Madrid Manoteras	URBASER		CNG	PRIVATE
101		Madrid		Madrid Aguacate	URBASER		CNG	PRIVATE
102		Madrid		Madrid Hormigueras	URBASER		CNG	PRIVATE
103		Madrid			URBASER / CESPA		CNG	PRIVATE
104		Madrid			IVECO PEGASO		CNG	PRIVATE
105		Alcobendas (Madrid)			CEPSA		CNG	PRIVATE
106		Pozuelo (Madrid)			FCC		CNG	PRIVATE
107		Aranjuez (Madrid)			CEPSA		CNG	PRIVATE
108		Colmenar (Madrid)			CEPSA		CNG	PRIVATE
109		Boadilla (Madrid)			URBASER		CNG	PRIVATE
110	MURCIA	Murcia	2011	DISFRIMUR MURCIA	GNF	6 CNG	CNG	OPEN TO THE PUBLIC

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
111	NAVARRE	Villava (Atarrabia, Navarre)	2011	ANAIZ EZCABA	GNF	2 CNG	CNG	OPEN TO THE PUBLIC
112		Navarre			IBEREMBAL		CNG	PRIVATE
113	BASQUE COUNTRY	Zierbena (Vizcaya)	2013	ZIERBENA	HAM		CNG, LNG	OPEN TO THE PUBLIC
114		Bilbao (Vizcaya)			Norbega (CocaCola)		CNG	PRIVATE
115		Sondika (Vizcaya)			INSTAGÁS		CNG	PRIVATE
116		Olaberria (Guipúzcoa)	2010	GN TRUCK	VICUÑA	3 CNG, 1 LNG	CNG, LNG[176]	OPEN TO THE PUBLIC
117		Anoeta (Guipúzcoa)			EDP NATURGÁS		CNG	PRIVATE
118		S.Sebastián (Guipúzcoa)			EDP NATURGÁS		CNG	PRIVATE
119		Vitoria (Álava)	2012	EUROCAM	GNF	2 CNG, 1 LNG	CNG, LNG	OPEN TO THE PUBLIC
120		Vitoria (Álava)	2016	EDP Vitoria	EDP		CNG	OPEN TO THE PUBLIC
121		Vitoria (Álava)			FCC		CNG	PRIVATE
122		Vitoria (Álava)			PEPSI (HAM)		CNG	PRIVATE
123	VALENCIA	Valencia	2012	DISFRIMUR VALENCIA	GNF	2 CNG, 1 LNG	CNG, LNG	OPEN TO THE PUBLIC
124		Sagunto (Valencia)	Planned	ES Sagunto	Galp		CNG, LNG	OPENING TO THE PUBLIC SOON
125		Valencia	2008	TAXCO	GNF	2 CNG	CNG	OPEN TO THE PUBLIC

[176] According to the Ministry of Industry, Energy and Tourism's Geoportal, this is a CNG-only station.

	AUTONOMOUS COMMUNITY	TOWN	COMMENCED	NAME	OWNED BY	NUMBER OF REFUELLING POINTS	CNG/LNG	STATUS
126		Valencia			EMT		CNG	PRIVATE
127		Valencia			FCC		CNG	PRIVATE
128		Valencia			Franz Schneider		CNG	PRIVATE
129		Castellón de la Plana (Castellón)	2007	TRANS. MONFORT	MONFORT	2 CNG, 1 LNG	CNG, LNG	PUBLIC ACCESS MAY BE LIMITED[177]
130		Castellón de la Plana (Castellón)			FCC		CNG	PRIVATE
131		San Isidro (Alicante)	2012	DISFRIMUR ALICANTE	GNF	1 CNG, 1 LNG	CNG, LNG	OPEN TO THE PUBLIC

Source: GASNAM

[177] This point is not listed as open to the public in the Ministry of Industry, Energy and Tourism's 'Geoportal'.

Annex table B-3. Charge points run by charge operators as at June 2016

CHARGE MANAGER				FACILITY		
No	**COMPANY NAME**	**AREA OF OPERATIONS**	**START DATE AS A CHARGE MANAGER**	**FACILITY ADDRESS**	**TOWN (PROVINCE)**	**AUTONOMOUS COMMUNITIES**
R4-0001	IBIL GESTOR DE CARGA DE VEHÍCULO ELÉCTRICO, S.A. TORRE BEC - RONDA AZKUE Nº1 PLTA. 14 BARAKALDO (VIZCAYA)	NATIONAL	16.6.2011	PARKING ARTIUM, PRUDENCIO Mª VERASTEGUI 1 01002	GASTEIZ (ÁLAVA)	BASQUE COUNTRY
				ALBERT EINSTEIN, 25	MIÑANO (ÁLAVA)	
				PT ÁLAVA, ALBERT EINSTEIN 48 01510	MIÑANO (ÁLAVA)	
				BOULEVARD SALBURUA S/N	VITORIA (ÁLAVA)	
				MUSAKOLA AUZOA, S/N, 20500	ARRASATE (GUIPÚZCOA)	
				AVENIDA OTAOLA, 5, 20600	EIBAR (GUIPÚZCOA)	
				AUTONOMIA 8, 20870	ELGOIBAR (GUIPÚZCOA)	
				ALBITXURI INDUSTRIGUNEA 2, 20870 (C/ IÑIGUEZ KARKIZANO)	ELGOIBAR (GUIPÚZCOA)	
				PLAZA UBITARTE	ELGOIBAR (GUIPÚZCOA)	
				MINASOROETA KALEA	HONDARRIBIA (GUIPÚZCOA)	
				C/ MAGDALENA 1, BAJO	MUTRIKU (GUIPÚZCOA)	
				ARCCO AMARA PLAZA IRÚN S/N	SAN SEBASTIÁN (GUIPÚZCOA)	
				DOKTOR BEGIRISTAIN PASEALEKUA, 107, 20014	SAN SEBASTIÁN (GUIPÚZCOA)	
				PASEO ERROTABURU 1, 6ª PLANTA 20018	SAN SEBASTIÁN (GUIPÚZCOA)	
				PASEO MIRARNON	SAN SEBASTIÁN (GUIPÚZCOA)	
				PASEO MIKELETEGI Nº53 20009	SAN SEBASTIÁN (GUIPÚZCOA)	
				BARRIO MURUETA, S/N, 48220	ABADIÑO (VIZCAYA)	
				BEC AVENIDA DE LA RIBERA 1	BARAKALDO (VIZCAYA)	
				INMACULADA 1	BARAKALDO (VIZCAYA)	
				BEC, RONDA DE AZKUE, 1, 48902	BARAKALDO (VIZCAYA)	
				PLAZA DE INDAUTXU 2 48010	BILBAO (VIZCAYA)	
				BOLUETA CARRETERA BILBAO-GALDAKAO 20	BILBAO (VIZCAYA)	
				PARKING ZABALBURU	BILBAO (VIZCAYA)	
				PARKING ALHONDIGA	BILBAO (VIZCAYA)	
				PARQUE EMPRESARIAL IBARRABARRI EDIFICIO A-2 48940	BILBAO (VIZCAYA)	
				ELORRIETA	BILBAO (VIZCAYA)	
				PARQUE TECNOLÓGICO ZAMUDIO, EDIFICIO 210	ZAMUDIO (VIZCAYA)	
				PARQUE TECNOLÓGICO ZAMUDIO (KANALA BIDEA EDIFICIO 101)	ZAMUDIO (VIZCAYA)	
R4-0002	E.ON ENERGÍA, S.L. C/ MEDIO, 12 SANTANDER (CANTABRIA)	SANTANDER	8.8.2011	PASEO PEREDA 30	SANTANDER (CANTABRIA)	CANTABRIA
				CALLE REAL CONSULADO	SANTANDER (CANTABRIA)	
				AVDA. GARCÍA LAGO	SANTANDER (CANTABRIA)	

CHARGE MANAGER				FACILITY		
No	**COMPANY NAME**	**AREA OF OPERATIONS**	**START DATE AS A CHARGE MANAGER**	**FACILITY ADDRESS**	**TOWN (PROVINCE)**	**AUTONOMOUS COMMUNITIES**
				CALLE LUCIANO MALUMBRES	SANTANDER (CANTABRIA)	
R4-0003	GAS NATURAL SERVICIOS SDG, S.A. PLAÇA DEL GAS, 1 BARCELONA	NATIONAL	24.11.2011	CALLE DE LA PLAZA, 4	A CORUÑA	GALICIA
				CARRETERA CIRCUNVALACIÓN, 1-15	A CORUÑA	
				C/ ENRIQUE MARIÑAS ROMERO PERIODI, 9	A CORUÑA	
				RUA DE LA TORRE, 60	A CORUÑA	
				AVDA. DEL ALCALDE ALFONSO MOLINA	A CORUÑA	
				C/ GALILEO GALILEI	A CORUÑA	
				COSTA DE PALLOZA, 5	A CORUÑA	
R4-0004	IBERDROLA SERVICIOS ENERGÉTICOS, S.A.U. PLAZA EUSKADI, 5 BILBAO (VIZCAYA)	NATIONAL	15.2.2012	PSEO. JUAN DE BORBON, 12 BJ EXT	BARCELONA	CATALONIA
				C/ LLULL, 285, BAJO	BARCELONA	
				C/ PASCUAL I VILA, 15-23 BAJO	BARCELONA	
				C/ DURAN I BAS, 10-14, BAJO EXT	BARCELONA	
R4-0005	SOL ARDILA, S.L. P. I. EL NEVERO, CALLE 18-19, VIAL INT. NAVE 28 BADAJOZ	EXTREMADURA	5.7.2012	P. I. EL NEVERO. CALLE NEVERO 18-19, VIAL INT. NAVE 17	BADAJOZ	EXTREMADURA
R4-0006	ENDESA ENERGIA, S.A. (Unipersonal) C/ RIBERA DEL LOIRA, 60 MADRID	NATIONAL	12.7.2012	CAMÍ DE CAN PASTILLA S/N (opposite Endesa offices)	ES COLL D'EN RABASSA (PALMA DE MALLORCA)	BALEARIC ISLANDS
				C/ LOPE DE VEGA, 125 08005 (E.S. Cepsa)	BARCELONA	CATALONIA
				CAMÍ DE CIUTAT VEL, S/N	CAMPOS (PALMA DE MALLORCA)	BALEARIC ISLANDS
				CARRETERA DE DESVIAMENT, 30	SOLLER (PALMA DE MALLORCA)	
				CARRETERA PALMA ALCUDIA KM 36,8	CAMPANET (PALMA DE MALLORCA)	
				CARRETERA ANDRATX KM 12-12,4	PALMANOVA (PALMA DE MALLORCA)	
				CAMÍ FONDO S/N	PALMA DE MALLORCA	
				VÍA PALMA, 87	MANACOR (PALMA DE MALLORCA)	
R4-0007	ACCIONA EFICIENCIA ENERGÉTICA, S.L. AVENIDA DE EUROPA, 6 ALCOBENDAS (MADRID)	NATIONAL	22.11.2011	CALLE BLAS DE LA SERNA 6	PAMPLONA (NAVARRE)	NAVARRE
				AVDA. SAN IGNACIO 10	PAMPLONA (NAVARRE)	
				CALLE VALPORTILLA II 8-1, BJ	ALCOBENDAS (MADRID)	MADRID
				AVDA. CIUDAD DE LA INNOVACIÓN, 5	SARRIGUREN (NAVARRE)	NAVARRE
R4-0008	REGESA APARCAMENTS I SERVEIS, S.A. C/ TA`PIES, 4 BARCELONA	CATALONIA	3.11.2011	PLAZA MARAGALL - PARKING (PLAZ - GAR APARCAMIENTO)	BARCELONA	CATALONIA
				MIQUEL FERRA - APARCAMENT - F.PUIG/J ALCOBER BARCELONA	BARCELONA	
				PLAÇA FERRAN REYES - PRK SUM. - PPAL BARCELONA	BARCELONA	
				PLAÇA WAGNER - SOS PARKING APARCAMENT BARCELONA	BARCELONA	
				FRANCESC MACIA I LLUS -	HOSPITALET DE LLOBREGAT	

CHARGE MANAGER				FACILITY		
No	**COMPANY NAME**	**AREA OF OPERATIONS**	**START DATE AS A CHARGE MANAGER**	**FACILITY ADDRESS**	**TOWN (PROVINCE)**	**AUTONOMOUS COMMUNITIES**
				PARKING - GAR GARAJE	(BARCELONA)	
R4-0009	GESTIÓN INTELIGENTE DE CARGAS, S.L. C/ CARDENAL MARCELO SPÍNOLA, 10 MADRID	NATIONAL	18.4.2013	AVDA. MADRID, 46	VALLADOLID	CASTILE-LEON
R4-0010	NEW BROADBAND NETWORK SOLUTIONS, S.L. (N2S) C/ CAPITÁN HAYA, 56 4ºE MADRID	NATIONAL	23.4.2013	CALLE PADRE DAMIÁN, 23, 28036	MADRID	MADRID
				CALLE DE ORENSE, 50, 28020	MADRID	
				CAMPO DE LAS NACIONES AVDA. CAPITAL DE ESPAÑA, 10, 28042	MADRID	
				PASEO DE LA CASTELLANA, 220, 28046	MADRID	
R4-0011	ESTABANELL Y PAHISA MERCATOR, S.A. C/ REC, 28 GRANOLLERS (BARCELONA)	CATALONIA	21.11.2013	CTRA. MANRESA, 2	TONA (BARCELONA)	CATALONIA
R4-0012	ELECTRIC PARKING SOLUTIONS, S.L. C/ CASTELLA Nº26 RUBÍ (BARCELONA)	NATIONAL	25.3.2014	PIZARRO, 41	RIPOLLET (BARCELONA)	CATALONIA
R4-0013	SAMPOL INGENIERIA Y OBRAS GREMIO BONETEROS Nº48 PALMA DE MALLORCA (ISLAS BALEARES)	BALEARIC ISLANDS	24.7.2014	CARRETERA VALLDEMOSA KM 7,4 C/MIKEL FARADAY Nº1 07121	PALMA DE MALLORCA	BALEARIC ISLANDS
R4-0014	DRIVETHECITY, S.L. RONDA DEL GENERAL MITRE, 15 7º 2ª BARCELONA	NATIONAL	20.5.2015	C/ CIÈNCIES, 77	HOSPITALET DE LLOBREGAT (BARCELONA)	CATALONIA
R4-0015	TESLA MOTORS NETHERLANDS BV BURGEMEESTER STRAMANWEG, 122 AMSTERDAM (NOORD-HOLLAND)	NATIONAL	29.6.2015	C/ FRANCESC FERRER 16-18	GIRONA	CATALONIA
R4-0016	PROMOCIONES BLAUMAR, S.A. C/ PAU CLARIS 165 5C BARCELONA	CATALONIA	31.7.2015	AUTOVÍA T-11, SALIDA 12	LA CANONJA (TARRAGONA)	CATALONIA
R4-0017	RIVELSA, S.L.U. PASEO DE LA INFANTA ISABEL Nº15 MADRID	MAINLAND SPAIN	31.7.2015	PASEO DE LA INFANTA ISABEL, 15	MADRID	MADRID
R4-0018	ESTACIÓN DE SERVICIOS VICÁLVARO, S.A.U. AVENIDA DE DAROCA, 332 MADRID	MAINLAND SPAIN	31.7.2015	AVENIDA DE DAROCA, 336	MADRID	MADRID
R4-0019	ESTACIÓN DE SERVICIO MAVEL, S.L. C/ ARROYO DEL SOTO Nº2, POL IND. LA LAGUNA LEGANES (MADRID)	MAINLAND SPAIN	31.7.2015	C/ ARROYO DEL SOTO 2, POL IND. LA LAGUNA	MADRID	MADRID
R4-0020	GESDEGAS, S.L. CTRA. BOADILLA-MAJADAHONDA, KM 7,3 (M-516) MAJADAHONDA (MADRID)	MAINLAND SPAIN	30.9.2015	CARRETERA DE POVEDA A MEJORADA	MADRID	MADRID
R4-0021	ZOILO RIOS, S.A. AUTOVIA DE LOGROÑO KM 0,3 ZARAGOZA	MAINLAND SPAIN	31.8.2015	AUTOVIA DE LOGROÑO KM 300	ZARAGOZA	ARAGON
R4-0022	NOSTRUM OIL MANAGEMENT, S.L.U.	MAINLAND SPAIN	4.11.2015	CARRETERA AGOST (PG-B) 9, BAJO	MORALET (ALICANTE)	AUTONOMOUS COMMUNITY

CHARGE MANAGER				FACILITY		
No	**COMPANY NAME**	**AREA OF OPERATIONS**	**START DATE AS A CHARGE MANAGER**	**FACILITY ADDRESS**	**TOWN (PROVINCE)**	**AUTONOMOUS COMMUNITIES**
	C/ NARCISO SERRA Nº25 LOCAL DCHA. MADRID					OF VALENCIA
R4-0023	COOPELEC SERVICIOS ENERGÉTICOS, S.L. C/ GRAN VIA, 88 GUADASSUAR (VALENCIA)	GUADASSUAR (VALENCIA)	1.10.2015	CTRA. TAVERNES-XIVA, 13	GUADASSUAR (VALENCIA)	AUTONOMOUS COMMUNITY OF VALENCIA
R4-0024	ABRIL, S.A.U AVENIDA MIGUEL HERNANDEZ S/N SAN JUAN DE ALICANTE (ALICANTE)	ALICANTE	31.7.2015	CARRETERA DE VALENCIA, 1	SAN JUAN DE ALICANTE (ALICANTE)	AUTONOMOUS COMMUNITY OF VALENCIA
R4-0025	ATRIBAL, S.L. C/ MAESTRO SERRANO Nº11 ALBORAYA	AUTONOMOUS COMMUNITY OF VALENCIA	9.11.2015	C/ REQUENA (POL. IND. LA PILA), 9-1	BENAGUASSIL (VALENCIA)	AUTONOMOUS COMMUNITY OF VALENCIA
R4-0026	ESTACION DE SERVICIO DE SAN ANTONIO S.L. CARRETERA M-516, KM 0,5 POLIGONO COMERCIAL EL CARRALERO MAJADAHONDA (MADRID)	MAINLAND SPAIN	14.1.2016	CARRETERA M-516 KM 0,5 POLIGONO COMERCIAL EL CARRALERO	MAJADAHONDA (MADRID)	MADRID
R4-0027	FENIE ENERGÍA S.A. C/ JACINTO BENAVENTE 2B-BAJO - EDIFICIO TRIPARK LAS ROZAS (MADRID)	CANARY ISLANDS	26.1.2016	C/ MAZO 5	LA LAGUNA (TENERIFE)	CANARY ISLANDS
R4-0028	FRANCISCO RIPOLL S.L. AVENIDA DE PRIMADO REIG, 76 VALENCIA	MAINLAND SPAIN	26.1.2016	AVENIDA PRIMADO REIG, 76	VALENCIA	AUTONOMOUS COMMUNITY OF VALENCIA
R4-0029	ESTACION DE SERVICIO ALZ S.L. CR NIII MADRID-VALENCIA KM 329 RIBA-ROJA DE TURIA (VALENCIA)	MAINLAND SPAIN	5.2.2016	CARRETERA REVA 2 Esc. PG	RIBA-ROJA DE TURIA VALENCIA	AUTONOMOUS COMMUNITY OF VALENCIA
R4-0030	COMERCIAL SAMA S.A. C/ ANTONIO LÓPEZ, 8 MADRID	MAINLAND SPAIN	23.11.2016	C/ ANTONIO LOPEZ 8	MADRID	MADRID
R4-0031	SOCIEDAD MUNICIPAL DE APARCAMIENTOS Y SERVICIOS S.A.(SMASSA) PLAZA DE LA ALCAZABA MÁLAGA	MALAGA	14/01/2016	PLAZA DE LA ALCAZABA S/N	MALAGA	ANDALUSIA
R4-0032	APOLOCUATRO, S.L. C/ SUDIERA, 34 AINSA (HUESCA)	MAINLAND SPAIN	3.5.2016	C/ PINETA Nº4	AINSA (HUESCA)	ARAGON
R4-0033	SOCIEDAD ESPAÑOLA DE CONSTRUCCIONES ELÉCTRICAS, S.A. C/ ROSSELLÓ I PORCEL Nº21 PLANTA 7 BARCELONA	NATIONAL	2.5.2016	PASEO DE LA ZONA FRANCA Nº142-144	BARCELONA	CATALONIA
				C/ MINYO, 112 NAVE 8	TERRASSA (BARCELONA)	
R4-0034	EDP EMPRESA DE SERVICIOS ENERGÉTICOS, S.L. PLAZA DE LA GESTA, 2 OVIEDO (ASTURIAS)	NATIONAL	18.5.2016	AVENIDA DE OVIEDO, 176	GIJÓN (ASTURIAS)	ASTURIAS

Source: CNMC. Data at 1 July 2016.

Annex table B-4. Charging points in the process of being added to the CNMC register, by province, socket type and type of premises (as at June 2016)

AUTONOMOUS COMMUNITY	PROVINCE	CHARGE POINTS	LOCATIONS	TOTAL CHARGE SOCKETS/POINTS	TOTAL LOCATIONS
Andalusia	Almeria	15	9	320	154
	Cadiz	24	13		
	Cordoba	22	7		
	Granada	57	30		
	Huelva	14	8		
	Jaen	6	4		
	Malaga	80	35		
	Seville	102	48		
Aragon	Huesca	9	6	119	41
	Teruel	26	9		
	Zaragoza	84	26		
Asturias	Asturias	49	29	49	29
Cantabria	Cantabria	41	24	41	24
Castile-La Mancha	Albacete	21	8	85	35
	Ciudad Real	5	3		
	Cuenca	14	6		
	Guadalajara	17	7		
	Toledo	28	11		
Castile-Leon	Avila	8	6	227	108
	Burgos	25	12		
	Leon	49	13		
	Salamanca	9	6		
	Segovia	10	6		
	Soria	13	7		
	Palencia	28	16		
	Valladolid	76	39		
	Zamora	9	3		
Catalonia	Barcelona	1257	330	1447	418
	Girona	88	45		
	Lleida	24	11		
	Tarragona	78	32		
Valencia	Alicante	220	61	415	132
	Castellón	40	19		
	Valencia	155	52		
Extremadura	Badajoz	75	32	79	34
	Cáceres	4	2		
Galicia	A Coruña	52	18	127	45
	Lugo	4	3		
	Ourense	9	5		
	Pontevedra	62	19		
La Rioja	La Rioja	19	10	19	10
Madrid	Madrid	753	216	753	216

AUTONOMOUS COMMUNITY	PROVINCE	CHARGE POINTS	LOCATIONS	TOTAL CHARGE SOCKETS/POINTS	TOTAL LOCATIONS
Murcia	Murcia	61	30	61	30
Navarre	Navarre	63	26	63	26
Basque Country	Alava	23	9	179	66
	Vizcaya	82	32		
	Guipuzcoa	74	25		
Balearic Islands	Balearic Islands	393	212	393	212
Canary Islands	Las Palmas	65	33	170	79
	Santa Cruz de Tenerife	105	46		
TOTAL		**4 547**	**1 659**	**4 547**	**1 659**

	NUMBER OF LOCATIONS	NUMBER OF CHARGE POINTS
Car park	369	1483
Street level	410	941
Shopping centre	143	489
Limited access	179	408
Car dealership	189	398
Hotel	131	234
Restaurant	85	172
Service station	64	144
Shop	31	143
Repair garage	35	88
Campsite	14	30
Reserved for taxis	5	9
Airport	4	8
TOTAL	**1 659**	**4 547**

SOCKET TYPE	No
Schuko (EU Plug)	2 730
MENNEKES (Type 2)	1 182
CEE 2P+E (blue - camping)	149
CHAdeMO (DC)	141
CEE 3P+N+E (red - 3-phase)	109
Unknown	88
CCS Combo (DC)	43
SAE J1772 (Type 1)	42
CEE 3P+E (blue - 3-phase)	23
Tesla Dest.Charger (Mod S)	20
Tesla Supercharger (Mod S)	18

SCAME (Type 3c)	2
TOTAL	**4 547**

Source: Electromaps

Annex table B-5. Service stations with LPG refuelling points as at June 2016

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
Andalusia	ALCALA DE GUADAIRA (SEVILLE)	AGLA
	NIJAR (ALMERÍA)	REPSOL
	MINAS DE RIOTINTO (HUELVA)	REPSOL
	JAEN	REPSOL
	LUISIANA (LA) (SEVILLE)	REPSOL
	EJIDO (EL) (ALMERÍA)	REPSOL
	GUARROMAN (JAÉN)	REPSOL
	SALOBREÑA (GRANADA)	REPSOL
	JEREZ DE LA FRONTERA (CÁDIZ)	REPSOL
	CORDOBA	REPSOL
	PUERTO DE SANTA MARIA (EL) (CÁDIZ)	REPSOL
	CHICLANA DE LA FRONTERA (CÁDIZ)	REPSOL
	JEREZ DE LA FRONTERA (CÁDIZ)	REPSOL
	LOJA (GRANADA)	REPSOL
	HUERCAL DE ALMERIA (ALMERÍA)	REPSOL
	LINARES (JAÉN)	REPSOL
	UBEDA (JAÉN)	CAMPSA
	CHUCENA (HUELVA)	REPSOL
	GRANADA	REPSOL
	MIJAS (MÁLAGA)	BP
	FUENGIROLA (MÁLAGA)	BP
	VERA (ALMERÍA)	REPSOL
	JEREZ DE LA FRONTERA (CÁDIZ)	REPSOL BUTANO
	CANTILLANA (SEVILLE)	A.S LA ESTACION-AGLA
	ESTEPA (SEVILLE)	REPSOL
	ESTEPA (SEVILLE)	REPSOL
	CAMAS (SEVILLE)	REPSOL
	SEVILLE	REPSOL
	FUENGIROLA (MÁLAGA)	REPSOL
	GINES (SEVILLE)	REPSOL
	MALAGA	REPSOL
	MALAGA	REPSOL
	HUELVA	REPSOL
	SEVILLE	E.S. PARQUE ALCOSA (PREMIUM)
	ANTEQUERA (MÁLAGA)	REPSOL
	GUILLENA (SEVILLE)	REPSOL
	JEREZ DE LA FRONTERA (CÁDIZ)	CEPSA
	JEREZ DE LA FRONTERA (CÁDIZ)	A3.81
	MARBELLA (MÁLAGA)	REPSOL
	GRANADA	REPSOL

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	ALCALA DE GUADAIRA (SEVILLE)	REPSOL
	ROQUETAS DE MAR (ALMERÍA)	REPSOL
	BARRIOS (LOS) (CÁDIZ)	REPSOL
	GRANADA	REPSOL
	CORDOBA	REPSOL
	TORRECERA (CÁDIZ)	REPSOL
	ALMERIA	CEPSA
	TORREMOLINOS (MÁLAGA)	REPSOL
	MARBELLA (MÁLAGA)	REPSOL
	MARBELLA (MÁLAGA)	REPSOL
	SEVILLE	REPSOL
	TORRE DEL MAR (MÁLAGA)	REPSOL
	MALAGA	REPSOL
	MAIRENA DEL ALJARAFE (SEVILLE)	REPSOL
	HUELVA	CEPSA
	MALAGA	CEPSA
	DOS HERMANAS (SEVILLE)	CEPSA
	CORDOBA	CEPSA
	GRANADA	CEPSA
	CARMONA (SEVILLE)	AGLA
	SEVILLE	CEPSA
	BAZA (GRANADA)	REPSOL
	FUENTE DE PIEDRA (MÁLAGA)	AGLA
	HUELVA	GAS AUTO
	ANDUJAR (JAÉN)	EL BALCON DE ANDALUCIA
	ALHAURIN DE LA TORRE (MÁLAGA)	HIDROCARBUROS ALHAURIN - AGLA
	SAN ROQUE (CÁDIZ)	CODES
	SEVILLE	REPSOL
	SEVILLE	REPSOL
	ALMERIA	REPSOL
	MAIRENA DEL ALJARAFE (SEVILLE)	REPSOL
	LUCENA (CÓRDOBA)	REPSOL
	SEVILLE	GALP
	JAEN	BP QUESADA
Aragon	ALCAÑIZ (TERUEL)	REPSOL
	TERUEL	REPSOL
	SABIÑANIGO (HUESCA)	REPSOL
	ZARAGOZA	CEPSA
	FERRERUELA DE HUERVA (TERUEL)	REPSOL
	ZARAGOZA	REPSOL
	EPILA (ZARAGOZA)	CEPSA
	ZARAGOZA	REPSOL

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	ZARAGOZA	COOPERATIVA AUTO-TAXI
	PUEBLA DE ALFINDEN (LA) (ZARAGOZA)	REPSOL
	PUEBLA DE ALFINDEN (LA) (ZARAGOZA)	REPSOL
	HUESCA	REPSOL
	ZARAGOZA	REPSOL
	CALATAYUD (ZARAGOZA)	REPSOL
Asturias	LLARANES (ASTURIAS)	REPSOL
	TAM ON (ASTURIAS)	PETRONOR
	MIERES (ASTURIAS)	REPSOL
	OVIEDO (ASTURIAS)	REPSOL
	TAM ON (ASTURIAS)	PETRONOR
	GIJON (ASTURIAS)	REPSOL
	POSADA (ASTURIAS)	EL CENTRO
	GIJON (ASTURIAS)	E.S. CEARES
	VIELLA (ASTURIAS)	REPSOL
	CANGAS DEL NARCEA (ASTURIAS)	FLOREZ COSMEN, S.L.
	CERDEÑO (ASTURIAS)	REPSOL
	GIJON (ASTURIAS)	REPSOL
Balearic Islands	CIUTADELLA DE MENORCA (BALEARIC ISLANDS)	REPSOL
	EIVISSA (BALEARIC ISLANDS)	REPSOL
	LLUCMAJOR (BALEARIC ISLANDS)	REPSOL
	PALMA (BALEARIC ISLANDS)	REPSOL
	SANTA EULALIA (BALEARIC ISLANDS)	REPSOL
	INCA (BALEARIC ISLANDS)	REPSOL BUTANO
	PALMA	REPSOL
	PALMA (BALEARIC ISLANDS)	REPSOL
	MANACOR (BALEARIC ISLANDS)	REPSOL BUTANO
	PORT D'ALCUDIA (BALEARIC ISLANDS)	REPSOL
	SON SANT JOAN (BALEARIC ISLANDS)	REPSOL BUTANO
	PALMA (BALEARIC ISLANDS)	REPSOL BUTANO
	MAO (BALEARIC ISLANDS)	REPSOL
	COSTA DE LA CALMA (BALEARIC ISLANDS)	REPSOL
Canary Islands	CHAFIRAS (LAS) (SANTA CRUZ DE TENERIFE)	DISA LAS CHAFIRAS
	PALMAS DE GRAN CANARIA (LAS) (LAS PALMAS)	DISA EL SEBADAL
	PALMAS DE GRAN CANARIA (LAS) (LAS PALMAS)	DISA VEGUETA
	CANDELARIA (SANTA CRUZ DE TENERIFE)	DISA CANDELARIA
	LA LAGUNA (SANTA CRUZ DE TENERIFE)	DISA PADRE ANCHIETA
	TELDE (LAS PALMAS)	SHELL TELDE
	ARUCAS (LAS PALMAS)	SHELL AUTOVIA ARUCAS

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	CUESTA, LA (SANTA CRUZ DE TENERIFE)	DISA OFRA
	SAN FERNANDO (LAS PALMAS)	DISA MASPALOMAS
	ARRECIFE (LAS PALMAS)	DISA NUEVA AEROPUERTO
	COSTA TEGUISE (LAS PALMAS)	DISA COSTA TEGUISE
Cantabria	LAREDO (CANTABRIA)	REPSOL
	CARTES (CANTABRIA)	REPSOL
	SANTANDER (CANTABRIA)	MEROIL
	CUDON (CANTABRIA)	EL CENTRO
	SANTANDER (CANTABRIA)	REPSOL
	PESUES (CANTABRIA)	AVIA
	HOZNAYO (CANTABRIA)	REPSOL
	CABROJO (CANTABRIA)	REPSOL
	LOS CORRALES DE BUELNA (CANTABRIA)	E.S. SOMAHOZ
	PUENTE SAN MIGUEL (CANTABRIA)	SHELL
	HOZNAYO (CANTABRIA)	REPSOL
	REQUEJADA (CANTABRIA)	E.S. POLANCO
Castile-La Mancha	ILLESCAS (TOLEDO)	REPSOL
	CIUDAD REAL	REPSOL
	CAZALEGAS (TOLEDO)	REPSOL
	CAZALEGAS (TOLEDO)	REPSOL
	BELINCHON (Cuenca)	REPSOL
	ALMANSA (Albacete)	REPSOL
	TOLEDO	REPSOL
	DAIMIEL (CIUDAD REAL)	REPSOL
	TALAVERA DE LA REINA (TOLEDO)	REPSOL
	CHINCHILLA DE MONTE-ARAGO (Albacete)	REPSOL
	CHINCHILLA DE MONTE-ARAGO (Albacete)	REPSOL
	Albacete	REPSOL
	ALCAZAR DE SAN JUAN (CIUDAD REAL)	REPSOL
	QUINTANAR DE LA ORDEN (TOLEDO)	REPSOL
	Cuenca	CAMPSA
	PUERTOLLANO (CIUDAD REAL)	REPSOL
	Guadalajara	REPSOL
	Albacete	REPSOL
	Guadalajara	REPSOL
	TEBAR (Cuenca)	REPSOL
	MALAGON (CIUDAD REAL)	CARBURANTES SEAL
	HONRUBIA (Cuenca)	REPSOL
	SESEÑA (TOLEDO)	REPSOL
	CALERA Y CHOZAS (TOLEDO)	GALP

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	MOTILLA DEL PALANCAR (Cuenca)	LA GAVIOTA GASOLINERA 24 HORAS
	TOLEDO	PUNTO AZUL 24 HORAS
Castile-Leon	VALDECARPINTEROS (SALAMANCA)	REPSOL
	ZAMORA	REPSOL
	VALLADOLID	REPSOL
	CALDAS DE LUNA (LEÓN)	REPSOL
	MIRANDA DE EBRO (BURGOS)	REPSOL
	MIRANDA DE EBRO (BURGOS)	REPSOL
	PALENCIA	REPSOL
	SORIA	REPSOL
	ARANDA DE DUERO (BURGOS)	REPSOL
	LEON	REPSOL
	VILLAYUDA O LA VENTILLA (BURGOS)	REPSOL
	VALLADOLID	REPSOL BUTANO
	BENAVENTE (ZAMORA)	CAMINO DE SANTIAGO
	SEGOVIA	REPSOL
	PALENCIA	AVIA
	SALAMANCA	REPSOL
	VILLAHERREROS (PALENCIA)	REPSOL
	SORIA	CEPSA
	CASTILLEJO DE MESLEON (SEGOVIA)	CEPSA
	ARAPILES (SALAMANCA)	REPSOL
	CIGALES (VALLADOLID)	E.S. REAL
	NAVALMANZANO (SEGOVIA)	NAVATRANS
	AVILA	REPSOL
	VEGA DE VALDETRONCO (VALLADOLID)	REPSOL
	BENAVENTE (ZAMORA)	REPSOL
	QUINTANAPALLA (BURGOS)	REPSOL
	DUEÑAS (PALENCIA)	REPSOL
	SALAMANCA	REPSOL
	VALLADOLID	REPSOL
	ESPINOSA DE LOS CABALLEROS (ÁVILA)	REPSOL
	PONFERRADA (LEÓN)	REPSOL
	ZAMORA	REPSOL
	LEON	REPSOL
	LEON	GASOLINERAS PECAFER S.L.
Catalonia	SABADELL (BARCELONA)	MEROIL
	BARCELONA	TORTUGA
	GAVA (BARCELONA)	PETROCAT
	GAVA (BARCELONA)	PETROCAT

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	CASTELLO D'EMPURIES (GIRONA)	REPSOL
	MANRESA (BARCELONA)	PETROCAT
	BARCELONA	REPSOL
	FIGUERES (GIRONA)	REPSOL
	CUNIT (TARRAGONA)	REPSOL
	CALONGE	PETRONOR
	BARCELONA	REPSOL
	MONTORNES NORD (BARCELONA)	REPSOL
	MATARO (BARCELONA)	REPSOL
	SANTA MARIA DE PALAUTORDERA (BARCELONA)	REPSOL
	TARRAGONA	REPSOL
	HOSPITALET DE LLOBREGAT (L') (BARCELONA)	REPSOL
	CASTELL D'ARO (GIRONA)	REPSOL
	GIRONA	REPSOL
	BANYOLES (GIRONA)	REPSOL
	MONTCADA CENTRE (BARCELONA)	REPSOL
	GARRIGAS (GIRONA)	REPSOL
	BADALONA (BARCELONA)	REPSOL
	TERRASSA (BARCELONA)	REPSOL
	SALLENT (BARCELONA)	PETRONOR
	VILADECANS (BARCELONA)	REPSOL
	VIC (BARCELONA)	REPSOL
	TAGAMANENT (BARCELONA)	REPSOL
	OLOT (GIRONA)	REPSOL
	MOLINS DE REI (BARCELONA)	REPSOL
	CANOVELLES (BARCELONA)	REPSOL
	SALOU (TARRAGONA)	REPSOL
	SABADELL (BARCELONA)	REPSOL
	HOSPITALET DE LLOBREGAT (L') (BARCELONA)	REPSOL
	BARCELONA	REPSOL
	REUS (TARRAGONA)	REPSOL
	SANT CUGAT DEL VALLES (BARCELONA)	REPSOL
	SABADELL (BARCELONA)	REPSOL
	LA JONQUERA (GIRONA)	REPSOL
	BARBERA DEL VALLES (BARCELONA)	REPSOL
	MARTORELL (BARCELONA)	CEPSA
	PRAT DE LLOBREGAT (EL) (BARCELONA)	CEPSA
	SABADELL (BARCELONA)	REPSOL BUTANO
	MANRESA (BARCELONA)	REPSOL BUTANO
	RIPOLL (GIRONA)	REPSOL BUTANO
	FONOLLERES (LLEIDA)	REPSOL

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	VILA-SECA (TARRAGONA)	ALAS
	PALAMOS (GIRONA)	REPSOL
	TORROELLA DE MONTGRI (GIRONA)	REPSOL
	LLEIDA	REPSOL
	SANT BOI DE LLOBREGAT (BARCELONA)	REPSOL
	PRAT DE LLOBREGAT (EL) (BARCELONA)	PETROCAT
	BASSELLA (LLEIDA)	REPSOL
	HOSPITALET DE L'INFANT (TARRAGONA)	PETROTAPIES
	TARRAGONA	EXOIL
	BLANES (GIRONA)	REPSOL BUTANO
	OLIUS (LLEIDA)	REDTORTUGA
	ESPLUGUES DE LLOBREGAT (BARCELONA)	OIL PRIX
	CORNELLA DE LLOBREGAT (BARCELONA)	OIL PRIX
	GAVA (BARCELONA)	REPSOL
	BELLVIS (LLEIDA)	GALP
	LLEIDA	REPSOL BUTANO
	GRANOLLERS (BARCELONA)	MEROIL
	VILAFRANCA DEL PENEDES (BARCELONA)	PETROMIRALLES
	IGUALADA (BARCELONA)	PETROMIRALLES
	AMPOSTA (TARRAGONA)	REPSOL
	BELLVEI (TARRAGONA)	REPSOL
	ESPARREGUERA (BARCELONA)	REPSOL
	SERRAT DE L'OCATA (BARCELONA)	PETROCAT
	CELRA (GIRONA)	REPSOL
	MAÇANET DE LA SELVA (GIRONA)	REPSOL
	BADALONA (BARCELONA)	REPSOL
	BARCELONA	REPSOL
	BLANES (GIRONA)	REPSOL
	SANTA AGNES DE MALANYANES (BARCELONA)	REPSOL
	SANTA PERPETUA DE MOGODA (BARCELONA)	REPSOL
	SANTA PERPETUA DE MOGODA (BARCELONA)	REPSOL
	SITGES (BARCELONA)	REPSOL
	VALLIRANA PARC (BARCELONA)	REPSOL
	BARCELONA	REPSOL
	VILANOVA I LA GELTRU (BARCELONA)	REPSOL
	SANTA PERPETUA DE MOGODA (BARCELONA)	REPSOL
	FONOLLERES (LLEIDA)	REPSOL
	SANT CUGAT DEL VALLES (BARCELONA)	REPSOL
	VILA-SECA (TARRAGONA)	REPSOL
	BARCELONA	MEROIL

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	SANT ADRIA DE BESOS (BARCELONA)	GALP
	PRAT DE LLOBREGAT (EL) (BARCELONA)	GALP
	ESPLUGUES DE LLOBREGAT (BARCELONA)	DANFORD
	SANT ADRIA DE BESOS (BARCELONA)	MEROIL
Valencia	VILLENA (ALICANTE)	REPSOL
	OLIVA (VALENCIA)	REPSOL
	JÁVEA/XÀBIA (ALICANTE)	REPSOL
	CREVILLENT (ALICANTE)	REPSOL
	SANTA POLA (ALICANTE)	REPSOL
	CAMPELLO (EL) (ALICANTE)	REPSOL
	TORRENT (VALENCIA)	REPSOL
	BENICARLO (CASTELLÓN)	REPSOL
	ALBALAT DELS SORELLS (VALENCIA)	REPSOL
	PATERNA (VALENCIA)	REPSOL
	ELCHE/ELX (ALICANTE)	REPSOL
	VALENCIA	REPSOL
	ALICANTE/ALACANT	REPSOL
	ALFAFAR (VALENCIA)	REPSOL
	CHIVA (VALENCIA)	REPSOL
	GUARDAMAR DEL SEGURA (ALICANTE)	REPSOL
	ORIHUELA (ALICANTE)	REPSOL
	CREVILLENT (ALICANTE)	REPSOL
	PATERNA (VALENCIA)	REPSOL
	SAN VICENTE DEL RASPEIG/SANT VICENT DEL RASPEIG (ALICANTE)	REPSOL
	VALENCIA	TAXCO
	BENIMAMET-BENIFERRI (VALENCIA)	REPSOL
	ALICANTE/ALACANT	REPSOL
	ALCOY/ALCOI (ALICANTE)	REPSOL
	TORREVIEJA (ALICANTE)	REPSOL
	BENIDORM (ALICANTE)	REPSOL
	VILLARREAL (CASTELLÓN)	COOPERATIVA CATOLICO AGRARIA COOP.V.
	GUADASSUAR (VALENCIA)	SERVICOOP
	ALICANTE/ALACANT	CEPSA
	SANTA POLA (ALICANTE)	EA SANTA POLA
	ALICANTE/ALACANT	PETRO ALACANT
	CASTELLON DE LA PLANA (CASTELLÓN)	REPSOL
	ALBORAYA (VALENCIA)	REPSOL
	TORREVIEJA (ALICANTE)	REPSOL
	CASTELLON DE LA PLANA (CASTELLÓN)	BENCINAS MESTRETS
	POBLA TORNESA (LA) (CASTELLÓN)	REPSOL

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	VALENCIA	REPSOL
Extremadura	DON BENITO (BADAJOZ)	REPSOL
	BADAJOZ	REPSOL
	VALDESALOR (CÁCERES)	REPSOL
	CACERES	REPSOL
	PLASENCIA (CÁCERES)	REPSOL
	MALPARTIDA DE PLASENCIA (CÁCERES)	REPSOL
	MERIDA (BADAJOZ)	REPSOL
	TRUJILLO (CÁCERES)	CEPSA
Galicia	PUENTE NUEVO (PONTEVEDRA)	SERTUY
	POIO (PONTEVEDRA)	REPSOL
	A CORUÑA	REPSOL
	CATABOIS (CORUÑA (A))	REPSOL
	MUXA DE ABAIXO (LUGO)	REPSOL
	VIGO (PONTEVEDRA)	REPSOL
	A CORUÑA	REPSOL
	AMEIXEIRA (CORUÑA (A))	REPSOL
	CAÑIZA (A) (PONTEVEDRA)	REPSOL
	VIGO (PONTEVEDRA)	REPSOL
	OURENSE	REPSOL
	LALIN (PONTEVEDRA)	REPSOL
	VILABOA (PONTEVEDRA)	REPSOL
	VILABOA (PONTEVEDRA)	REPSOL
	POBRA DO CARAMIÑAL (CORUÑA A)	REPSOL
	A CORUÑA	PETRONOR
	SAN CIBRAO DAS VIÑAS (OURENSE)	REPSOL
	BERGONDIÑO (CORUÑA A)	E.S. CORTIÑAN
	CABANELAS (PONTEVEDRA)	REPSOL BUTANO
	CERVO (LUGO)	REPSOL
	PERILLO (CORUÑA A)	REPSOL
	O'VAL-NARÓN (CORUÑA A)	ORTEGAL OIL
	LAPIDO (CORUÑA A)	GALP
	PERILLO (CORUÑA A)	GALP
	CABANA (CORUÑA A)	REPSOL BUTANO
	ARZUA (CORUÑA A)	REPSOL
	BOIRO (CORUÑA A)	CEPSA
	SANTIAGO DE COMPOSTELA (CORUÑA (A))	REPSOL
	RIOS (OURENSE)	REPSOL
	FEANS (CORUÑA (A))	REPSOL BUTANO
Madrid	MADRID	REPSOL
	AJALVIR (MADRID)	REPSOL
	AJALVIR (MADRID)	CAMPSA

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	COLMENAR VIEJO (MADRID)	REPSOL
	ALCALA DE HENARES (MADRID)	REPSOL
	MADRID	REPSOL
	VALDEMORILLO (MADRID)	REPSOL
	ROZAS DE MADRID (LAS) (MADRID)	REPSOL
	FUENLABRADA (MADRID)	REPSOL
	MADRID	REPSOL
	ALCOBENDAS (MADRID)	REPSOL
	MOSTOLES (MADRID)	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	PINTO (MADRID)	REPSOL
	GALAPAGAR (MADRID)	REPSOL
	SAN SEBASTIAN DE LOS REYES (MADRID)	REPSOL
	GALAPAGAR (MADRID)	REPSOL
	MOSTOLES (MADRID)	REPSOL
	MADRID	REPSOL
	ARROYOMOLINOS (MADRID)	REPSOL
	ALCORCON (MADRID)	REPSOL
	SAN SEBASTIAN DE LOS REYES (MADRID)	REPSOL
	SAN FERNANDO DE HENARES (MADRID)	REPSOL
	ALCORCON (MADRID)	REPSOL
	MADRID	REPSOL
	PINTO (MADRID)	REPSOL
	ALCORCON (MADRID)	LISBOA
	MADRID	CEPSA
	MADRID	REPSOL BUTANO
	MADRID	REPSOL BUTANO
	MOSTOLES (MADRID)	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	MADRID	REPSOL
	MOLAR (EL) (MADRID)	REPSOL
	ALCALA DE HENARES (MADRID)	REPSOL
	FRAILES (LOS) (MADRID)	GASOLEOS DAGANZO
	MADRID	CEPSA VALLECAS-LA ATALAYUELA 365
	GETAFE (MADRID)	CEPSA

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	MADRID	REPSOL
	MADRID	REPSOL
	FUENLABRADA (MADRID)	REPSOL
	TRES CANTOS (MADRID)	REPSOL
	VILLAVICIOSA DE ODON (MADRID)	REPSOL
	VILLAVICIOSA DE ODON (MADRID)	REPSOL
	ALCALA DE HENARES (MADRID)	GALP
	ALCALA DE HENARES (MADRID)	GALP
	MADRID	GALP
	MADRID	GALP
	ALCORCON (MADRID)	CEPSA URTINSA 365
	SAN AGUSTIN DEL GUADALIX (MADRID)	REPSOL
Murcia	CARTAGENA (MURCIA)	REPSOL
	CARTAGENA (MURCIA)	REPSOL
	CARTAGENA (MURCIA)	SHELL
	MURCIA	REPSOL BUTANO
	ALGAR (EL) (MURCIA)	ADRIDAN
	CHURRA (MURCIA)	CEPSA
	AGUILAS (MURCIA)	ANIBAL
	MURCIA	REPSOL
	MOLINA DE SEGURA (MURCIA)	APELLAN
Navarre	ESTELLA O LIZARRA (NAVARRE)	REPSOL
	ZUASTI (NAVARRE)	REPSOL
	FONTELLAS (NAVARRE)	REPSOL
	NOAIN (NAVARRE)	REPSOL
	TAFALLA (NAVARRE)	REPSOL
	PAMPLONA/IRUÑA (NAVARRE)	REPSOL
	AIZOAIN (NAVARRE)	ESTACION DE SERVICIO ARALAR
	DANTXARINEA (NAVARRE)	REPSOL
	TUDELA (NAVARRE)	REPSOL
	PAMPLONA/IRUÑA (NAVARRE)	CEPSA
	PAMPLONA/IRUÑA (NAVARRE)	ARALAR
	PAMPLONA/IRUÑA (NAVARRE)	EUROCAM
Basque Country	DONOSTIA-SAN SEBASTIAN (GUIPÚZCOA)	REPSOL
	DONOSTIA-SAN SEBASTIAN (GUIPÚZCOA)	REPSOL
	ALTUBE (ÁLAVA)	PETRONOR
	DERIO (VIZCAYA)	PETRONOR
	OIARTZUN (GUIPÚZCOA)	REPSOL
	TOLOSA (GUIPÚZCOA)	REPSOL
	AMOREBIETA (VIZCAYA)	PETRONOR
	ARRIGORRIAGA (VIZCAYA)	PETRONOR
	ERANDIO-GOIKOA (VIZCAYA)	PETRONOR

AUTONOMOUS COMMUNITY	TOWN (PROVINCE)	COMPANY
	BEASAIN (GUIPÚZCOA)	REPSOL
	ABANTO (VIZCAYA)	PETRONOR
	SAN VICENTE DE BARAKALDO (VIZCAYA)	REPSOL
	VITORIA-GASTEIZ (ÁLAVA)	REPSOL
	LOPIDANA (ÁLAVA)	REPSOL
	IRUN (GUIPÚZCOA)	CEPSA
	IRUN (GUIPÚZCOA)	CEPSA
	ELBURGO/BURGELU (ÁLAVA)	REPSOL
	SESTAO (VIZCAYA)	REPSOL
	AMOREBIETA (VIZCAYA)	PETRONOR
	ARRASATE/MONDRAGON	REPSOL
	APOTZAGA	REPSOL
	VITORIA-GASTEIZ (ÁLAVA)	CEPSA
	AMASA (GUIPÚZCOA)	CEPSA
	VITORIA-GASTEIZ (ÁLAVA)	AVIA
	HERNANI (GUIPÚZCOA)	REPSOL
	HERNANI (GUIPÚZCOA)	REPSOL
	OLABERRIA(GUIPÚZCOA)	AVIA
La Rioja	LOGROÑO (LA RIOJA)	REPSOL
	LOGROÑO (LA RIOJA)	REPSOL
	TRICIO (LA RIOJA)	REPSOL
	HORMILLA (LA RIOJA)	VALCARCE

Source: Geoportal of the Ministry of Industry, Energy and Tourism

Annex table B-6. Existing hydrogen stations in Spain as at June 2016

AUTONOMOUS COMMUNITY	LOCATION	YEAR OPENED	OPERATIONAL STATUS	ACCESS TYPE	OPERATED BY
Andalusia	Sanlúcar la Mayor (Seville)	2010	Operating	Open to the public	Abengoa
	Puerto de Sevilla (Seville)	2015	Operating	Open to the public	Abengoa
Aragon	Valderespartera (Zaragoza)	2008	Operating	Restricted use	Expo Zaragoza Empresarial, S.A.
	Walqa Science and Technology Park, Ctra Zaragoza-Huesca km 75 (Huesca)	2010	Operating	Open to the public	Fundación del Hidrógeno de Aragón
Castile-La Mancha	La Torrecica (Albacete)	2012	Operating		AJUSA
	Puertollano (Ciudad Real)	2016	Operating	Open to the public	CNH2

Source: Spanish Hydrogen Association

Annex table B-7. Technical characteristics of existing hydrogen stations as at June 2016

Location	Can service cars?	Can service buses?	Can service other vehicles?	Number of pumps	H_2 production	H_2 source	Delivery	Pressure (bar)
Sanlúcar la Mayor (Seville)	Yes	Yes	Yes	1	Can be supplied with gas under pressure but also produces gas on-site using renewable electrolysis.	Renewable electrolysis	Under pressure	350
Puerto de Sevilla (Seville)	Yes	Yes	Yes	1	Can be supplied with gas under pressure but also produces gas on-site using renewable electrolysis.	Renewable electrolysis	Under pressure	350
Valderespartera (Zaragoza)	Yes	Yes	Yes	2	External supplier and on-site production		Under pressure	200-350
Walqa Science and Technology Park	Yes	Yes	Yes	2	On-site production with electrolysis using solar/wind energy	Renewable electrolysis	Under pressure	200-350

Location	Can service cars?	Can service buses?	Can service other vehicles?	Number of pumps	H_2 production	H_2 source	Delivery	Pressure (bar)
La Torrecica (Albacete)	Yes	Yes			External supplier and on-site production			350
Puertollano (Ciudad Real)	Yes	No	Depending on tank	1	On-site production with electrolysis using solar energy	Solar	Under pressure	350

Source: Spanish Hydrogen Association

Annex table B-8. Petrol stations offering blends with a higher biofuel content than B7 and E5 as at June 2016

AUTONOMOUS COMMUNITY	TOWN	COMPANY	BIODIESEL	BIOETHANOL
Andalusia	JAEN	TAMOIL	X	
	GRANADA	TAMOIL	X	
	JEREZ DE LA FRONTERA (CÁDIZ)	TAMOIL	X	
	MARMOLEJO (JAÉN)	TAMOIL	X	
	BOLLULLOS PAR DEL CONDADO (HUELVA)	AGLA	X	
	UTRERA (SEVILLE)	TAMOIL	X	
	ALJARAQUE (HUELVA)	TAMOIL	X	
	SAN ROQUE (CÁDIZ)	CODES	X	
	SEVILLE	SANCARISA	X	
	VILLANUEVA DEL ARZOBISPO (JAÉN)	AGLA	X	
Aragon	ANGUES (HUESCA)	COMBUSTIBLES DEL PIRINEO	X	
	ALMUDEVAR (HUESCA)	VIRGEN DE LA CORONA	X	
	JACA (HUESCA)	EROSKI	X	
	ZUERA (ZARAGOZA)	COOP.SAN LICER - ARENTO	X	
	VILLAMAYOR DE GALLEGO (ZARAGOZA)	EL PUEYO	X	
	NOVALLAS (ZARAGOZA)	COOP. NTRA.SRA. PILAR	X	
Asturias	CORUÑO (ASTURIAS)	ASIPO SERVICIOS		X
	SALINAS (ASTURIAS)	GF	X	
Cantabria	GUARNIZO (CANTABRIA)	AREA DE SERVICIO LA PALMERA	X	
	CARTES (CANTABRIA)	MEROIL	X	
	BOO (CANTABRIA)	G2	X	
Castile-Leon	ZARATÁN (VALLADOLID)	REPOSTAR--ZARATAN	X	
	ARANDA DE DUERO (BURGOS)	DACAR	X	

	REVILLA (LA) (BURGOS)	PINAROIL S.L.	X	
	BURGOS	AVIA VISTA ALEGRE	X	
	PALENCIA	SUANCES	X	
	BARCO DE AVILA (EL) (ÁVILA)	BELLAVISTA S.L.	X	
	VALENCIA DE DON JUAN (LEÓN)	SAENZ DE MIERA SL	X	
Catalonia	CERDANYOLA DEL VALLES (BARCELONA)	SABATER NURI CARBURANTS SA	X	
	CERDANYOLA DEL VALLES (BARCELONA)	SABATER NURI CARBURANTS SA	X	
	SANT JOAN DE VILATORRADA (BARCELONA)	TAMOIL	X	
	ARBOÇ (L') (TARRAGONA)	TAMOIL	X	
	HOSPITALET DE LLOBREGAT (L') (BARCELONA)	TAMOIL	X	
	SABADELL (BARCELONA)	COBASA	X	
	SANT BOI DE LLOBREGAT (BARCELONA)	E.S.OASIS	X	
	ALCANAR (TARRAGONA)	TAMOIL	X	
	FOGARS DE LA SELVA (BARCELONA)	CEPSA	X	
	BARCELONA	PETROZAL	X	
	ALCOVER (TARRAGONA)	ESTACIO SERVEI ALCOVER	X	
	TARRAGONA	TAMOIL	X	
	BARCELONA	TAMOIL	X	
	FULIOLA (LA) (LLEIDA)	XOPLUC-PETROMIRALLES	X	
	POLIGON EMPORDA INTERNACIONAL (GIRONA)	IS-XXI	X	
	TARRAGONA	BIONET	X	
	SANT JOAN DESPI (BARCELONA)	OIL PRIX	X	
	OLIANA (LLEIDA)	ESTACIO SERVEI OLIANA	X	
	VILAFRANCA DEL PENEDES (BARCELONA)	PETROMIRALLES	X	
	IGUALADA (BARCELONA)	PETROMIRALLES	X	X

	TARREGA (LLEIDA)	PETROMIRALLES	X	
	AVINYONET DE PUIGVENTOS (GIRONA)	E.S.AVINYONET	X	
	ESPARREGUERA (BARCELONA)	REPSOL	X	
	BARCELONA	MEROIL	X	X
	BARCELONA	GALP	X	
	MATARO (BARCELONA)	GALP	X	
	MALLA (BARCELONA)	ESCLATOIL	X	
	MONJOS (ELS) (BARCELONA)	GALP	X	
Valencia	PICASSENT (VALENCIA)	TAMOIL	X	
	ONDA (CASTELLÓN)	BDMED	X	
	CASTELLON DE LA PLANA (CASTELLÓN)	BDMED	X	
	APEADERO DE BECHI (CASTELLÓN)	BDMED	X	
	ALICANTE	TAMOIL	X	
	VALENCIA	SHELL		X
	CORBERA (VALENCIA)	COOPERATIVA DE CORBERA	X	
Extremadura	BATAN (EL) (CÁCERES)	BATAN	X	
Galicia	SOBREIRA (LUGO)	ICOS OIL	X	
	GUDIÑA (A) (OURENSE)	STAROIL	X	
	O'VAL-NARÓN (A CORUÑA)	ORTEGAL OIL	X	
	SANTIAGO DE COMPOSTELA (A CORUÑA)	STAROIL		X
	ACEA DE AMA (A CORUÑA)	GALP	X	
	FENE (A CORUÑA)	ORTEGAL OIL	X	
	CORGO (A CORUÑA)	LOW COST ATENDIDO O CORGO	X	
Madrid	MIRAFLORES DE LA SIERRA (MADRID)	EDV	X	
	MADRID	SHELL	X	X

	TORREJON DE ARDOZ (MADRID)	SHELL	X	X
Murcia	TOTANA (MURCIA)	COATO	X	
	CHURRA (MURCIA)	THADER	X	
	CHURRA (MURCIA)	THADER	X	
Navarre	MILAGRO (NAVARRE)	AVIA	X	
	LARRAGA (NAVARRE)	AN ENERGETICOS LARRAGA	X	
Basque Country	DONOSTIA-SAN SEBASTIAN (GUIPÚZCOA)	AVIA	X	X
	ARANGUIZ (ÁLAVA)	AVIA		X
	EIBAR (GUIPÚZCOA)	AVIA-KANTOI	X	
	LAZKAO (GUIPÚZCOA)	AVIA	X	
	ZURBANO (ÁLAVA)	AVIA	X	X
	IRUN (GUIPÚZCOA)	AVIA		X
	VITORIA-GASTEIZ (ÁLAVA)	ESASA	X	
	RIBABELLOSA (ÁLAVA)	EESS ROMPETROL	X	
	DURRUMA/SAN ROMAN DE SAN (ÁLAVA)	IS-XXI	X	
	ALDEKONA (SAN ISIDRO) (VIZCAYA)	AVIA USOA	X	X
	ARROA-BEKOA (GUIPÚZCOA)	AVIA	X	X
	VITORIA-GASTEIZ (ÁLAVA)	AVIA	X	
La Rioja	LOGROÑO (LA RIOJA)	EROSKI	X	

Source: Geoportal of the Ministry of Industry, Energy and Tourism

ANEXO C. COMPILATION OF MEASURES CARRIED OUT AT AUTONOMOUS COMMUNITY LEVEL

ANDALUSIA

9. From 2005 to 2014, the Andalusian Energy Agency incentivised both the production of biofuels and their distribution and logistics, subsidising the installation of E85 pumps at service stations and biodisel tanks and pumps at company premises for use by that company.[178] An Order is to be published for aid up to 2020 incentivising the production of second-generation biofuels and also investment in distribution and logistics.

ARAGON

10. From 2008 to 2011 the Government of Aragon and the Institute for Energy Diversification and Saving (IDAE) signed partnership agreements to grant subsidies for energy saving and efficiency in different fields, including the transport sector.

11. From 2008 to 2011 the Government of Aragon, through its Department of Industry, Trade and Tourism, awarded grants for efficient use of energy and use of renewable energies; among other actions, these incentivised the purchase of electric vehicles and the installation of charging points.

12. Grants were awarded in 2010 and 2011 to promote the use of biofuels in road transport.

CANTABRIA

13. In 2012 the Government of Cantabria, through the e-Aire project,[179] installed seven electric charging points (four in Santander, one in Camargo, one in Torrelavega and one in Laredo).

CASTILE-LA MANCHA

14. The Department of Infrastructure introduced an aid scheme for the purchase of vehicles powered by alternative fuels (electricity, LPG, CNG and LNG) through the following orders: Order of 30 November 2011 published in the Official Gazette issue 236 on 2 December 2011, and Order of 16 April 2014 published in the Official Gazette issue 84 of 6 May 2014.

15. Aid granted in 2011 supported the conversion of ten passenger vehicles to natural gas between 2/12/2011 and 1/10/2012, and the construction of two refuelling stations. Meanwhile in 2014 30 CNG cars were converted, each one being granted a maximum of €800 or 50 % of the cost of conversion. There were also grants for the purchase of passenger cars or commercial vehicles converted at the manufacturing works up to a maximum of €1 200 per vehicle as well as buses and vehicles for the

[178] Order of 18 July 2005 establishing the terms and conditions of an Incentive Programme for Sustainable Energy Development of Andalusia and announcing the call for applications for 2005 and 2006.
Order of 11 April 2007 establishing the terms and conditions of an Incentive Programme for Sustainable Energy Development of Andalusia and announcing the call for applications for 2007.
Order of 4 February 2009 establishing the terms and conditions of an Incentive Programme for Sustainable Energy Development of Andalusia and announcing the call for applications for 2009-2014.

[179] The project e-Aire project was originally an initiative of the Directorate-General for the Environment of the Government of Cantabria. It has been joined by the Department of Agriculture, Livestock and Environment of the Government of La Rioja, the Energy Agency of the Province of Ávila, and the municipal councils of Loures (Portugal) and Aranjuez.

transport of goods (€15 000 for new vehicles and €3 000 for conversion, up to a limit of 50 % of the cost of conversion), although no grant application for this type of vehicle was approved.

16. In 2014 the Department of Infrastructure granted aid for the purchase of vehicles powered by alternative fuels and power system conversion by Order of 16.04.2014 laying down the terms and conditions for aid for savings and energy efficiency in the transport sector in Castile-La Mancha (published in Official Gazette issue 84 of 06.05.2014). The purchase of six hybrid vehicles was supported through this aid scheme.

CASTILE-LEON

17. Order EYE/1592/2011 of 23 December 2011, announcing a call for applications of subsidies eligible for co-funding by the European Regional Development Fund and aimed at investments in energy saving and efficiency in the transport sector in Castile-Leon except for the acquisition of vehicles (Official Gazette of 29 December 2011). This aid was to promote, among other initiatives, the conversion of internal combustion vehicles less than five years old to electric vehicles.

18. The total budget for this line is €100 000. The maximum amount eligible for the conversion of vehicles was €3 000 per unit.

19. Order EYE/1135/2014 of 22 December 2014 provided aid for the installation of 17 electric charging points by local councils, businesses and private individuals.

20. The Government of Castile-Leon is aware of 200 electric charging points (public and private) installed in the region.

21. Public-private partnership agreements

YEAR SIGNED	PARTICIPANTS	BUDGET	PURPOSE
2013	Nissan International SA and the Government of Castile-Leon		DQ Launch Program (fast charging)
2012	Partnership agreement between Iberdrola, SA and the authorities of the Autonomous Community of Castile-Leon	€130 000	Installation of charging points in 60 buildings used by the authorities of Castile-Leon
2010	Specific partnersihp agreement between the Regional Energy Agency of Castile-Leon, the city councils of Valladolid and Palencia and Iberdrola, SA	€276 000	Implementation of the pilot scheme 'Installation of Charging Stations for Electric Vehicles'

22. Outreach activities

On 16 January 2013 at Palencia City Hall an event was held to present the Electric Vehicle (EV) Guide for Castile-Leon. The Electric Vehicle Guide for Castile-Leon was drawn up with the participation of representatives from: the municipalities of the Network of Municipalities of Castile-Leon ADE Sector Policy department, the Regional Energy Agency, the company Tool Alfa and Directorate-General of Industry and Technological Innovation.

The EV Guide of Castile-Leon was presented in the following towns and cities: Paencia, Soria, Bejar, Leon, Laguna de Duero, Salamanca, Miranda de Ebro, Ponferrada, Medina del Campo and Benavente.

Since 2014 there has been a specific section in the Castile-Leon electric vehicle website (http://www.vehiculoelectrico.jcyl.es/) for members of the Network of Municipalities, where information

and best practices are exchanged and direct contact is maintained with other representatives of the municipalities of the Network of Municipalities.

23. Training activities

    Decree 27/2011 of 9 June 2011 was passed, establishing the syllabus to be studied for the Diploma in Vehicle Electromechanics in the Autonomous Community of Castile-Leon. This measure aims to meet the general needs for qualification of staff to join the production industry in the Autonomous Community of Castile-Leon.

    During 2012-2013 academic year, a total of 27 centres spread across all provinces of the Autonomous Community offered such training courses, with 1 254 students.

    During 2013-2014 academic year, a total of 27 centres spread across all provinces of the Autonomous Community offered such training courses, with 1 423 students.

    During 2014-2015 academic year, a total of 26 centres spread across all provinces of the Autonomous Community offered such training courses, with 1 355 students.

24. In 2014 the Department of Economy and Employment of the Government of Castile-Leon signed an agreement with the company REPSOL to promote and support the use of LPG. This has covered the following initiatives:

    - The conversion of four official vehicles of the Government of Castile-Leon (Avila, Burgos, Soria and León) for the monitoring and analysis of this technology.
    - Support for the purchase of AutoGas vehicles in the Autonomous Community of -Leon through
    - a maximum contribution of €500 LPG in the form of customer loyalty card per new vehicle purchased by the Government of Castile-Leon.
    - Contributions to different sectors and individuals in the Autonomous Community of Castile and Leon to acquire new LPG vehicles under certain conditions

25. ORDER EYE/1591/2011 of 23 December 2011, announcing a call for applications of subsidies eligible for co-funding by the European Regional Development Fund and for the purchase of automobiles, motorcycles, buses, lorries and other mobility equipment using more energy-efficient technology (REAY Code: IND041) (Official Gazette of 29 December 2011).

    This aid could finance the purchase of new vehicles with different technology, either passenger cars or commercial vehicles up to 3 500 kg GVW, new motorcycles, buses and/or new lorries and replacement of rolling stock with a new item. The total budget for this line is €250 000. An amount of €7 000 is available for passenger cars or commercial vehicles up to 3 500 kg MMA, among others. The results of this aid are as follows:

    - 94 Hybrids, 1 natural gas. Aid of €213 964.
    - 2 electric motorcycles Investment of €9 900 / aid of €1 402
    - 15 LPG vehicles (ambulances) Investment of €1 024 664 / aid of €138 200

VALENCIA

26. The now-defunct Valencian Energy Agency (AVEN) supported the installation of three natural gas refuelling stations up to 2011.

27. In 2011, the AVEN, under an agreement signed with the Institute for Energy Diversification and Saving , supported conversions of passenger cars to LPG.

EXTREMADURA

28. Until 2012 the Government of Extremadura and the Institute for Energy Diversification and Saving (IDAE) signed partnership agreements to provide grants to purchase vehicles powered by alternative fuels. However, no applications for aid relating to natural gas were made.

29. The Government of Extremadura signed an agreement with the Institute for Energy Diversification and Saving (IDAE) to carry out the 2008-2012 Action Plan (PAE4 +), as a result of which the Department of Agriculture, Rural Development, Environment and Energy issued Decree 151/2012 of 27 July 2012, establishing the terms and conditions for granting subsidies for the purchase of hybrid vehicles and other vehicles powered by alternative fuel and announced the call for applications for 2012.

30. In 2013 Endesa won an open tender organised by the Extremadura Energy Agency to install 40 charging points for electric vehicles in the province of Badajoz, 22 of which were to be located in the city of Badajoz and the remaining 18 in the city of Merida. This measure was developed by the Extremadura Energy Agency, through a delegation agreement between the Department of Agriculture, Rural Development, Environment and Energy of the Government of Extremadura and the Extremadura Energy Agency for the implementation of the actions of public support in the Action Plan for the Energy Savings and Efficiency Strategy. This tendering process won by Endesa resulted in nine recharge points being installed in Merida and 13 in Badajoz; details are as follows:

BADAJOZ		MÉRIDA	
NO	LOCATION	NO	LOCATION
1	IFEBA	1	Polytechnic
2	University	2	Félix Valverde Lillo
3	Old Nursery	3	Plaza de Roma
4	Railway Station	4	Avenida de la Libertad
5	Plaza Alta	5	Atarazanas
6	Luis de Morales Museum Car Park	6	Plaza Margartita Xirgú
7	Menacho Car Park	7	Avenida Juan Carlos I
8	Conquistadores Car Park	8	Tourist Centre (MAM)
9	San Atón Car Park	9	Calle Trébol (Emergency Services Building)
10	Streetlight Service		
11	San Roque Swimming Pool		
12	La Granadilla Sports Facility		

GALICIA

31. Decision of 1 December 2011 establishing the terms and conditions for awarding grants, on a non-competitive basis, related to the Efficient Vehicle Plan, and regulating the selection of the associate bodies participating in the management of these grants.

32. According to the the Official Province Gazette of 21/05/2013 A Coruña council opened a call for applications for subsidies for motor vehicles for taxi services. To be eligible vehicles had to be hybrid vehicles or use LPG, natural gas or electricity, be taxis and/or be installing GPS or taxi screens.

BALEARIC ISLANDS

33. In 2014 the Balearic Government signed an agreement with REPSOL, without any associated public budget, which involved the conversion of two vehicles to LPG.

CANARY ISLANDS

34. 3In November 2013 the Canary Islands government backed a study into the introduction of electric vehicles in the Canaries.

35. In 2014 and 2015 the Island Energy Agency of Tenerife and the Energy Agency of the Canaries jointly launched a line of grants for: (1) the replacement of cars by models fuelled by liquefied gas and (2) the conversion of vehicles to use this fuel. The maximum grants were set at €600 and €450 per vehicle, respectively, and they went exclusively to island and city councils.

NAVARRE

36. In 2011 the Directorate-General for Enterprise and Innovation, through Decision 02532 DGE/2011 of 15 December 2011, supported six vehicle conversions to LPG through an agreement between the Government of Navarre and the IDAE.

37. In 2011 the Directorate-General of Enterprise and Innovation announced a call for applications for subsidies for the purchase of passenger and commercial vehicles powered by alternative fuels.

BASQUE COUNTRY

38. In 2013 a public-private partnership agreement was signed to promote alternative fuels in the taxi sector.

39. In 2014 public-private partnership agreements were signed to install electric charging points. The aim was to develop a novel solution for fast, smart, flexible and manageable charging through research and development of the most advanced charging and communications technologies (EV charger — and Charger-Manager), energy management and the associated tariff-setting, obtaining as a result a single final advanced product for fast charging of electric vehicles that is a global groundbreaker, based on the know-how of the Basque Country. The budget was €4 001 444.18.

    The participating institutions were: INGETEAM POWER TECHNOLOGY, S.A., ASOCIAC DE PROMOCIÓN E INVESTIGACIÓN CLUSTER DE ENERGÍA, EDS INGENIERIA Y MONTAJES S.A., IBERDROLA GENERACION S.A., IBIL GESTOR DE CARGA DE VEHÍCULO ELÉCTRICO, S.A. and ZIV METERING SOLUTIONS.

40. From 2011 to 2015 various public-private partnership agreements were established to encourage electric mobility in areas other than charging points.

ASTURIAS

41. From 2008 to 2011 the Department of Economy and Employment together with the IDAE granted aid for the purchase of electric vehicles within the E4 Strategy 2008-2012. This support subsidised four cars in 2008, one car in 2009, two cars and a motorcycle in 2010 and one car in 2011.

42. From 2010 to 2012 the Department of Economy and Employment together with the IDAE granted aid for the installation of charging points within the E4 Strategy 2008-2012. This support subsidised 13 points in 2010, 29 points in 2011 and 10 points in 2012.

MURCIA

43. From 2008 to 2011 the Government of Murcia, together with the IDAE, granted aid for the purchase of electric vehicles within the E4 Strategy 2008-2010.