THE SMALL SCALE LNG USE
EURO-MEDITERRANEAN CONFERENCE & EXPO

ConferenzaGNL®

NAPLES
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«LNG for Heavy Duty Road Transport»

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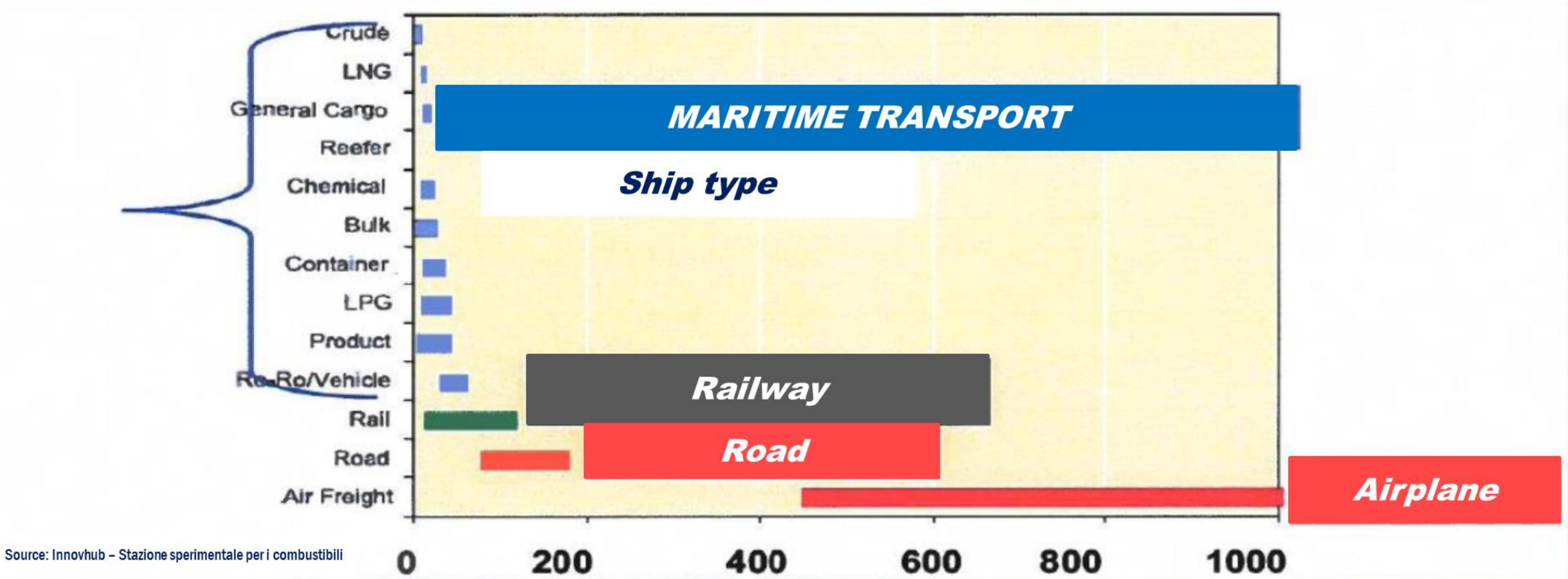
WORLD ENERGY COUNCIL ITALIA

Heavy duty road transport

- Commercial road transport plays a fundamental role for the economic system and for the mobility of goods
- In 2018 75% of goods in Italy has been moved by road transport while in 2016 80% of goods were carried by road
- Road transport is less efficient ($gCO_2/t*km$) than rail or sea transport
- Huge progresses have been made towards better environmental standards and performances for heavy duty vehicles but there is still a lot to be improved

Efficiency of different modes of transportation



Source: Innovhub – Stazione sperimentale per i combustibili

Emission factor: $gCO_2/(Ton^*/km)$
***gCO_2 emitted per tons of goods transported per km**

Different environmental targets to achieve....

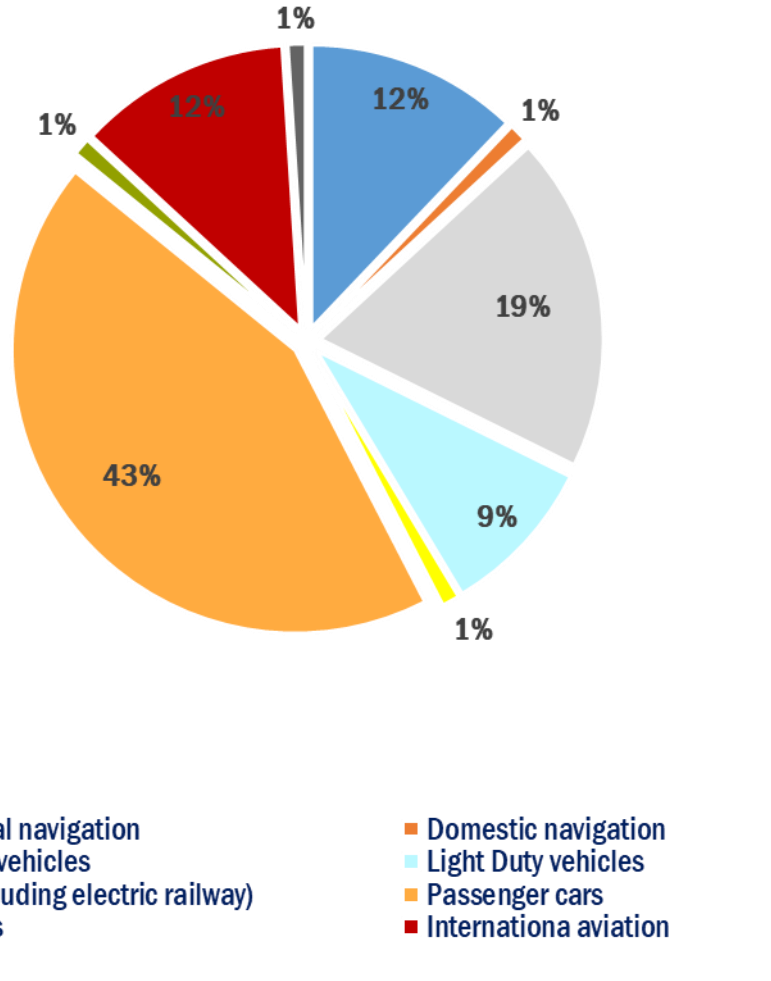
To have a sustainable transport system policies should aim to guarantee:

CO_2 reduction (Paris Agreement)	To fulfil the CO_2 emission pledges towards 2030 (33% less than 2005)	Global action with the involvement of national governments
Better air quality in the cities	To improve as quickly as possible air quality and NO_x and PM of urban areas	Actions at a city level with the involvement of local administrations

...AND DIFFERENT TOOLS AND TIMEFRAMES TO ACHIEVE THEM

EU CO_2 emissions in transport

- The European contribution to the global amount of CO_2 emissions is currently around 12%
- All transportation modes are responsible for around 25% of the EU's CO_2 emissions
- Of these, 43% derive from passenger cars and 19% from heavy duty transport
- The last generation of diesel engines has achieved a great CO_2 reduction of 33% over the last 15 years
- The new EU Regulation (Mobility Package) on CO_2 emission limits at 2025 and 2030 for heavy duty vehicles is critical for the entire road freight transport chain because it is not based on technological neutrality



Source: Transport emission rising (EEA, 2015b)

The future CO_2 emission limits for new heavy duty vehicles

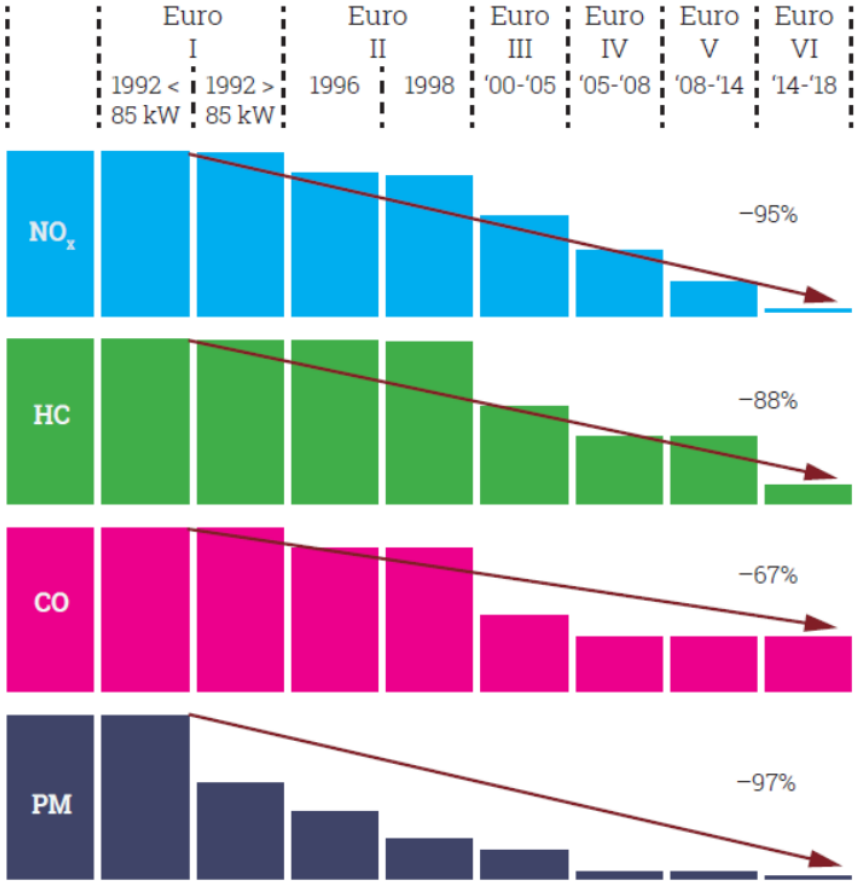
- The European Union has finalized the new regulations of CO_2 emissions from new heavy duty vehicles
- Taking the CO_2 emission monitoring data of 2019 as a reference, these limits must be reduced by 15% from 2025 and 30% from 2030
- The discussion about the targets to be reached after 2030 will start in 2022
- The new CO_2 legislation will have a great influence on the powertrain choices that the sector will adopt in the short and medium term
- In setting these new limits, we ask to recognize the effects on CO_2 emissions derived from the fuel used in a "Well to Wheel" approach (to better account for biofuels and synthetic fuels in diesel and biomethane in CNG and LNG, etc.)

The future CO_2 emission limits for new heavy duty vehicles

- The management of CO_2 emissions in heavy duty vehicles is particularly complex, as the type of vehicles included in this class of transport can be extremely different.
- These vehicles are often customized to meet specific requirements set out by clients: it is common to modify the number of axles, engine power, fuel tank capacity, cabin dimensions, chassis height and other features.
- To achieve a CO_2 reduction the possible solutions should therefore be addressed to:
    - the use of alternative fuels, including LNG, CNG, biofuels, synthetic fuels, electricity and hydrogen
    - optimizing the vehicle's engine, trailer and tire configurations
    - management changes in the use of the vehicle

Evolution of polluting emissions in diesel heavy duty vehicles

Heavy duty polluting emissions: limit values

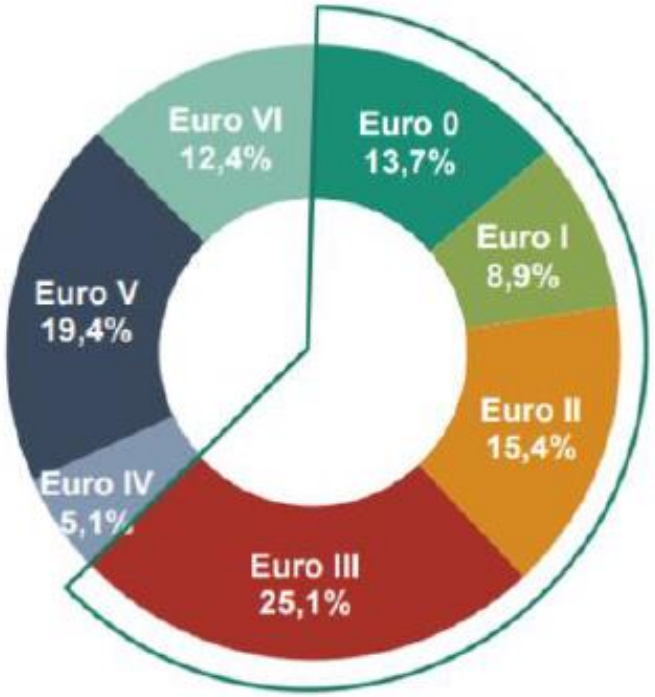


Source: Rie per Unrae (2019)

- The latest generation of heavy duty vehicles has near-zero emissions thanks to the combination of ultra-low sulfur fuels, advanced engine technologies and sophisticated emissions abatement systems
- The use of very low sulfur diesel fuel (ULSD) allows the use of particularly sophisticated emission control devices (FAP - Anti-particulate filters; EGR - Exhaust gas recirculation; SCR - Selective Catalytic Reduction)
- In the last 25 years there has been a drastic reduction in polluting emissions from heavy vehicles, with a 95% reduction for NOx and 97% for PM
- Today a Euro VI truck has 8 times lower emissions than a Euro III of the same category, thanks to anti-particulate filters

Heavy duty > 3,5 ton – fleet at 30.6.2018

Average age: 13,5 years



Ante Euro IV
63,1%

Fonte: Unrae (2019)

Heavy duty road transport by type in italy

NUMBER OF VEHICLES*	BUSES	HEAVY DUTY VEHICLES	TOTAL
DIESEL	94.410	673.655	768.065
NATURAL GAS	4.380	1.030	5.410
LNG**	-	1.440	1.440
ELECTRICITY	480	-	480
HYDROGEN	5-10	-	5-10

Source: elaborazioni UP

*Updated at 31.12.2018
** Updated at 31.3.2019

The evolution of heavy duty road transport

- The commercial road transport energy demand in Italy, today, is mainly met by diesel fuel with an annual consumption for this sector of around 10 million tons in 2018
- The new heavy duty vehicles are increasingly performing, both from an environmental and from a performance and safety point of view. European producers are world leaders in this sector
- In the coming years, great changes are expected in this sector with a transition to new fuels and new energy sources
- LNG and CNG are contributing with increasing shares to meet the heavy duty energy demand in recent years.
- Electricity and Hydrogen are only marginal and still at demonstration level
- Digitization and new kinds of freight transport management (platooning) will help optimize solutions for heavy road transport

LNG contribution towards reducing emissions

- Modern LNG-powered trucks offer further significant reductions not only for traditional pollutants but also for CO_2 without hindering too much the trucks' performance and capabilities (range and load capacity)
- CO_2 abatement becomes much more effective with the use of Bio-LNG
- LNG-powered engines emit less **PM**, less **NO_X** and **15%** less **CO_2** than comparable Euro VI diesel engines, which already meet very stringent environmental standards

Engine technology	CO2 (kg/km)	No_x (g/km)	PM (mg/km)
Diesel (Euro V)	0,914	1,477	19,9
Diesel (Euro VI)	0,855	0,295	6,6
LNG	0,641	0,148	0,3

Source: LC3 trasporti

The alternative fuels infrastructure directive (AFID) in italy

Targets for the development of small scale LNG infrastructures from the National Policy Framework		
Type of infrastructure	Target to 2025	Target to 2030
Primary storages (30k-50k mc)	4	5
Secondary storages (1,5k-10k mc)	15	30
Heavy-duty LNG trucks (% of the total fleet)		12%-15%
LNG filling stations for road transport	10% of all the filling stations that already sell natural gas	800
LNG for bunker use in ports*	12	20

*Small scale depots for the refueling of ships are supposed to be in ports that are part of the EU-designed TEN-T network: Ancona, Bari, Genova, Gioia Tauro, La Spezia, Livorno, Napoli, Palermo, Ravenna, Taranto

The AFID and the LNG refuelling network

The Italian transposition of the AFID (Legislative Decree n.257/2016) requires filling stations to install natural gas (in liquid or in compressed form) in the following cases:

- in new filling stations or existing stations that have been thoroughly renovated
- in already existing filling stations that are located in areas with high pollution levels from PM_{10} and have annual sales that exceed the following thresholds:
  - sales in 2015 > 10 mln litres (projects within 31.12.2018, end of works within 31.12.2020)
  - sales in 2017 > 5 mln litres (projects within 31.12.2020, end of works within 31.12.2022)

Exemptions, stations that are:

- too far away from a small scale LNG facility (>1000 km)
- too distant from the nearest natural gas pipeline
- fire safety rules prevent the installation of CNG or LNG

LNG in the Italian energy and climate plan (Pniec)

PNIEC

Consistent with the guidelines of the AFI Directive, the National energy and climate plan contains provisions for the development of LNG infrastructures both for transport (road and sea) and energy uses

The current approach to favour the growth of LNG powered heavy duty vehicles is to **keep on current levels the excise duties on natural gas for road transport**

UP POSITION

We value positively the measures outlined by the Plan

To guarantee a wide spread at the national level of LNG small scale depots it's essential a **coordinated and coherent planning activity for the development of LNG stockage infrastructures**

How to help the development of LNG powered veichels

- Reduced excise taxes
- Grants for the purchase of LNG powered vehicles for freight transport by private businesses
- Co-financing of the purchase by local Authorities of LNG powered vehicles for urban and suburban transport

TYPE OF BUSES ELIGIBLE FOR CO-FINANCING BY THE GOVENRMENT
(*Piano strategico nazionale della mobilità sostenibile*)

TYPE OF VEHICLE	URBAN	EXTRA-URBAN
ELECTRICITY	80%	-
METHANE (CNG-LNG)	60%	80%
DIESEL VI AND/OR HYBRID	-	50%*
HYDROGEN	80%	80%

*With a financial help to purchase diesel and/or hybrid buses (50%) for first 5 years when included in regional plans

Source: Asstra 2019

Further initiatives for the development of LNG vehicles

- Long term stability of excise duties and public funds for the financing of vehicle purchases
- Significant discounts on motorway tolls and engine taxes for LNG vehicles
- Nation-wide development of a network of small scale LNG costal storage terminals and of a resilient logistic chain
- Filling stations available in all the Regions

The fundamental role of a widespread and efficient logistic chain

STAFFETTA QUOTIDIANA
DAL 1933 - QUOTIDIANO DELLE FONTI DI ENERGIA

Gnl auto, blocco degli approvvigionamenti da Marsiglia

A secco diversi punti vendita in Italia

Fos Cavaou

Martedì lo sciopero generale indetto in Francia dal sindacato confederale Cgt ha bloccato tra l'altro il rigassificatore di Fos Cavaou, dal quale arriva via autobotte molto del Gnl destinato all'Italia, in particolare ai punti vendita stradali.

Da allora, la Fosmax, la società che gestisce il terminale, ha cancellato giorno per giorno tutti gli slot di carico, avvisando gli acquirenti la sera prima. Al momento ancora non si sa se lunedì riprenderanno i carichi.

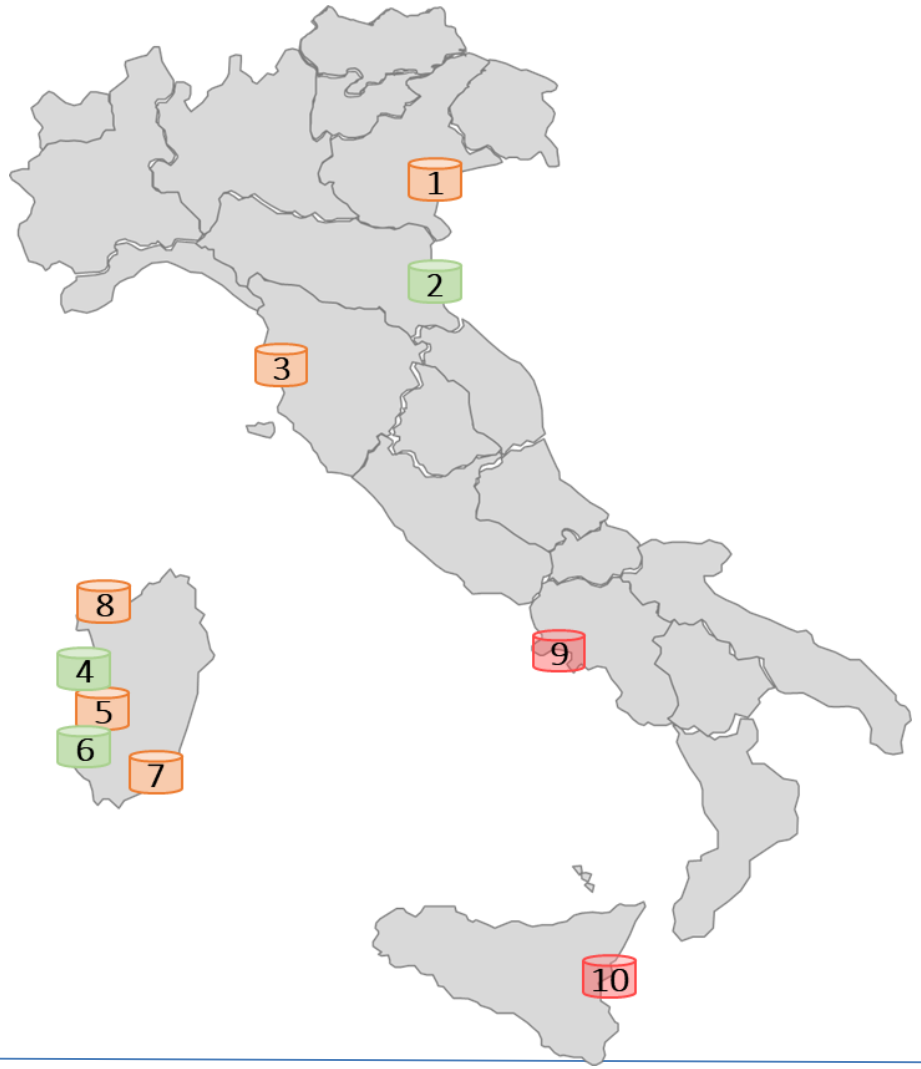
Il 4 febbraio un avviso della società agli utenti avvertiva che non ci sarebbe stata immissione in rete dal 4 fino alla mattina del 7 a causa dello sciopero.

I dati operativi del gestore francese delle infrastrutture gas Grt Gaz mostrano flussi azzerati anche per le giornate di ieri e oggi. Per oggi risulta azzerata anche la capacità tecnica effettiva.

Il blocco dei carichi su Marsiglia ha spostato le autobotti su Barcellona, al punto che anche il terminale spagnolo – che normalmente è più flessibile e opera a metà del carico massimo – sarebbe saturo.

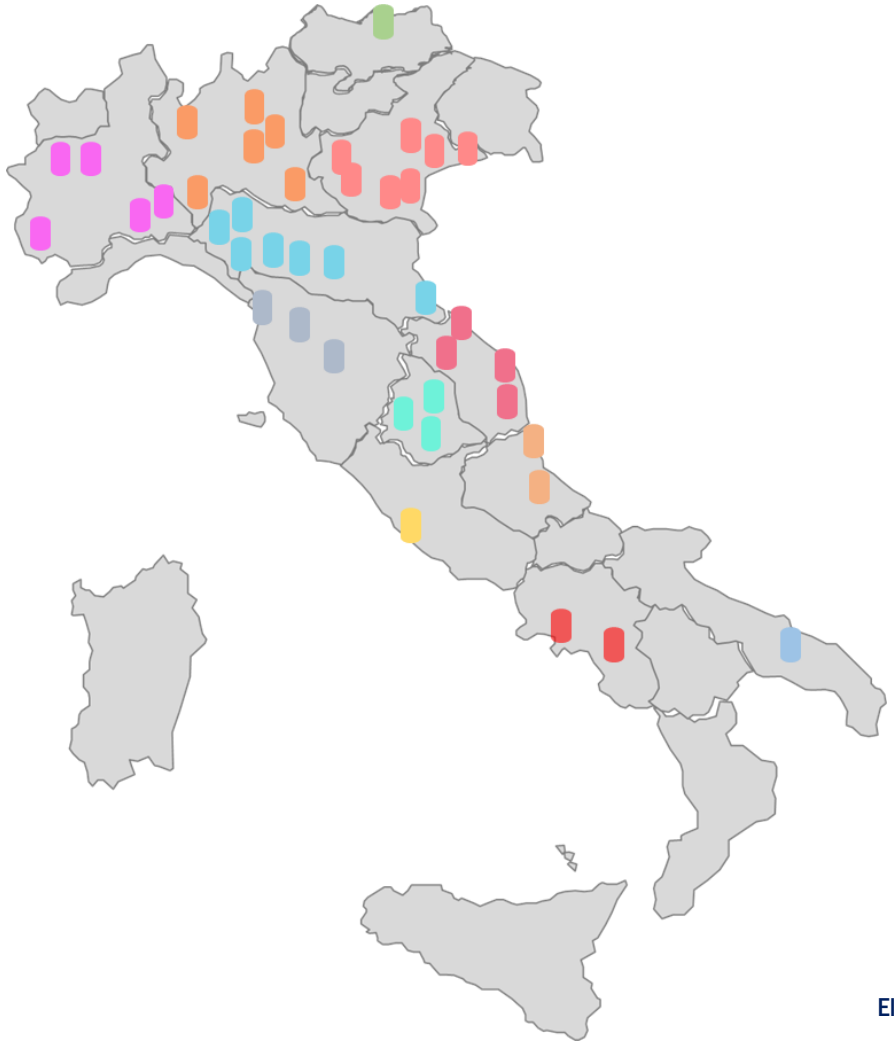
Le ripercussioni sui punti vendita di Gnl auto sono abbastanza serie. Diverse sono le segnalazioni di impianti chiusi per mancanza di prodotto.

Small-scale LNG – work in progress



Società/ubicazione	Capacità prevista (m^3)	Autocisterne	Ferro	Nuovi	Iter autorizzativo
1. Venice LNG S.p.A.* *Porto Marghera*	32.000	5	-	1	Via in corso
2. PIR S.p.A.* - Edison S.p.A. *Ravenna*	20.000	6	-	1	In costruzione (operatività attesa per 2021)
3. Livorno LNG Terminal S.p.A.* *Livorno*	9.000	2	2	1	Progetto presentato a AdSP per richiesta conformità
4. Higas Srl *Oristano*	9.000	2	-	1	In costruzione (operatività attesa per 2020)
5. IVI Petrolifera S.p.A. *Oristano*	9.000	2	-	1	Via in corso
6. Edison S.p.A. *Oristano*	9.000	4	-	1	Autorizzato, in attesa via dei lavori
7. ISGAS ENERGIT Multiutilities S.p.A. *Cagliari*	22.000	2	-	1	Via in corso
8. Consorzio industriale provinciale Sassari *Porto Torres*	10.000	1	-	1	Avvio iter autorizzativo in seguito a concessione AdSP
9. Adsp Mar Tirreno Centrale** *Napoli*	10.000-20.000	-	-	-	Prima ricezione manifestazioni di interesse
10. Adsp Sicilia Orientale *Augusta*	3.000-15.000	-	-	-	Prima ricezione manifestazioni di interesse

Small-scale LNG – work in progress



	NUMBER OF FILLING STATIONS OPENED	PROJECTS UNDER WAY
ABRUZZO	2	1
CALABRIA	-	1
CAMPANIA	2	3
EMILIA ROMAGNA	7	4
FRIULI VENEZIA GIULIA	-	1
LAZIO	1	4
LIGURIA	0	1
LOMBARDIA	6	2
MARCHE	4	3
PIEMONTE	5	5
PUGLIA	1	-
TOSCANA	3	-
TRENTINO-ALTO ADIGE	1	1
UMBRIA	3	1
VENETO	7	-
TOTAL	42	27

Elaborazione UP su dati Federmetano

Distribution of LNG retail network

Titolare	Regione	Provincia	Comune	Anno
Concessionaria ENI	Abruzzo	Teramo	Teramo	2018
Q8	Abruzzo	Teramo	Roseto degli Abruzzi	2018
Galdieri	Campania	Salerno	Baronissi	
Distributori Pepe	Campania	Napoli	San Vitaliano	2019
Concessionaria ENI	Emilia Romagna	Piacenza	Piacenza	2014
VGE Carburanti	Emilia Romagna	Bologna	Castel san Pietro Terme	2016
Vulcangas	Emilia Romagna	Rimini-Cesena	Rimini	2017
IPER Carburanti	Emilia Romagna	Parma	Noceto	2017
Gibertini Petroli	Emilia Romagna	Modena	Modena	2017
Spoil S.p.a.	Emilia Romagna	Piacenza	Sarmato	
Brixia	Emilia Romagna	Piacenza	Fiorenzuola d'Arda	2017
IP	Lazio	Roma	Riano	2018
Maganetti	Lombardia	Como	Gera Lario	2016
MZ (Pe.Tra.)	Lombardia	Bergamo	Brembate	2018
	Lombardia	Bergamo	Calcinate	
Pe.Tra.	Lombardia	Bergamo	Mozzo	2019
ICLAM	Lombardia	Brescia	Brescia	2019
Oilgest	Lombardia	Pavia	Voghera	2019
Metano Senigallia	Marche	Macerata	Corridonia	2016
Metano Toscana	Marche	Pesaro Urbino	Sant'Angelo in Vado	
Snam4Mobility/Alema	Marche	Pesaro Urbino	Pesaro	2018
Diotallevi Delfo	Marche	Pesaro Urbino	Marotta	2018

Titolare	Regione	Provincia	Comune	Anno
F.lli Ratti	Piemonte	Alessandria	Tortona	
F.lli Ratti	Piemonte	Alessandria	Novi Ligure	2015
Concessionaria ENI	Piemonte	Cuneo	Villa Farletto	2017
Rete S.p.a.	Piemonte	Torino	Beinasco	2018
Rete S.p.a.	Piemonte	Torino	San Maurizio Canavese	2019
Bianco Petroli	Puglia	Brindisi	Mesagne	2017
Concessionaria ENI	Toscana	Pisa	Pontedera	2016
Goldengas	Toscana	Firenze	San Casciano	
Rete spa	Toscana	Lucca	Porcari	2019
Aps Fuel	Trentino	Bolzano	Campo di Trens	2018
Automigliorgas	Umbria	Perugia	Balanzano	2018
C.m.F.	Umbria	Perugia	Foligno	2019
Scat	Umbria	Perugia	Magione	2018
Liquimet	Veneto	Padova	Padova	2017
AF Petroli	Veneto	Padova	Saonara	2017
B-Petrol	Veneto	Verona	Villafranca di Verona	2017
B-Petrol	Veneto	Verona	San Bonifacio	2019
San Marco Petroli	Veneto	Venezia	Meolo	
Vega Carburanti	Veneto	Venezia	Mestre	2018
Noaloil	Veneto	Venezia	San Donà di Piave	2019

Conclusions

- The development of LNG for freight transport will be impressive as it is a mature technology
- The traditional pollutants (NO_x and Particulate) are severely reduced in LNG vehicles
- The progressive extension of the logistic asset and distribution network will solve every problem o availability of supply
- The number that is being found in terms of sales of vehicles powered by this source clearly demonstrate the success of this solution

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