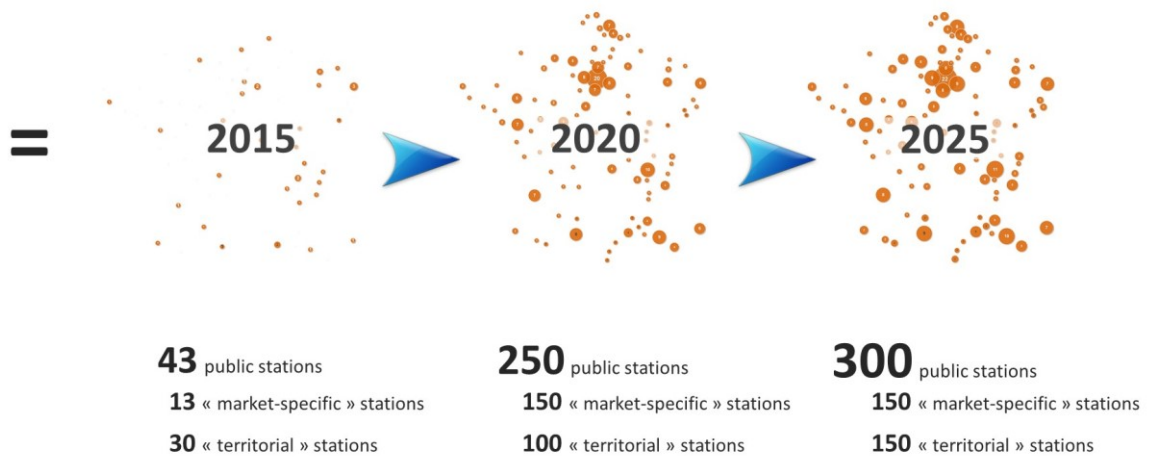

NGV Infrastructure France 2020 – 2025



March 2016

NGV industry and territories commitment

- + Difference in taxation on natural gas and on diesel to be maintained until 2025
- + Subsidies on vehicle purchases
- + Biogas to be considered as an advanced fuel



On 28 March 2011, the European Commission adopted a White Paper titled "Roadmap to a single European transport area — towards a competitive and resource-efficient transport system." This document presents the EU's vision to reduce the dependency of its transport system on petroleum products without impairing its efficiency, while laying down an objective to reduce greenhouse gas emissions by 60 % by 2050 compared to 1990. On this basis, in January 2013 the Commission published a Europe-wide strategy for alternative fuels, while recalling the need to pursue efforts to increase air quality.

The DAFI Directive¹ on the Deployment of an Alternative Fuels Infrastructure was adopted in October 2014. This Directive asks each Member State to implement a national framework for action in the development of the alternative fuels market and the deployment of associated infrastructures: electric vehicle charging points, CNG (Compressed Natural Gas) and LNG (Liquefied Natural Gas) fuelling points for road, sea and river transport modes, along with hydrogen fuelling stations. For road vehicles, Member states are required to determine the appropriate number of CNG stations accessible to the public and to be installed by the end of 2020 in urban and suburban areas. They are also asked to indicate the appropriate number of CNG and LNG stations accessible to the public to be installed by the end of 2025, to cover at least the transport corridors of the existing TEN-T² core network, to enable fully trans-European transport.

Natural gas is already used as a fuel in France for bus and refuse truck fleets. New projects for NGV buses are currently in the design stage. With its public access network of 43 NGV fuelling points³ (42 CNG stations and 1 LNG station), of which 13 are accessible to Heavy Duty Vehicles (HDV), the French natural gas supply infrastructure does not currently provide sufficient capacity to envisage the significant introduction of natural gas in the land-based transport mix to be on a par with the European objective.

However, interest in using NGV has risen in France over the past few years. Firstly for use in freight transport, where natural gas is the only economically viable alternative to diesel, without impairing Light Commercial Vehicle (LCV). We have also observed increasing signs of interest from passenger transport operators (bus and coach companies) for NGVs.

Secondly for more "universal" use in larger urban communities, where authorities seek rapid and efficient solutions to improve air quality for local residents.

The consequences of air pollution on health are now widely known and public authorities have an obligation to take action to reduce the effects. Alongside the WHO studies which estimate that outdoor air pollution causes 3.7 million premature deaths worldwide each year⁴, a French Senate enquiry recently estimated the total cost of outdoor air pollution in France at between €68 million and €97 million a year⁵. Road transport is responsible for 56 % of NOx emissions nationally and 30 % of PM_{2.5} emissions in the Ile-de-France region⁶. As France is currently defending itself at the European Court of Justice for its non-observance of pollution emission limits imposed by the Air Quality Directive and as city authorities are starting to progressively restrict city centre access to low-emissions vehicles, natural gas and biogas fuels bring solutions

¹ EU Directive 2014/94 Deployment of Alternative Fuels Infrastructure

² The Trans-European transport network (TEN-T) is a European Union transport infrastructure development programme.

³ Figures as at end February 2016 (www.afgnv.info)

⁴ "Le GNL, composante européenne de la transition énergétique du transport routier de marchandises" Report in French - "LNG - European component of energy transition in commercial road transport" CGEDD (conseil général de l'environnement et du développement durable) – September 2015

⁵ Enquiry Commission on the economic and financial cost of air pollution - July 2015

⁶ Particle and NOx emissions from road vehicles - ADEME (French Environment and Energy Management Agency) - June 2014

that can be deployed rapidly and at an acceptable cost for local authorities in terms of the benefits generated.

Natural gas could form a substantial part of the national transport mix, on the condition that certain support measures currently in effect are made permanent, and that others are implemented, according to usage. For 2020, total energy consumption by all natural gas vehicles is estimated at a little over 3 TWh (it is below 1 TWh today), which would represent 0.7 % of France's road transport mix. Most of this demand would be generated by the freight transport sector (trucks) and in the medium term by the passenger transport sector (coaches), general usage (delivery vans, company car fleets, tradesmen) and local authority vehicle stock.

A network of 150 public refuelling stations for the commercial transport sector by the end of 2020

To successfully prepare this development, it is essential that by 2020 we have built a strategic network infrastructure of NGV refuelling points estimated at 150 stations (40 LNG stations and 110 CNG stations), accessible to the public and for a large majority to serve regional commercial transport. Over the longer term, passenger transport fleets (coach lines) will be included. The investment required to develop this network is estimated at €150 million and could for the most part be contributed by the private sector on three main conditions:

- The current difference in taxation on natural gas and on diesel must be maintained until *at least* 2025, to ensure the necessary visibility for users wishing to invest in gas solutions, similar to mechanisms adopted in the UK, Italy or Germany.
- Supportive measures for investment, to offset the barrier of high purchase prices of NGVs in relation to diesel-powered vehicles; the measures currently in place (accelerated amortisation) must be maintained and additional measures implemented, such as direct rebates on purchases, even for 3.5 tonne vehicles. These support mechanisms must be available for long-term vehicle leases, which are increasingly used by transport operators as they allow such operators to externalise the uncertainty inherent to the emergence of the NGV market.
- Reinforcement of the incentives for the development of biogas for mobility use, through the recognition of biogas as an advanced fuel for NGV and the elimination, or at least the capping at its current level, of the carbon tax (CCE) levied on it⁷.

This network of 150 stations is particular in that it mobilises little direct support for investment in the infrastructure. Indeed, the business models depend on one hand on the intense proximity of the vehicle fleets and the stations they require, and on the other hand on the high individual vehicle consumption levels, in majority HDVs, which facilitates the construction of the demand curve leading to project profitability and the security of investments.

Through their accessibility to the public, these stations built according to market mechanisms provide regions with real opportunities to propose NG fuel to the greatest number of users at competitive prices. However, refuelling stations that emerge based on this model will logically seek to be located as close as possible to the stakeholders providing the investment, for example in business parks, which may be far from city centres. So these "market-specific" stations could only provide a partial response to the problems of land development, air quality improvement and public health, to which the local authorities must identify suitable responses.

⁷ As the carbon footprint of biomethane is very low over the whole life cycle ("from well to wheel"), it does not seem logical to levy a carbon tax indexed to its carbon content as if it were a fossil fuel.

A network of 100 stations serving regions and city centres

It also seems necessary to complete these "market-specific" stations with "territorial" stations that ensure better coverage of major agglomerations and enable the development of NGV infrastructures beyond facilities for HDVs, in particular for local delivery vehicles which are increasingly targeted by local access regulations to city centres. This "territorial" infrastructure is estimated at 100 stations by 2020, for an investment in the order of €25 million⁸. Such an investment is guided by an approach to propose gas and biogas for vehicles to the greatest possible number of users, involving mixed fleets of multiple stock and to improve public health. Securing the investment required is far from a simple matter. So it is improbable that this investment will be sourced solely from private stakeholders; the emergence of the network of "territorial" stations therefore depends on the implementation of a specific framework of action that needs support from the public sector both on local and national level, in addition to the measures required to develop the "market-specific" stations. This framework remains to be created (direct investment aid for stations? Ease of access to the land required? Subsidies to cover any under-use of refuelling points, ensuring that project sponsors receive at least a minimum return on their investment?) and could for example result in tender projects issued by local authorities.

The concurrent development of these two networks of "market-specific" and "territorial" NGV refuelling stations, forming a network of 250 public stations by 2020, would enable France to meet the European guidelines concerning the development of alternative fuels infrastructures.

A gas system ready to supply a station network

With 40,000 km of high pressure gas pipelines, 200,000 km of distribution networks, 14 underground storage tanks that can contain up to 20 % of annual national consumption and 4 methane terminals located on each of its coasts, France has ample assets to provide a solid basis for development of gas-powered mobility, with a level of security of supply equivalent to that of petroleum fuels.



The existing public fuel distribution network comprising 11,000 public filling stations also represents a base that needs to be used, particularly in areas affected by strict land availability restrictions. The proximity of gas refuelling points to conventional fuel pumps will also contribute to the efficient delivery of information to users about the availability of NGV.

4 TWh of biogas is forecast to be injected into the networks every year starting in 2020 so the development of NGV will be able to count on a supply that meets its needs, thereby considerably increasing the already interesting carbon footprint of natural gas, while reinforcing energy independence on a national level. Through the certificates of origin mechanism, which like green certificates for electricity enable the separation of production and consumption locations, the NGV ecosystem could feature a growing and progressive portion of renewable energy without technical modifications to the vehicles or to refuelling stations.

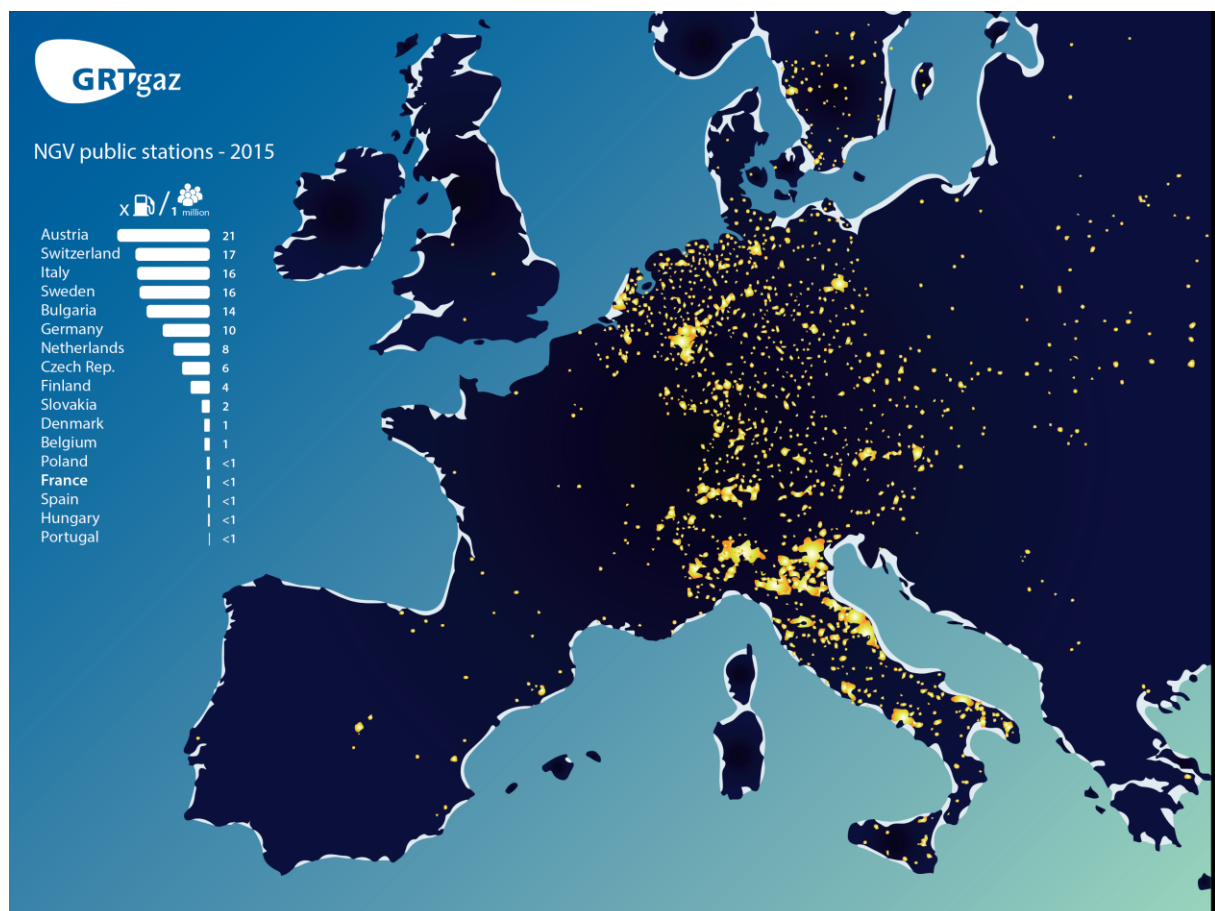
⁸ At the end of 2015, we count 30 "territorial" stations, which means that around 70 new refuelling points are required.

Beyond the infrastructure aspects, the NGV sector will also be able to count on freight transport operators (loaders, hauliers, builders, rental operators) who are today in favour of gas engines and are poised to initiate this major fuel transition.

Development of NGV after 2020

Beyond 2020, the dynamic will depend on the continued progression of use of gas in the HDV segment and on the place that NGV will assume for Light Duty (passenger) Vehicles (LDV), and in the yet longer term for passenger vehicles. Depending on the scenario, the consumption of gas could reach 25 TWh in 2030, or 6 % of the transport energy mix. By then, other key factors to success must be secured in addition to public sector support, in particular an attractive product offering from French vehicle manufacturers and the installation of gas and biogas refuelling points in the existing network of fuel stations, including for the supermarkets.

In light of the economic, environmental and societal benefits (improvement in trade balance, lower greenhouse gas emissions, less atmospheric and noise pollution), and with the necessary public sector support in the early years, an NGV ecosystem could be deployed without excess cost to local authorities. The result would be lesser dependence on petroleum fuels in the short term and greater energy independence over the medium term through the use of biogas.



NGV public stations in Europe by end of 2015

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A. Context

1. Energy transition necessary in the transport sector

In line with the 2030 Climate and Energy package issued by the European Commission, the French law on the Energy Transition for Green Growth (LTECV law), enacted on 17 August 2015, lays down ambitious energy-related and environmental objectives for France, in particular a 40 % reduction in greenhouse gas (GHG) emissions by 2030 compared to 1990 levels and a 30% share of renewable energies in the final energy consumption mix by 2030.

To achieve these targets, France and Europe have been engaged in a proactive energy transition approach for some time, resulting in the implementation of policies that have enabled significant progress in the field of electricity production (high growth of renewable energies) and building energy use (reduced consumption by new buildings through the introduction of new standards and regulations). In parallel, the transport sector remains the weakest link in this transition, due to the lack of a viable alternative to petrol and diesel fuel from an economic and technical viewpoint, yet it is the leading GHG-emitting sector (27 % of GHG emissions in 2013 in France).

And beyond its impacts on climate change, the transport sector is also one of the main culprits in terms of air pollution, representing de facto a major health issue. EU Directive 2008/50 defines targets for ambient air quality, specifying limit values that must not be exceeded in terms of pollution emissions, to avoid or prevent toxic effects to public health and to the environment⁹. Despite notable improvements over the past few years, air quality remains a matter of concern, particularly in urban areas. The effects of atmospheric pollution on public health are known, as is the economic cost: between €20 and 30 billion per year for damage to health caused just by fine particles¹⁰. On a national scale, the transport sector is one of the largest producers of atmospheric pollution with 2012 figures showing it is responsible for 59 % of NO_x emissions, 16 % of PM₁₀ emissions and 19 % of PM_{2.5} emissions¹¹.

The energy transition in the transport industry is therefore a major issue for the decades to come, both for France and for Europe as a region.

To enable this transition, in October 2014 Europe adopted the Directive on the Deployment of Alternative Fuels Infrastructure¹² which aims to deploy infrastructures for alternative vehicle fuels (electricity, hydrogen, bio-fuels, synthetic fuels, liquefied petroleum gas and natural gas) in each Member State. The French infrastructure development plan which should be presented no later than 18 November 2016, needs to be built in line with the "Clean Mobility Development Strategy" introduced by article 40 of the LTECV law and is currently being drafted.

⁹ Critical threshold for NO_x at 30 µg/m³, annual limit value at 40 µg/m³ for PM₁₀ ⁹ and 25 µg/m³ for PM_{2.5}

¹⁰ CGEDD: Air pollution and Health: the cost for society (in French) - October 2013

¹¹ CITEPA 2012.

¹² Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure

2. What are the benefits of natural gas and biogas for the energy transition in the transport sector?

What is Natural Gas Vehicle?

An NGV vehicle runs on natural gas

NGV vehicles use natural gas as a fuel to power their engines. The gas used is over 97 % methane (CH₄). This is not the same as LPG (Liquefied Petroleum Gas) which is gas fuel stored in liquid state, produced by the petroleum refinery process and natural gas processing. It contains principally propane (C₃H₈) and butane (C₄H₁₀).

NG can be used in a liquid or gaseous state. Depending on the configuration used, it will be called LNG (Liquefied Natural Gas) or CNG (Compressed Natural Gas). The difference is just a change of state which in no way affects the chemical composition of the fuel.

Whether used in gaseous or liquid form, the natural gas molecule used to power vehicles is identical in all aspects to that supplied in the natural gas supply network. NGV engines are for the most part based on the positive ignition technology used by petrol engines. CNG and LNG vehicles currently available on the market can produce engine HP that stand comparison with petrol and diesel engines. These vehicles run only on gas (HDV, buses, urban vehicles) or are gas/petrol bi-fuel vehicles (LCV or LDV). Bi-fuel vehicles use either fuel, but petrol is used to extend their operating distances¹³.

Refuelling NGVs is similar to conventional petrol or diesel vehicles. It uses filling equipment of a similar format to petrol or diesel pumps. In Germany or Italy for example, NGV refuelling points are most commonly located at multi-fuel filling stations alongside conventional diesel or petrol pumps. If the refuelling points and equipment are correctly dimensioned, filling an NGV tank only takes a few minutes.

Biogas

The NGV sector offers good renewable energy opportunities through the development of biogas. This fuel is produced using organic waste from the agricultural sector, public sector food waste or farm waste, household waste or sludge from wastewater treatment plants. The fermentation of organic matter produces a fertiliser, or digestate, and biogas.

It is traceable using the guarantee of origin mechanism and can be consumed all over the country via the gas supply network. Biogas blends perfectly with natural gas as it has the same composition. So the NGV system could claim a growing and progressive share of renewable energy use, without requiring the technical adaptation of vehicles or refuelling stations.

The environmental benefits of NGVs

Few comparative studies between natural gas and petroleum fuels under real driving conditions exist for the time being. Nonetheless, one study conducted by ADEME and a large supermarket group¹⁴ comparing two HDVs, one running a diesel engine and the other a gas engine, both equipped with onboard measurement equipment, reveals some interesting trends. Depending on the journey undertaken, the study reveals a drop in CO₂ emissions, ranging from -4 % to -16 % and lower NO_x emissions, varying from -30 % to -70 % in favour of NGV. Concerning particulate matters, the measurement equipment detected no significant

¹³ In this case, the vehicle usually runs on natural gas and automatically switches over to petrol when the gas tank is empty.

¹⁴ Casino-ADEME study conducted in early 2015 with the participation of AXEGAZ, IVECO, CRMT and Transports PERRENOT.

differences, as the values for both diesel and NGV were extremely low. However, it is important to remember that NGV engines are equipped with very basic filtration systems, even non-existent for certain components, in particular particulate matters. This provides performance guarantees over the whole vehicle lifetime.

If the gas is of renewable origin, the CO₂ footprint is considerably reduced, reaching emissions reductions of approximately 80 % in relation to diesel, according to full-cycle or "well-to-wheel" calculations.

In addition to the lower CO₂ and pollution emissions, NGV engines generate half as much noise as diesel engines and are forcibly appreciated for urban vehicles such as buses, refuse trucks and "last kilometer" delivery vehicles.

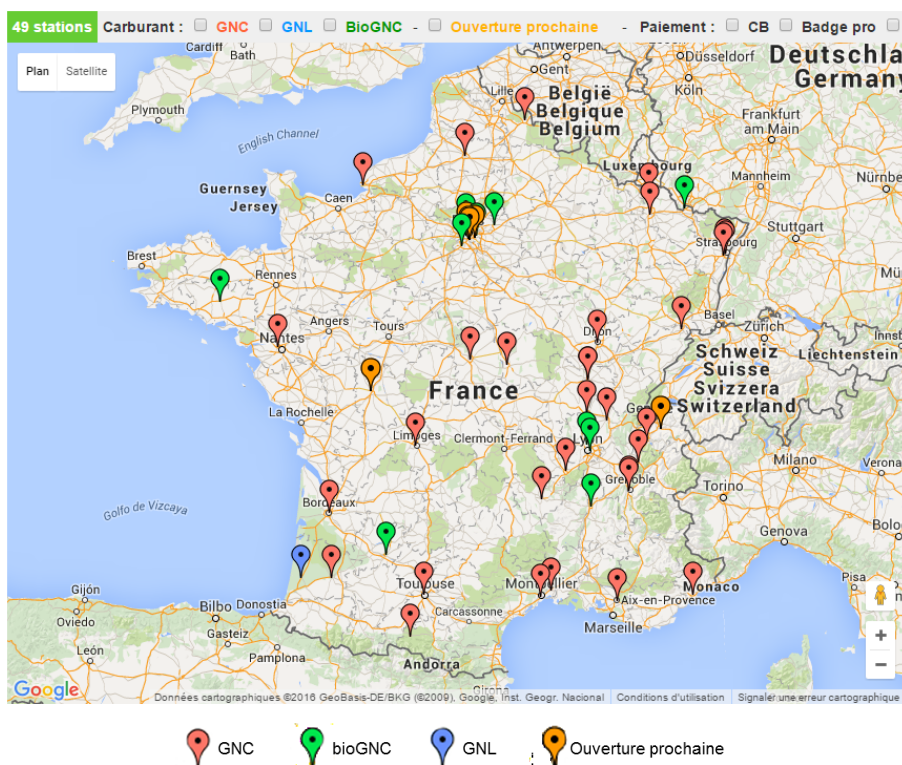


3. Natural gas, well developed worldwide as a fuel but underdeveloped in France

Natural Gas Vehicles are not the results of recent technological innovations. This type of vehicle engine has already shown strong development in other regions of the world. In 2013, the stock of NGVs in circulation around the world was estimated at approximately 18 million vehicles. With a little over 5 million vehicles, South America (Brazil & Argentina for the most part) and Asia (Iran, Pakistan, China, India) are today the largest markets around the world. If the reasons for development vary according to the country, it is important to realise that NGV is already well developed and continues to grow in many developing markets, as well as in countries representing the world's main vehicle markets (in particular China and the USA): since 2004 the worldwide NGV market has tripled in size and has reported approximately 10 % annual growth for several years.

Aside South America and Asia, NGV are showing growth in our nearby European neighbours, such as Sweden, Switzerland, Germany (100,000 vehicles and 900 public CNG stations), Austria and Italy, which represents the largest CNG market in OECD countries (1 million vehicles and around 1,000 public stations).

In France the stock of NGVs remains marginal. They are essentially concentrated in the bus and waste truck segment, with respective stocks of 2,600 and 1,000 vehicles in 2015. Two thirds of local authorities with over 200,000 inhabitants have adopted NGV buses for at least a part of their operating fleets. The LCV segment represents a total of 6,900 NGV, mainly in dedicated corporate vehicle fleets). HDV only represent 250 NGVs yet have shown good growth since 2014. Lastly, the passenger vehicle segment remains highly under-developed at this time, with just 2,400 vehicles.



French NGV public filling stations by end of 2015 (www.afgnv.info)

B. The potential for growth of the NGV and biogas vehicle stock

1. Recent positive market dynamic driven by local authorities and commercial transport sector

Growth driven by freight and commercial transport sector, seeking an alternative to diesel

With a driving distance of around 400 km for CNG HDVs, which can be extended to over 1,000 km for LNG HDVs, gas currently represents the only mature and competitive alternative to diesel for heavy-duty transport vehicles which require significant autonomy. Moreover, the refuelling times are simply a few minutes, which enables freight transport operators and urban vehicle (buses, refuse trucks) fleet operators to choose gas as a fuel without altering their internal organisation and the management of their organisational flows, often optimised for productivity.

Concerning fuel infrastructures, the majority of existing refuelling points are for private use, intended for bus fleets, HDVs, refuse trucks or corporate fleets. At the end of 2015, France's public access network amounts to 42 CNG stations and 1 LNG station¹⁵, of which 13 are accessible to HDV. It is clear that the NGV supply infrastructure does not provide sufficient capacity to envisage the significant introduction of gas in the land-based transport mix.

In Europe and especially in France, we observe an increase in the number of registrations of new heavy goods NGV; in 2015 we counted 320 new registrations on the 19-44 Tonne segment¹⁶ and the 2016 order book is estimated at 400 units¹⁷ at this time.

Bus	2,689
Coach	34
High Duty Vehicle (HDV)	275
Refuse truck	1,122
Light Commercial Vehicle (LCV)	6,952
Ligh Duty (passenger) Vehicle (LDV)	2,065
Others	618
Total	13,755

NGV stock in France, end of year 2015 (source: SIV – AAA Data)



¹⁵ NGV refuelling infrastructure with public access, end of year 2015

¹⁶ Source AAA Data

¹⁷ Source: IVECO France

This interest for gas is a result of several elements that can be summarized as follows:

- On this market segment, alternative fuels to diesel other than gas are few and less technically and economically viable.
- A part of the regional freight and commercial transport sector activity is compatible with a "delivery route" based operation, within a defined geographical area, which limits dependency to a dense, national network of stations for the initial phases of development.
- The potential for gas HDVs is easy to identify, which after aggregation of volumes, provides a basis to secure the required investment in refuelling stations. Indeed, at this time, only freight and commercial transport operators (major freight forwarders, hauliers) and local authorities engaged in sustainable mobility programmes can invest in their own infrastructures or guarantee gas distributors adequate returns on their investment, due to their critical size or their capacity to aggregate fuel volumes.
- The deployment of city-centre pollution control plans requires the extensive and rapid adoption of clean fuel solutions without loss of utility in relation to diesel.
- Stakeholders in the freight and commercial road transport sector, in particular major supermarket and retail distribution chains, are favourable to gas engines and are today poised to initiate their energy transition along these lines.

In practice this movement results in NGV fleet and station development initiatives in the freight and commercial transport sector.

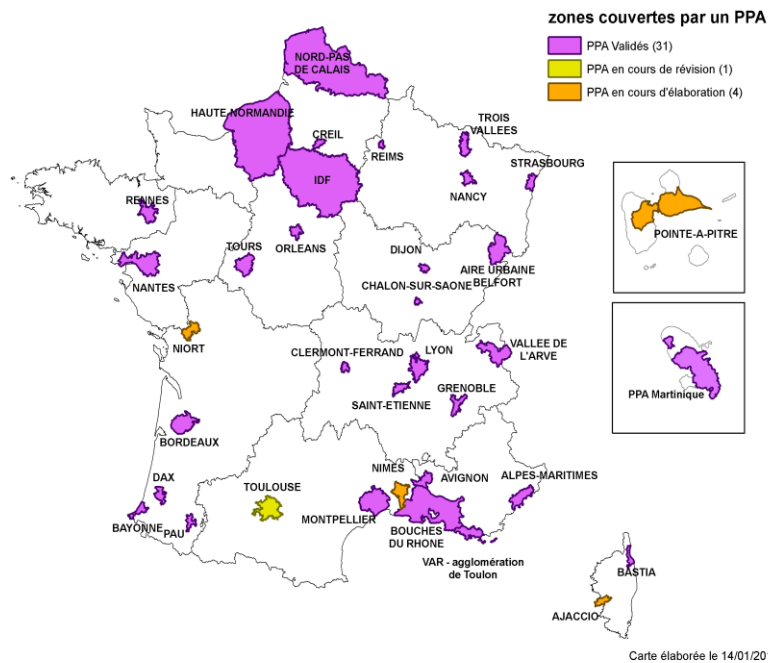
Illustration of the interest of gas for HDVs: the Equilibre project

Equilibre is a project undertaken by road transport operators aiming to try out NGV solutions "in actual operating conditions", by measuring the environmental and economic performance as an alternative to diesel. The aim is to inform the freight and commercial transport sector about the benefits of this solution. The Equilibre project is run by six freight road transport companies (Magnin, Megevand Frères, Prabel, Sotradel, Jacky Perrenot and Transalliance) and French environment agency ADEME.



Local authority projects to develop clean transport systems

NGV provide firm responses to local initiatives in terms of energy transition (TEPCV - positive energy territories for green growth, breathable cities within 5 years, PPA zones, etc.). Several local authorities are already fully engaged in solid actions to promote NGV as a clean mobility solution.



Atmosphere Protection Plans deployment (www.developpement-durable.gouv.fr)

Of the hundred or so TEPCV-certified energy planning approaches, around forty have identified or included NGV as an area for development, and around 20 are actually involved in operational action plans. For example, NGV programmes have been included in the TEPCV funding plans for the Grand Troyes or Saint-Etienne agglomerations.

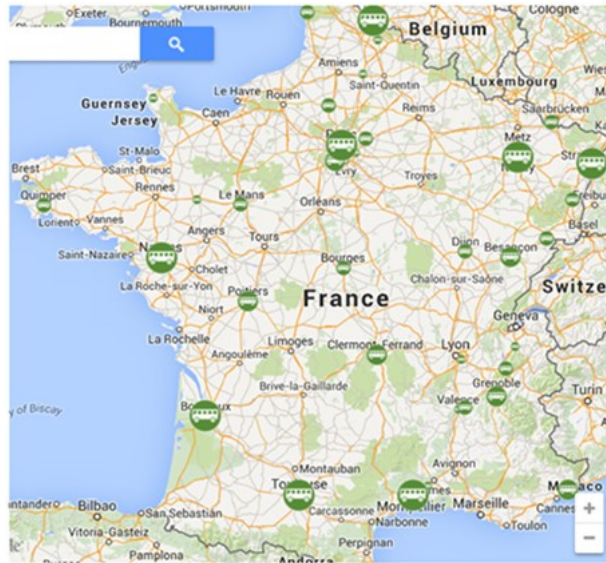
NGV has also generated interest amongst city delivery operators and "last kilometer" logistics operators, through urban delivery charters that promote alternative fuels to diesel. As an example as part of the "GNVolontaire" voluntary gas approach initiated by ADEME and GRDF, Lyon-based delivery firm Citylogistics will soon use around 15 HDVs running on biogas. This initiative is part of a larger initiative undertaken by the Grand-Lyon authorities who wish to 'greenify' the city centre.

We can also cite the example of the Pays-de-la-Loire region, which in early 2016 launched an opportunity study on the implantation of gas/biogas stations, or that of the Paris city authorities and SIGEIF (Inter-community Syndicate for Gas and Electricity in Ile-de-France), which in 20104 formed a partnership with GRDF and La Poste to develop the use of NGV in the Ile-de-France region¹⁸.

Furthermore, as a sign of the involvement of local authorities, two thirds of cities with over 200,000 inhabitants have today opted for gas or biogas bus fleets (Nice, Nantes, Lille, Bordeaux,

¹⁸ Equip Paris city authority and La Poste postal delivery fleets with NGV stock; convert the capital's existing fuel stations into multi-energy stations (NG, petroleum products and electric vehicle charging points); create new refuelling stations in Ile-de-France with SIGEIF.

Strasbourg, Paris, Montpellier, Toulouse). In its "Bus 2025" program, the Paris urban passenger transport operator RATP aims to convert 20 % of its bus stock to biogas.



*Bus au GNV :
2/3 des villes de plus de 200 000 hab*

2. The potential for growth of NGV stock

By 2020, growth driven by the freight and commercial road transport sector and by local authority fleets

In light of the context, if the support measures required to ensure the development of NGV are implemented, it would be possible to extend the stock of gas HDVs to a little over 10,000 vehicles (including refuse trucks) by 2020. Concerning LCV, the stock is estimated to reach 20,000 units by 2020. NGV buses which currently represent 14 % of the stock, with an annual consumption of 0.5 TWh, will continue to grow at a rate higher than that observed currently, reaching 0.7 TWh of fuel consumption. Taking into account the energy efficiency savings that natural gas engines will generate in the coming years, the quantity of energy needed to fuel the French NGV stock in 2020 will be 3.2 TWh. By way of comparison, NGV consumption in 2015 is estimated at 0.8 TWh.

Beyond 2020, growth in the use of NGV on the LCV and LDV segments

Based on progressive increases in NGV share in the various market segments, by 2030 the vehicle stock could reach:

- 110,000 Heavy Duty Vehicles (HDV) (>3.5 Tonne)
- 13,000 buses and coaches
- 140,000 Light Commercial Vehicles (LCV)
- 130,000 Light Duty (passenger) Vehicles (LDV)

The total consumption of energy by the GNV stock is estimated to reach 25 TWh by 2030. According to the ADEME roadmap, the quantity of biogas injected into gas supply networks will be between 12 TWh and 30 TWh by this time.

C. Infrastructure development plan

1. Requirements of DAFI Directive

The European Union Directive 2014/94/EU on the deployment of an alternative fuels infrastructure imposes several requirements that all Member States must honour. Article 6 requires that an appropriate number of LNG refuelling points accessible to the public are put in place by 31 December 2025, at least along the existing TEN-T Core Network (also in ports if appropriate) to ensure that NG motor vehicles can circulate throughout the Union with an average distance between refuelling points of approximately 400 km. Similarly, by 31 December 2020, an appropriate number of CNG refuelling points accessible to the public are put in place in urban/suburban agglomerations and other densely populated areas, and by 31 December 2025, along the existing TEN-T Core Network with an average distance between refuelling points of approximately 150 km.

According to the DAFI Directive, a 'recharging or refuelling point accessible to the public' means "a recharging or refuelling point to supply an alternative fuel which provides Union-wide non-discriminatory access to users. Non-discriminatory access may include different terms of authentication, use and payment." The working group led by the NGV sector to produce this document took the step of providing a complementary definition; a refuelling point is considered 'public' when it is accessible by a (professional or private) third party who has not taken part in the investment decision and who benefits from access to the point according to customary conditions subject to no "take-or-pay" minimum commitment on the volume of fuel served.



2. NGV refuelling infrastructure models

Beyond the purely technical characteristics of NGV refuelling points¹⁹, in the absolute we can segment the requirements of the NGV refuelling infrastructure into three sub-segments, behind which there are distinct cases of use:

- Major corridors: refuelling point located on major roads and intended to supply vehicles that cover long distances.
- Suburban: refuelling point located in major logistics terminals on the edge of cities and acting as distribution hubs for long distance transport vehicles and local delivery vehicles.
- Urban: filling stations for local delivery vehicles and meeting various needs with less predictability of journey routes.

Whether they belong to types 1, 2 or 3, the refuelling points will not deliver the same level of profitability and will be financed according to different business models:

- Major corridors: in majority, motorway service stations for HDVs, along the TEN-T network.
- Suburban: stations that will meet increasing demand from regional commercial goods transport operators (e.g. mass retail distribution). These refuelling points will mostly be used by HDVs and in the medium term by LCV. They will for the most part be financed by private stakeholders for dedicated or pooled usage.
- Urban: these stations meet various needs and will mostly be used by LCVs and LDVs. Multi-usage operations (shared stations) or dedicated usage stations (private refuelling points) seem to be problematic due to low volumes and the difficulty in aggregating unitary demands. The emergence of this type of station depends largely on strong support from the public sector both on local and national scales.

So it is possible to see two distinct business models:

- "Market-specific" refuelling points which will offer interesting returns due to the predictability of NGV fuel volumes over time, with incentive measures to act on demand (gas and vehicles). These fuel stations will require private sector funding.
- "Territorial" stations, which will generate lower returns and/or higher investment risk due to the difficulty of aggregating supply volumes and securing commitments from users. Such fuel stations are nevertheless necessary to cover the local territory, especially in the vicinity of major agglomerations which need to deliver adequate solutions upstream of the implementation of city centre access regulations.

3. Infrastructure required for NGV development

Network by end of 2020

A network of 150 "market-specific" fuelling stations by the end of 2020 to enable the growth of NGV in the commercial goods transport sector

To enable the development of NGV in the commercial transport sector, it is essential to secure the rapid development of a strategic network of fuel infrastructures, estimated at 150 stations²⁰:

¹⁹ State of gas delivered (liquid (LNG), liquid and compressed (LNG-C) or just compressed (CNG)), method of station supply (via natural gas supply network (high/medium/low pressure connection) or LNG tanker supply), etc.

²⁰ Including 13 HDV refuelling points accessible to the public and already operational at the end of 2015.

40 LNG stations (certain of which will also propose CNG - Appendix 1) and 110 CNG stations (Appendix 2).

This network of stations should be able to:

- guarantee balanced geographical coverage (no region without a station),
- be centred on major agglomerations and major road corridors (TEN-T core network),
- cover "strategic hubs" for goods transport i.e. major logistics hubs and major container ports²¹.

Although in the short term these stations are intended to fuel HDV and in the medium term the passenger transport sector (buses, coaches), they need to be accessible to the public to receive the highest possible number of vehicle types, in order to deliver a refuelling service to as many users as possible to handle the later stages of NGV development.

Based on these criteria and by analysing the size of agglomerations and their level of commitment to gas for mobility needs, the French NGV Association AFGNV²² has produced an initial map of a possible "market-specific" NGV refuelling point network by the end of 2020. This network of "market-specific" refuelling points is split into the LNG/LNG-C and CNG networks, with the stations of the latter network being divided up by administrative region and major populated areas. It nonetheless seems reasonable to assume that a large part of these "market-specific" stations will be located near major cities according to a population density approach. This map remains one possibility given that the locations of "market-specific" refuelling points do not correspond to a local land development plan, but to localised demand.

The investment required between now and 2020 to develop this network of "market-specific" points is estimated at €150 million²³.

On the condition that support and assistance measures are implemented to boost demand (for fuel and vehicles), the investment in this network of "market-specific" refuelling points could be provided by private sector stakeholders, who are now poised to ensure the funding and development of this infrastructure as long as the risks are attenuated by guarantees and positive perspectives for demand growth.

An additional network of around 100 "territorial" stations with a dominant urban reach by 2020, to enable good coverage of major agglomerations and development of NGV beyond the commercial goods transport sector

To complement the network of "market-specific" NGV refuelling points mainly targeting HDVs, around a hundred "territorial" CNG refuelling points²⁴, meeting the needs of gas LCVs and LDVs could be built (Appendix 3).

The purpose of this network would be to:

- ensure a better supply grid for the major urban agglomerations to compensate for the weak predictability of "market-specific" station locations, as they have short term needs in terms of developing clean mobility solutions,

²¹ LNG stations have been planned in each major container port identified by the TEN-T.

²² AFGNV : Association Française du Gaz Naturel Véhicule

²³ Assumed total CAPEX of €1 million/CNG and LNG refuelling point, €1.2 million per LNG-C point.

²⁴ Although they represent a minority, "territorial" LNG and LNG-C stations are possible.

- enable development of NGV beyond HDV fleets, by developing refuelling points suited to the needs of LCV and LDV fleets, in particular in the vicinity of city centres and potentially using existing fuel stations²⁵.

This network of stations will be formed by extending 30 existing "territorial" stations, entirely dedicated to serving local authorities and based on a network operation approach.

AFGNV has produced a map of the "territorial" stations by 2020, based on agglomeration populations and their stated level of commitment to the improvement of air quality. The map shows the distribution of stations by administrative region and for each major urban agglomeration, with 95 CNG refuelling points in service by the end of 2020. As the current network comprises approximately 30 "territorial" type stations, the deployment of this network requires the construction of 65 more refuelling points by 2020.

The investment required between now and 2020 to develop this network is estimated at €25 million²⁶.

Contrary to the refuelling points serving HDVs and the commercial goods road transport sector, pooled investment and funding of this network of "territorial" fuel stations from only the private sector is highly unlikely. In effect, this network must meet a wide variety of needs, in majority those of LCVs and LDVs. Multi-usage operations (shared stations) or dedicated usage stations (private refuelling points) seem to be problematic due to low volumes and the difficulty in aggregating unitary demands. The emergence of this type of station depends largely on support from the public sector both on local and national scales, alongside the support required for "market-specific" stations.

Use of existing fuel station network

The installation of a network of refuelling points, whether "territorial" or "market-specific" could be supported by the network of existing service stations, through the use of NGV refuelling equipment *in situ*. This avenue of development could be particularly appropriate to overcome difficulties in terms of land availability, especially in dense urban areas. The use of the existing refuelling network also presents other benefits: optimal locations, zero costs (land, access roads), proximity of services (shops, vehicle washes, petrol for bi-fuel vehicles) and the visibility of gas-as-a-fuel for promotion to potential future NGV users.

A global network of 250 stations by 2020, first component of the NGV ecosystem

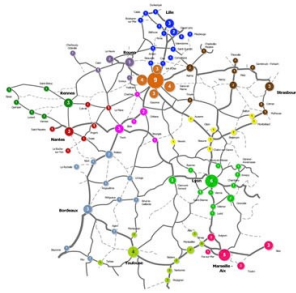
The parallel development of these two networks of NGV refuelling points - "market-specific" and "territorial" - meets the requirements of the DAFI Directive, the spirit of which depends on a balance between economic stakeholders in the short and medium term and the transport challenges for major urban conurbations over the long term.

This network will meet the recommendations of the Directive in terms of minimum distance between refuelling points and will result in the installation as from late 2020, of the LNG and CNG infrastructure along the main transport corridors, as required by the Directive by the end of 2025,

²⁵ Light commercial and private vehicles are mostly commonly gas/petrol hybrids. This also offers a solution to the issue of the availability of land to build a new refuelling point.

²⁶ Assuming €400 K CAPEX per station

"Market-specific" station network

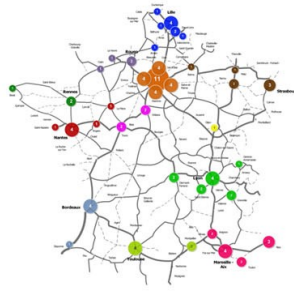


40 LNG and LNG-C stations
110 CNG stations

The dynamic of "market-specific" stations is already a reality. Demand is observed, business plans are robust.

- ⇒ Network that the sector will be able to expand on the condition that the incentive measures currently in force will be maintained until 2020.
- ⇒ Investment €150 M

"Territorial" station network

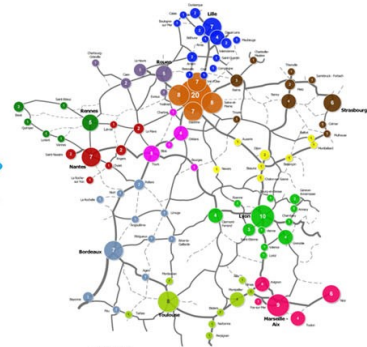


100 CNG stations

The interest of local authorities for NG fuel is confirmed, the signs of interest from institutional (Caisse des Dépôts, ADEME) and public sector stakeholders (CGI, MEDDE) continue to grow.

- ⇒ Network for which the sector could cooperate with local authorities, with supplementary support measures to offset lower profitability rates.
- ⇒ Investment €25 M

National network



250 public access stations

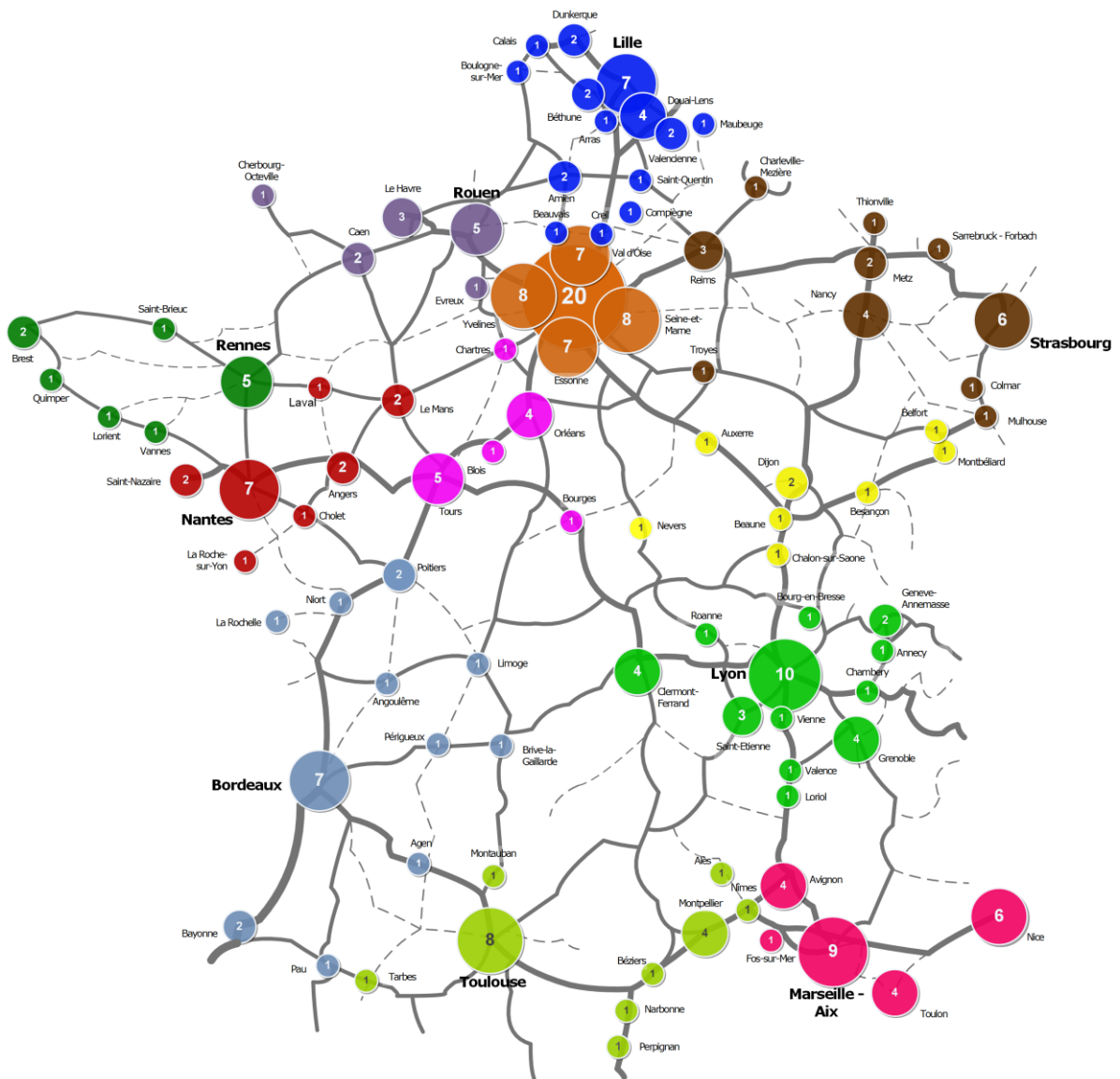
⇒ National network comprising a foundation based on public-access stations built for HGV use, which may be extended for more "universal" use if supported by the public sector and local authorities.

- ⇒ Investment €175 M

Assessment of construction of public-access NGV infrastructure by 2020



National network composed of 250 LNG and CNG public stations, included the 43 existing public stations in operation by end of 2015



Régions administratives selon le projet de réforme territoriale (loi NOTRe)

- Bourgogne, Franche-Comté
- Bretagne
- Centre, Val-de-Loire
- Champagne-Ardenne, Lorraine, Alsace
- Haute-Normandie, Basse-Normandie
- Ile-de-France
- Midi-Pyrénées, Languedoc-Roussillon
- Nord-Pas-de-Calais, Picardie
- Pays de Loire
- Poitou-Charentes, Limousin, Aquitaine
- Provence-Alpes-Côte d'Azur
- Rhône-Alpes, Auvergne

- Réseau Routier National
- Réseau RTE-T

Distances between refuelling points in accordance with Directive requirements

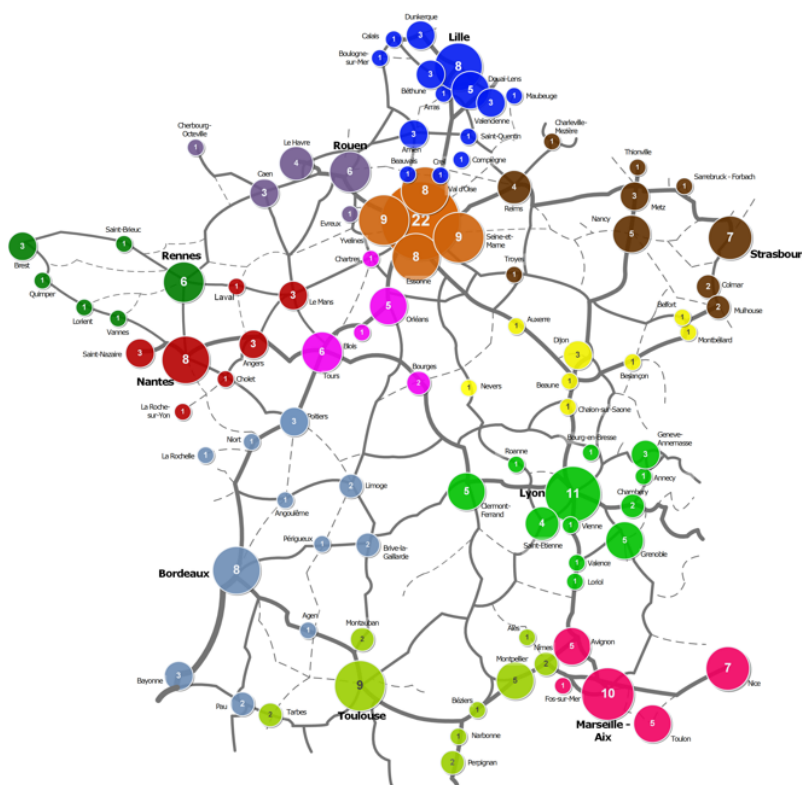
In recitals (41) and (46), the DAFI Directive recommends the minimum distances between CNG and LNG refuelling points:

- "(41)...Member States should ensure that refuelling points accessible to the public are put in place, taking into account the minimum range of CNG motor vehicles. As an indication, the necessary average distance between refuelling points should be approximately 150 km."
- "(46)...Member States should ensure that refuelling points accessible to the public are put in place, at least along the existing TEN-T core network, within adequate distances taking into account the minimum range of LNG heavy-duty motor vehicles. As an indication, the necessary average distance between refuelling points should be approximately 400 km."

Using the maps of the LNG and CNG fuel stations (see Appendix), we can verify that the minimum distances required by the DAFI Directive are satisfied as early as 2020. The density and good geographical distribution of main French agglomerations will guarantee that minimum distances are respected along the TEN-T core network by locating the refuelling points near to major urbanised areas.

The network in 2025

The network of "market-specific" fuelling points built by 2020 is relatively extensive and the increase in the number of gas HDVs will be able to continue with a significant increase in the number of fuel stations. We assume that the progression of NGV for varied usage will be longer and more heterogeneous from one city to another. It is therefore important to continue the growth of the "territorial" station network beyond 2020 to reach 150 stations by 2025.



GNL and CNG public stations network by end of 2025

D. The measures needed to support the development of NGV

1. Barriers to the development of gas and biogas as a fuel

Visibility requirements on taxation and support for gas vehicles purchases for regional commercial goods transport and passenger transport

Today, operators in the goods transport sector and the passenger transport sector are showing healthy signs of interest for the development of NGV use in their vehicle stock. Although the lack of fuelling infrastructure is a real issue for these operators, it is not the only barrier to the development of NGV use.

Indeed, these stakeholders operate mainly on a defined route basis with a limited geographical area of operation, and for the majority are less sensitive to the absence of a dense, national refuelling point network in the initial stages of development. Moreover, the NGV potential for HDV (large commercial vehicles and HDVs for commercial transport, buses and coaches in the passenger transport segment) are easy to identify, which after aggregation of the volumes enables the required investment in the infrastructure to be secured.

The main barriers to development on this segment may be eliminated by greater medium-term visibility in terms of taxation - and in particular the difference in taxation on NGV and diesel-powered vehicles - along with investment support measures for NGV to lower the purchase price to that of diesel vehicles. Effectively, if at this time the tax benefits applied to NGV make a tangible difference to the operating costs of HDV, fleet managers who want to transition to NGV must support high supplementary costs on their acquisition (in the order of 25 % to 30 % - or €30,000 for a 44-tonne tractor rig and in the order of 20 % - or €60,000 - for a bus), mainly due to the lack of the economies of scale effect enjoyed by diesel powered models.

The "GNVolontaire" voluntary programme, offering subsidies for the acquisition of HDVs over 19 tonnes implemented in Rhône-Alpes region, coordinated and sponsored by ADEME and GRDF, shows that targeted support for NGV demand generates investment in refuelling points. It has been observed that €1 of public sector funding in the acquisition of gas-powered HDVs can generate €10 of private sector investment in the development of NG fuel (modernisation of vehicle stock by replacing diesel-engine vehicles with NGV, investment in refuelling point infrastructure).

Furthermore, national measures recently put in place for 2016, such as the accelerated amortisation for gas HDVs, are purely common sense and intended to enable the development of NGV in the commercial and passenger transport sectors.

Need for refuelling infrastructures and NGV offering on the LCV and LDV segments

The main barrier to the development of NGV in the LCV and LDV segments is above all the lack of refuelling stations. Due to lower unitary demand, their varied character and the lower route predictability, vehicle subsidies and fuel tax benefits, while necessary, are not sufficient to ensure the development of NGV in this market segment, which is the most directly exposed to the "chicken and the egg" problem.

To ensure growth in this market segment and ensure that gas gains a foothold on the national market in the long term, the development of the fuel infrastructure must encourage and generate greater development of NGV stock. It is improbable that the investment and funding of the network of "territorial" refuelling points needed in urban areas can be secured only from

private sector stakeholders. The emergence of this type of station depends largely on strong support from the public sector both on local and national scales.

Furthermore, the existence of a vehicle offering from French manufacturers, whose involvement is a key factor in ensuring user confidence in the segment, is also an essential condition for the development of NGV in these vehicle segments.

2. The support mechanisms needed

Visible taxation until 2025 to guarantee the difference in taxes on NGV and diesel

The adoption of NGV to replace conventional fuels is highly structuring and represents the outcome of strategic reflection on the part of decision-makers. The risk in relation to a "business as usual" solution is high and each stakeholder needs to be reassured that NGV is the right option in light of the current limitations that are undergoing transformation.

So everything is based on confidence. Any factor that supports or increases uncertainty about the benefits of NGV, especially in economic terms, will impair the development of the market.

Today the resolution of the economic viability of NG in relation to diesel remains a complicated matter due to the excessive cost of NGV due to a lack of economies of scale, resulting in turn from the absence of a fuel infrastructure.

In this context, the taxation levied on the fuel plays a major role in the attractiveness of a gas solution. Even though it is logical that all fuels are taxed according to their carbon content²⁷, the difference in taxation between NGV and diesel vehicles as laid down by the amending finance law of 2015 must be maintained at least until 2025 to enable sufficient visibility for users intending to invest in NGV. Initiatives of a similar scale have already seen the day elsewhere in Europe:

- In Italy where the "Salva Italia" ("Save Italy") decree maintains a difference in taxation favourable to NGV for a period of 4 years.
- In the UK, where the government has agreed to maintain the difference in taxation levied on NG and petroleum products until 2023²⁸.
- In Germany, where the tax incentive applied to NG fuel currently in force until 2018 could be extended until 2026²⁹.

Subsidies on vehicle purchases, mainly targeting NGV in the commercial goods transport and passenger transport sector

The prices of NGVs are currently higher than those of conventionally-powered vehicles due to a relatively-limited offering from manufacturers and the absence of the economies of scale effect. This leads to excessively high purchase costs and lower resale prices.

However, the majority of components that currently impair the economic viability of NGV compared to diesel vehicles are not structural and will be reduced over the long term. The scale effect generated by higher production volumes and the effects of changes in emissions

²⁷ via the CCE carbon tax mechanism.

²⁸ Autumn statement of 2013, p49

²⁹ NGV Global News - NG Fuel Tax Incentive Extended in Germany – July 2015

standards³⁰ will over time be such that they reduce or even reverse the cost difference between gas and petroleum fuels.

Nonetheless, in the short term, the incentives to invest in vehicles set up for 2016 (accelerated amortisation) must be sustained and reinforced to compensate for the existing barrier of high NGV purchase prices in relation to diesel vehicles. Furthermore, they must be made accessible to stakeholders who are not vehicle owners, as they more commonly make use of long term leases, in priority from operators in the commercial goods and passenger transport sector. They must also be extended to vehicles with a weight below or equal to 3.5 tonnes³¹.



Investment incentives for "territorial" public fuelling stations in large urban agglomerations

"Market-specific" stations will be the fruit of a successful captive fleet aggregation process. HDV fleets make this process even easier, as unit volumes are high. Fleets comprising a small number of vehicles and especially small vehicles (LCVs and LDVs) are not part of the "market-specific" station target stock, in that the volumes of NG supplied will never be sufficiently high to attract investors.

So to enable the development of NGV beyond HDVs, authorities must provide investment incentives for "territorial" fuel stations to equip major urban agglomerations.

The appropriate mechanisms remain to be invented, but could include and are not limited to direct aids for investment in fuelling points, facilitation of access to land or incentives to cover any under-use of refuelling equipment, in order to ensure that project sponsors obtain at least a minimum level of return on their investment.

Support for development of biogas in transport

Biogas is a key factor in the reduction of the carbon footprint of NGV. The incentives to develop the supply of biogas and its use as vehicle fuel must be pursued and reinforced.

Gas is identified as an available and credible alternative fuel that meet air quality issues but also as part of territorial projects based on the production of biogas. Associating a biogas production project to NGV development within public sector fleets such as buses, refuse trucks and local authority LCV fleets, will integrate gas into the core of local circular economies.

³⁰ Standard Euro6c introducing in 2017 certification tests in actual conditions for <3.5T vehicles or standardisation of greenhouse gas emissions for HDV.

³¹ Measure until now only accessible to vehicles over 3.5 tonnes.

To achieve this, several measures must be taken.

- Firstly, biogas must be considered as an advanced biofuel. Although the Renewable Energies Directive (RED) identifies biogas as an advanced biofuel, French laws and regulations do not. So despite the observed development of biogas and its use in NGV³², it is not accounted for in national LTECV objectives which are set at 10 % of renewable fuels by 2020 and 15 % by 2030.
- Since April 1st 2014, biogas is subject to the French CCE carbon tax identically to natural gas. As the CCE tax is levied in proportion to the carbon content of fuels, and in light of the very low carbon content of biogas over the full life cycle, it is essential to ensure at the very least, the stability of this tax from 2017 onwards.

Visibility of changes in regulated traffic zones

Many local authorities envisage the creation of regulated traffic zones (*zones à circulation restreinte* or ZCR), which aim to limit the presence of the highest-polluting vehicles. For users, and in particular commercial goods transport operators, it is essential to enjoy sufficient visibility on the introduction of these regulated zones to be able to anticipate transition to eligible fuels such as NGV.

Application of low-emission vehicle quotas in the renewal of public sector vehicle stock

Although these measures have already been adopted by LTECV in article 37, it is important to remember that the obligations concerning minimum quotas for low-emissions vehicle acquisitions for public sector fleets must be respected and applied.

Other key factors of success

Lastly, going beyond public sector support, other key success factors need to be present to ensure the successful development of NGV over the long term, such as extended communication to transport operators, the existence of an attractive offering from French vehicle manufacturers and the introduction of an gas and biogas offering in the existing service station network, including supermarket chain fuel stations, where over 60 % of the fuel distributed in France is sold.

3. The benefits of NGV for the national community

Although support mechanisms are necessary to ensure the development of NGV use, they could bring benefits for the national community over the long term. As an illustration and with all reserves associated with these projections, our macroeconomic analysis for the period between now and 2030 has quantified the following:

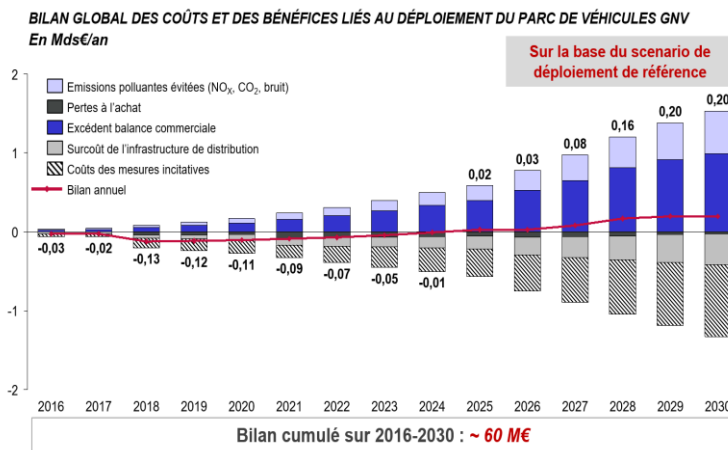
- firstly the additional costs that the national community must support in general terms to introduce the NGV ecosystem, in relation to a "business as usual" reference situation, based on an extension of diesel (costs of incentive measures, installation of fuelling infrastructure),
- secondly the savings generated compared to the reference situation (improved balance of trade, lower noise pollution, lower CO₂ emissions and pollution levels).

Subject to minimal growth in the NGV stock, development of NGV would effectively enable:

³² Since 2011, 75 % of biomethane volumes injected into the NG networks have been used to fuel transport.

- a €5.5 billion reduction in the balance of trade by 2030 through the use of energy that costs less to import (even produced locally for the biogas proportion) in relation than crude oil or refined diesel,
- reductions in greenhouse gas emissions (CO₂) through the injection of biogas into the network, amounting to 12 million tonnes of CO₂ avoided (i.e. the equivalent of the CO₂ emissions of 400,000 light diesel vehicles by 2030),
- reductions in pollution emissions (NO_x),
- the creation of new industrial jobs with the emergence of the sector, estimated at between 1,200 and 1,500 jobs by 2020,
- lower sound pollution representing social savings in the order of a cumulative total of €1.7 billion by 2030, due to the impact of noise on the attractiveness of an area, productivity and health.

These savings will offset the costs incurred, mainly due to losses in tax income (€5 billion), the construction of the fuelling infrastructure to meet the demand profile (€2.4 billion³³) and subsidies on the higher purchase price of NGV compared to diesel vehicles (€700 million).



The resulting cumulative sum of these costs and savings will achieve equilibrium by 2030 (+€60 million), given that only a part of the savings have been quantified. The non-quantified savings include:

- lower dependency on transport of oil products and more globally a top-rank contribution to the diversification of the energy mix in the sector,
- the jobs generated by the introduction of the NGV ecosystem (France already has several industrial sites specialising in CNG and LNG technologies³⁴),
- The development of transport usage for the biogas sector to the benefit of support for a growing industry, an evolution towards a circular economy for local authorities and progressive growth of the national energy independence level.

So it appears that in quantitative terms, the introduction of the NGV ecosystem over the 2016-2030 period is a question of balance between the costs borne by the national community and all the expected benefits, rather than a situation based on an extension of the existing infrastructure.

³³ These costs cover all the investment and operational spending required to ensure the demand profile for the 2016-2030 period is adequately supplied.

³⁴ Some examples: IVECO builds NGV engines for its HDV in its Bourbon-Lancy plant and assembles its NGV buses in its Annonay and Rorthais plants. RENAULT TRUCKS builds NGV engines at its Vennissieux plant.