

Gas Natural Servicios
Energy Solutions for Transport

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Who we are

Who we are

Gas Natural Fenosa



25
countries

Around **20 M**
customers in
the world

17,769¹
employees

The largest integrated
**gas and
electricity company**
in Spain and Latin America

**EBITDA
€4,645 M¹**

**Total assets
€46,502 M¹**

**Installed
capacity
15,443 MW¹**

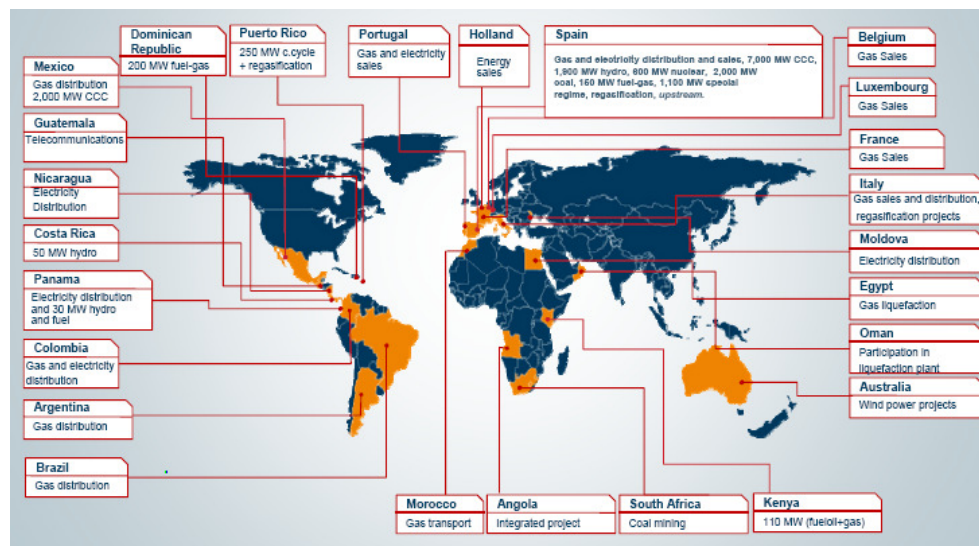
A multinational company,
leader in the sector
**of gas and
electricity**

Leadership

in liquefied natural gas
markets

- Benchmark operator in LNG/MG in the Atlantic and Mediterranean basins **with 30 bcm¹**
- One of the biggest **LNG** operators in the world, through its Stream and Unión Fenosa Gas affiliates.
- Fleet of **11 methane carriers^{1,2}**
- Investments in **3 regasifiers** (2 more under development), **2 liquefaction plants** and several **projects** in the gas value chain¹

1. Taking Unión Fenosa Gas into consideration.
2. The fleet of 11 tankers includes 7 Gas Natural Fenosa Vessels, 2 Unión Fenosa Gas, and 2 co-owned with Repsol, managed by Repsol Gas Natural LNG - Stream

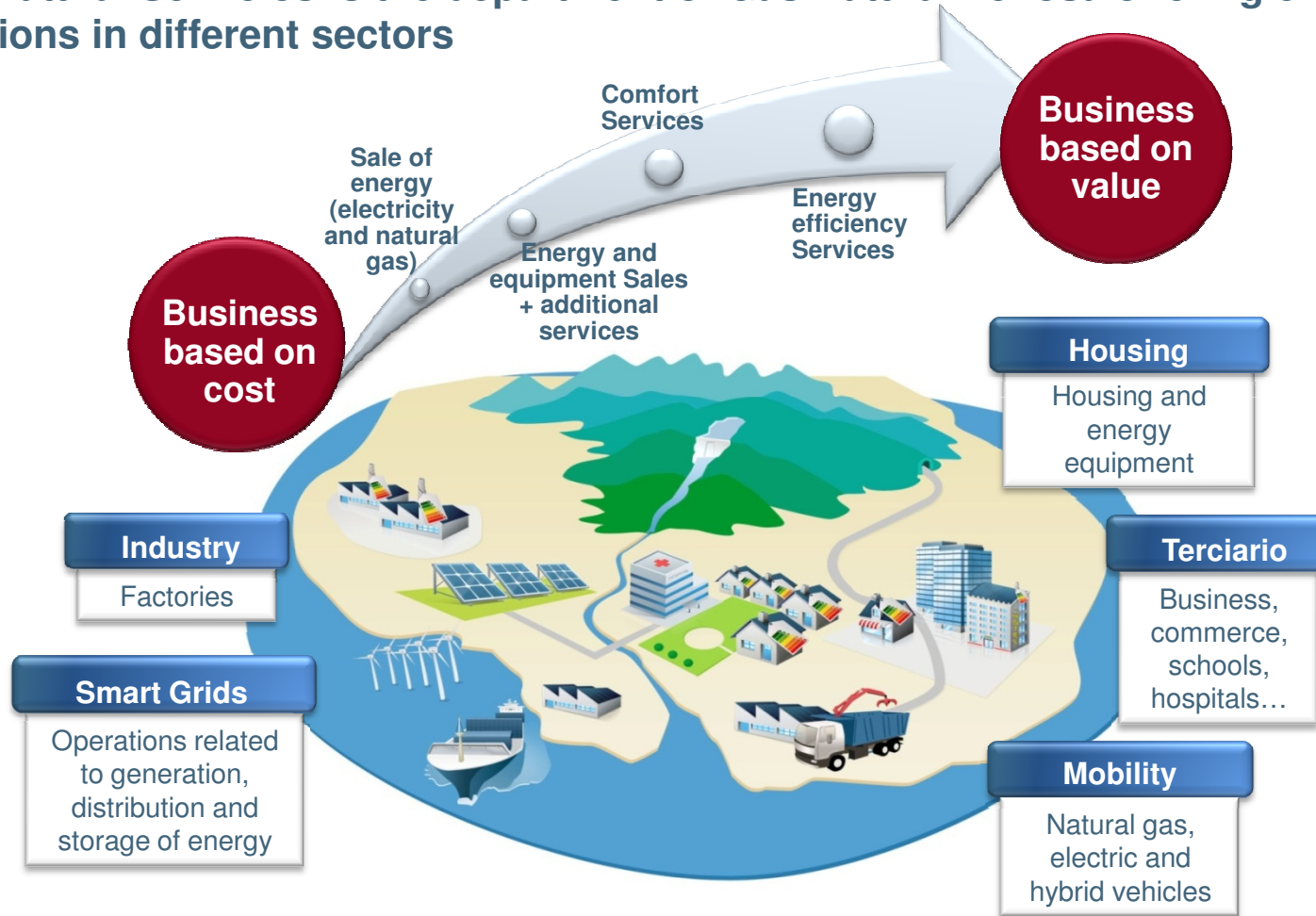


Who we are



Gas Natural Servicios

Gas Natural Servicios is the department of Gas Natural Fenosa offering energy solutions in different sectors



Our business approach based on value allows us to approach the real needs of the customer: "SERVICE AND SAVINGS"



Benefits of natural gas as transport fuel

Benefits of natural gas as transport fuel



Present transportation model

The present transportation model seems non-sustainable considering several factors:

- Unpredictability and constant increase of **Fuel Prices**
- **Limited world reserves.** Concentrated in difficult geopolitically areas. 96% of energy for transportation comes from crude oil, strong dependence of external supply sources (in Spain this dependence is higher than EU average)
- 41% of final energy used in Spain is dedicated to transportation. Increasing needs, **increasing CO₂ emissions** and global warming.
- 60% of entire vehicle fleet of Spain is diesel-engined. **Increase in local pollutants:** PM and NOx.

We have to achieve strategies to reduce economical, enviromental and risky impact with:

- Improved **EFFICIENCY** in technologies: reduction in consumption
- Fuel **DIVERSIFICATION**
- Reduction in **POLLUTANTS**

Benefits of natural gas as transport fuel



Environmental aspects

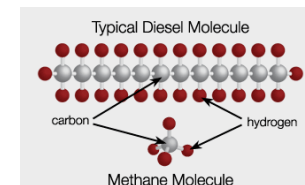
Local pollution. Air quality in the cities influences on human health

- ❑ Natural gas reduces local pollutants: **NO_x >80%**, **SO₂ ≈100%**, **PM >95%**, **CO ≈ 25%**
- ❑ Natural gas improves acoustic emissions compared against diesel. In heavy vehicles this reduction can get up to 50%.



Global pollution. Global warming affects climate change

- Owing to chemical composition, one carbone molecules, natural gas combustion produces, on equal terms of energy; CO₂ emissions between **10 and 25 percent** less than others fuels.
- Natural gas is 100% compatible (same molecule) with biomethane (treated biogas came from anaerobic digestion of organic matter), a totally renewable fuel.



Benefits of natural gas as transport fuel



Economical aspects

- ❑ Important infrastructure development
- ❑ Reduced taxes
 - ❑ Spanish Law 11/02/05: introduces european directives for energy product taxes and stablishs a natural gas tax when being used as transport fuel.
The tax is 0,4140 c€/kWh (1,15 €/GJ).
- ❑ Savings
 - ❑ The use of natural gas compared against fuel allows us to introduce **savings above 25%** and in some case **even 40%**, depending on the type of vehicle and the natural gas refuelling station.

3

Market situation

Market situation



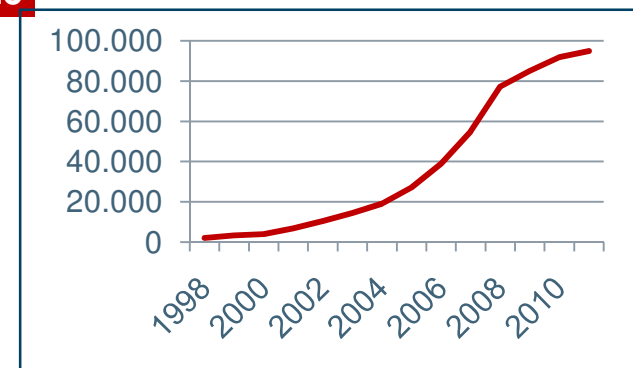
International development

2011	Country	Vehicles	Heavies	Gas stations
	Spain	3.176	82 %	61
Natural Gas development leaders	Italy	779.090	< 1 %	860
	USA	112.000	14 %	1.021
	Argentina	2.044.131	< 1 %	1.890
Other developed countries	Germany	96.157	3 %	903
	France	13.500	24 %	177
	Sweden	40.027	10 %	183
Other significant countries	Brasil	1.702.790	< 1 %	1.729
	Pakistán	2.670.667	< 1 %	3.300
	India	1.093.471	2%	724
	China	600.000	30 %	2.514
	Colombia	348.747	7 %	651
World Total		14.253.074	5 %	20.026

Source: www.ngvaeurope.eu

Germany example:

- Agreement among gas sector, administration, vehicle makers, and oil companies. Setting up ERDGAS MOBIL consortium.
- Medium-term objective: 1.000 gas stations.
- Increase supported by CNG production cars.



Market situation



Situation in Spain

Vehicles: 3.176

Public buses \cong **1.500** (1.014 refuel in natural gas stations owned by **GNS**) Madrid, Barcelona, Sevilla, Valencia, Salamanca, Toledo, Burgos and Málaga.

Garbage collection trucks \cong **1.100** (273 refuel in natural gas stations owned by **GNS**. Main fleets belong to licensed companies of public services: FCC, URBASER, CESPAS, SUFI, CLD.

Other vehicles \cong **600**

417 customer cards delivered by **GNS**

Natural gas stations: 61

Public: 21 (12 owned by **GNS**. Supply capacity: 206 GWh/year or 4.120 equivalent vehicles)

Private: 40 (12 owned by **GNS**. Supply capacity: 498 GWh/year or 9.960 equivalent vehicles)

Present portfolio of natural gas stations (opening in 2012-2013): 18

Public: 17 (16 owned by **GNS**. Supply capacity: 335 GWh/year or 6.700 equivalent vehicles)

Private: 1 (owned by **GNS**. Supply capacity: 30 GWh/year or 600 equivalent vehicles)

Market situation



Situation in Spain. Public natural gas refueling stations

Public stations: In operation

<u>Name</u>	<u>Owner</u>	<u>Address</u>	<u>City</u>	<u>Province</u>	<u>Fuel</u>
HAM	HAM	N-II. Km. 582	Abrera	Barcelona	GNC/GNL
HAM	HAM	Ctra. Del Mig, 36	L'Hospitalet del Llobregat	Barcelona	GNC
HAM	HAM	C/ d'Alemanya, 19. Polígono Can Ferrer, AP7	Sant Sadurní d'Anoia	Barcelona	GNC
TMB exterior	GNF	Carrer Lletra A, Zona Franca	Barcelona	Barcelona	GNC
URBASER Bon Pastor ext	GNF	Fra Juníper Serra, 75	Barcelona	Barcelona	GNC
SSTT GNF HOSPITALET	GNF	C/ Fabregada, 257 / Av. Carrilet	Hospitalet de Llobregat	Barcelona	GNC
TRANS. MONFORT	MONFORT	C/ Dinamarca. Ciudad del Transporte	Castellón de la Plana	Castellón	GNC/GNL
HAM	HAM	N-II, Km. 117. E.S. Petromiralles	Torremocha del Campo	Guadalajara	GNC/GNL
GN TRUCK	VICUÑA	N-I, Km. 419	Olaberria	Guipuzcoa	GNC/GNL
GNF	GNF	Av. Industria, parcel.la 501. Pol. Ind. El Segre	Lleida	Lleida	GNC/GNL
EMT Sanchinarro exterior	GNF	Sanchinarro	Madrid	Madrid	GNC
TAXCO	GNF	C/ Gremis, 10. Poligono Vara de Quart	Valencia	Valencia	GNC
BOTANICA	GNF	C/ Botánica, 114	L'Hospitalet del Llobregat	Barcelona	GNC
TRANS. CAMPILLO	GNF	Polígono Fuente del Jarro	Paterna	Valencia	GNC
CTM	GNF	Ctra. Villaverde-Vallecas. M-40	Madrid	Madrid	GNC
BIONET	HAM	C/ Sofre nº 3. Políg Ind Riu Clar.	Tarragona	Tarragona	GNC/GNL
HAM	HAM	E.S. Repsol. Av. Europa, 2	Igualada	Barcelona	GNC
SSTT GNF SALT	GNF	Disseminat el Sitjar, 1	Salt	Girona	GNC
DISFRIMUR MURCIA	GNF	Ctra. Era Alta. Nonduermas	Murcia	Murcia	GNC
ANAIZ EZCABA	GNF	Ctra. Pamplona-Irún Km. 4	Villaba	Pamplona	GNC
SANTA BARBARA	SERPAUTO ALPI	Paseo de la Rosa, 156	Toledo	Toledo	GNC

Public stations: Start-up in the near future

<u>Name</u>	<u>Owner</u>	<u>Address</u>	<u>City</u>	<u>Province</u>	<u>Fuel</u>
VIA AUGUSTA GAS	VIA AUGUSTA	N-II, km 328	Zaragoza	Zaragoza	GNC/GNL
TUSSAM exterior	GNF	Av. De Andalucía	Sevilla	Sevilla	GNC
GHC	GNF	N-III Km 11,8	Rivas	Madrid	GNC/GNL
J. SANTOS	GNF	N-II Km. 47,5	Alovera	Guadalajara	GNC/GNL
SERPARLA	GNF	Ctra. Parla Pinto km 1,8 (Recinto Ferial)	Parla	Madrid	GNC
SAN BLAS	GNF	C/ San Romualdo. San Blas	Madrid	Madrid	GNC
ARAVACA	GNF	C/ Alsasua. Aravaca, A-6	Madrid	Madrid	GNC
VICALVARO	GNF	Ctra. FFCC de Tajuña. Vicalvaro, M-45	Madrid	Madrid	GNC
VILLAVERDE	GNF	C/ Bascuñuelos. Villaverde, M-45	Madrid	Madrid	GNC
MARENOSTRUM	GNF	C/ Doctor Aiguader / Pza. del Gas , 1. Cinturón Litoral	Barcelona	Barcelona	GNC
EUROCAM	GNF	N-I, km	Vitoria	Alava	GNC/GNL
CESPA	GNF	C/ Albarracín. San Blas	Madrid	Madrid	GNC
DISFRIMUR VALENCIA	GNF	Ribarroja	Valencia	Valencia	GNC/GNL
SAN CIBRAO	GNF	C/ Ricardo Martín Esperanza nº 12	San Cibrao das Viñas	Ourense	GNC
DISFRIMUR ALICANTE	GNF	Poligono Industrial La Granadina	San Isidro	Alicante	GNC/GNL
MONEGAS	GNF	Ctra Albacete km 72	Motilla del Palancar	Cuenca	GNC/GNL
PREMIUM	GNF	Parque Alcosa, Ctra N-IV, Km 535,591	Sevilla	Sevilla	GNC/GNL

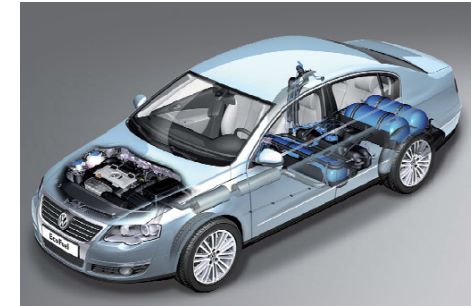
4 Technologies

Technologies



Otto Cycle-engined vehicles

- ❑ New vehicles designed to run on natural gas.
- ❑ Petrol-powered vehicles retrofitted to natural gas.
- ❑ Cars, vans, trucks, buses. In heavy vehicles power limited to 330 hp.
- ❑ Light vehicles are **bi-fuel** (natural gas - petrol).
Autonomy between 380 and 480 km in natural gas and between 150 and 480 km in petrol.



Diesel Cycle-engined vehicles

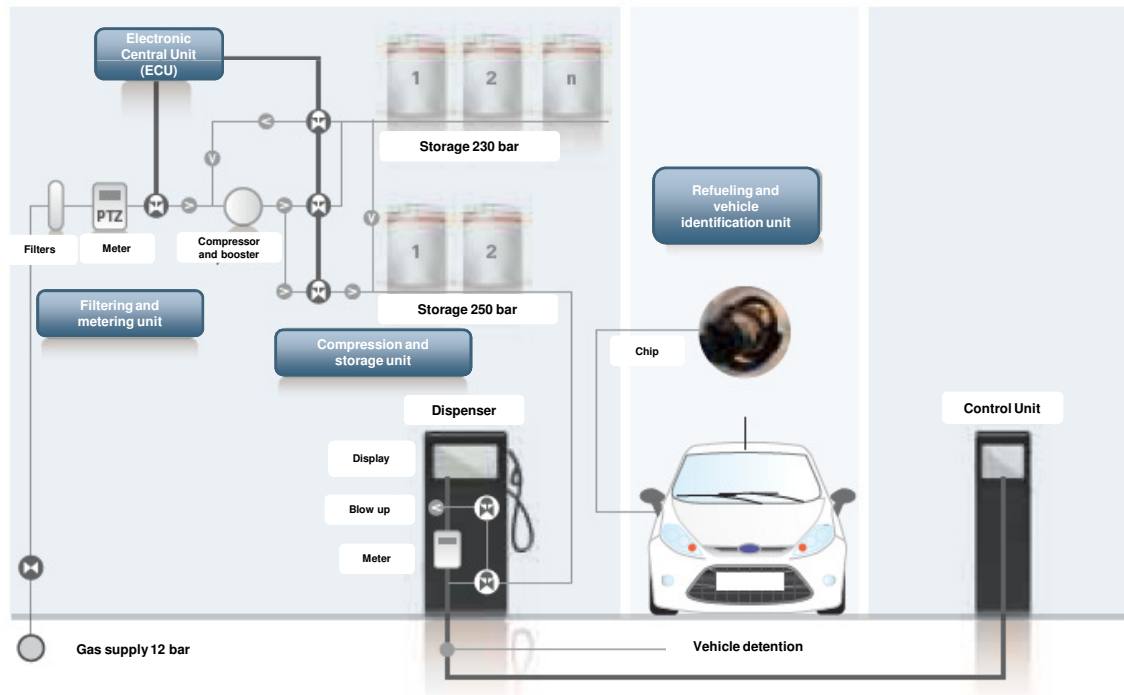
- ❑ Diesel Cycle with **dual-fuel** technology. (Gas Natural – Diesel). Diesel substitution rate up to 95%. The diesel is injected to produce the spark plug effect and so the ignition of the gas natural.
- ❑ It can run only with diesel.
- ❑ No limitation in power.
- ❑ Existing engines can be retrofitted.



Technologies

Compressed natural gas (CNG)

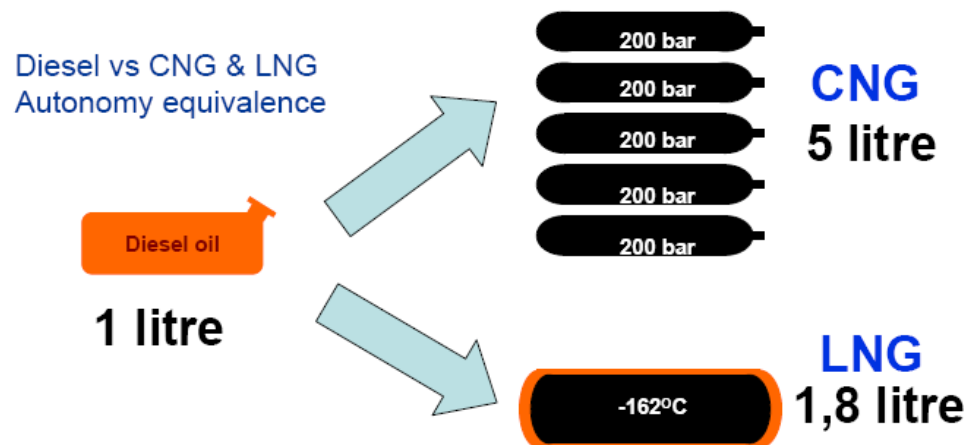
- Compressors to rise gas pressure from distribution pressure to 200 bar.



Technologies

Liquefied natural gas (LNG)

- ❑ Natural gas in gaseous phase in gasfields.
- ❑ For transport: liquefaction at atmospheric pressure falling temperature to $-163\text{ }^{\circ}\text{C}$. Volume reduced **600 times**.
- ❑ LNG tanks: triple range ($\sim 1.000\text{ km}$)



LNG is a key factor for medium and long distance transportation



**Gas Natural Fenosa Mobility
Solutions**

Gas Natural Fenosa Mobility Solutions



Growing plans.

Product development and marketing plan in new sales channels

Key markets

Heavy transport fleets

Taxi fleets and light profesional
vehicles in urban areas

Medium sized transport fleets in
metropolitan areas

Forklifts and other captive fleets

Actions

Development of LNG corridors (interurban)

Public and mixte stations (GNC in big cities)

Cooperations agreements with vehicle
manufacturers. Retrofit of new and used
vehicles

Commercialization plan for new channels

Gas Natural Fenosa Mobility Solutions



LNG Technologies

A vast range of vehicles can run with LNG.

Two engine technologies are available for heavy engines:

- Dedicated, using 100% natural gas
- Dual fuel, using diesel injection for ignition and natural gas as the main fuel



LNG opened the way for the medium and long distance road transport

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LNG: International actions

European LNG Blue Corridors
NGVA Europe Concept



LNG Blue Corridors in the USA
“Natural Gas Highway System”



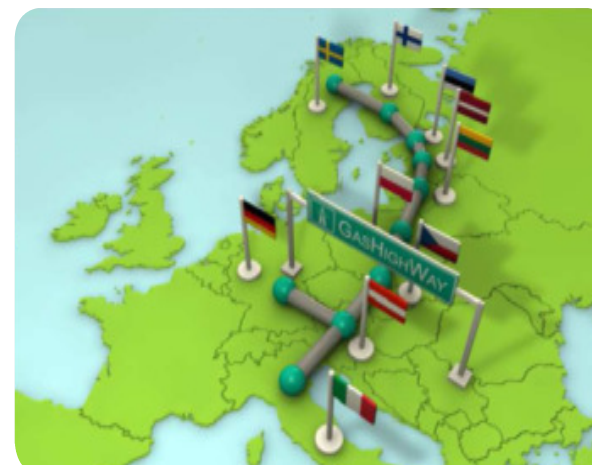
America’s Natural gas Highway – December 2012 Projected

Source: Clean Energy Fuels Corporation

Latin America
Dual-Ocean Blue Corridor



European GasHighWays Project



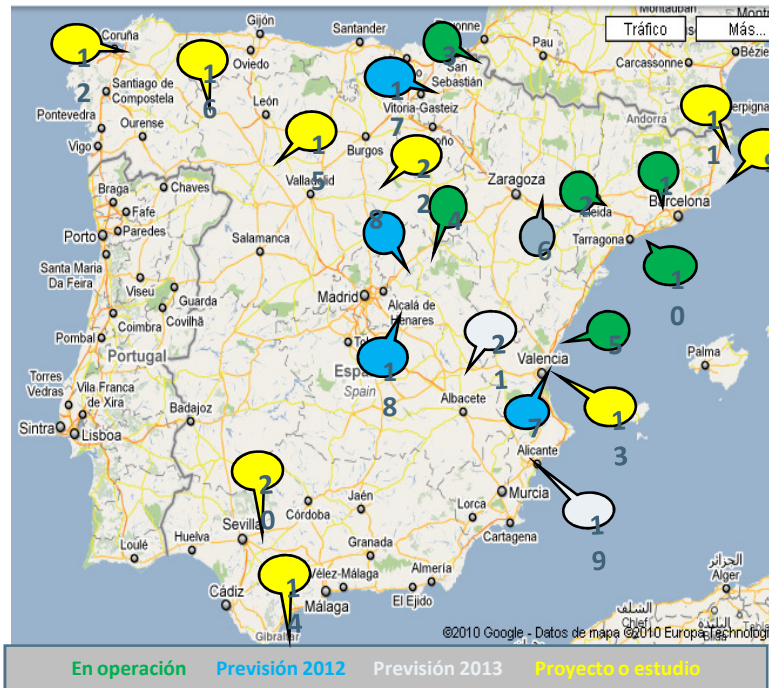
Refueling infrastructure needed by 2020
Italy ~ > 200
Estonia ~ 13
Poland ~ 20
Austria ~ 600
Germany ~ 150
Finland ~ 200
Czech-Republic ~ 30

Gas Natural Fenosa Mobility Solutions

LNG: Spanish actions



After Japan and Korea, Spain is the country with the highest consumption of LNG in the world.



- LNG development in major transportation corridors supported by an important range of vehicles and cost savings (between 25% and 40%)
- Agreements with distribution companies and large carriers: Mercadona, Leche Pascual, Inditex, Acotral, DHL, etc.
- Cooperation with manufacturers (Volvo, Mercedes, Iveco, MAN, Scania, etc) and technologist experts (Hardstaff, Clean Air Power, Westport, etc.)
- European Programmes TRANS-EUROPEAN TRANSPORT NETWORK (4 fixed stations and 3 mobile stations)



Mare Nostrum Refuelling Station

Mare Nostrum Refuelling Station



General characteristics

- A Public service station in Barcelona urban space.
- Flow Compression of **400 m³(n)/h**.
- Self service station incorporating **two natural gas dispensers**. Two different payment terminals (GNF client card or conventional credit card).
- Maximum charge capacity per dispenser: 90 charges/day (180 charges/day total).
- The station may serve a fleet of over 250 vehicles
- Investment of 550.000 €

The desing allows a great integration with the architecture of the GNFcorporate building and in fulfillment with the local Authorities requirements.

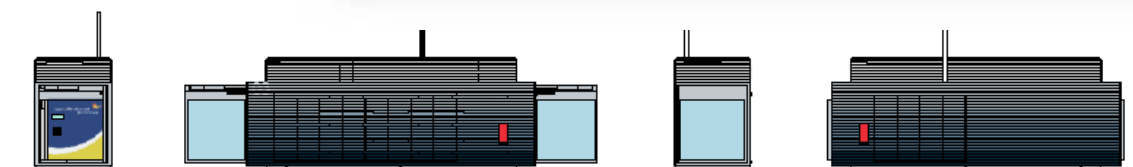
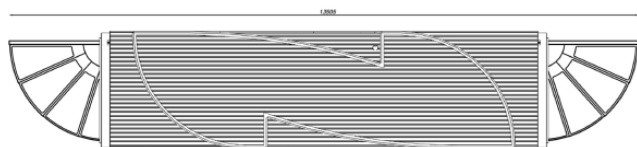
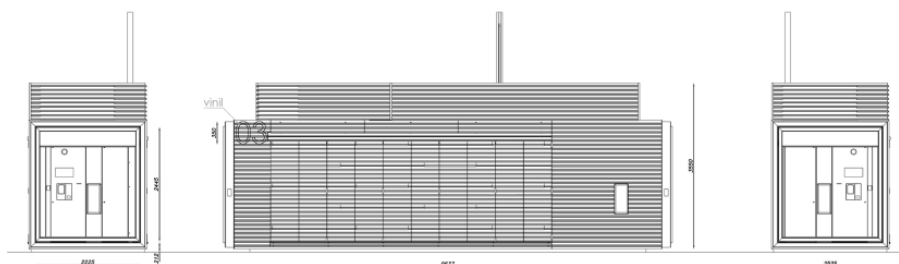
- This same skid “**Mare Nostrum**” will be executed in the following GNF stations.

Mare Nostrum Refuelling Station

General characteristics



- Mare Nostrum Service Station drawings:



Mare Nostrum Refuelling Station

Natural Gas for transport in Barcelona



- GNS has a **170** registered natural gas vehicles refueling in public stations in Barcelona and surroundings.
- Additionally, 411 public buses and cleaning service vehicles refuel in private gas stations.
- Natural gas Vehicles are being gradually incorporate in the GNF fleet.
- On 2011, **EdS de Hospitalet Botánica** and **Urbaser Bon Pastor** station started successfully the operation. Both stations are also located in Barcelona.
- The construction is already finished. The commissioning is expected in the following days.

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