

DELIVERABLE D.T3.3.2 LNG USE IN FREIGHT TRANSPORT IN EMILIA ROMAGNA REGION PILOT (INCLUDES D.T3.2.6 AND.T3.3.1)

Final assessment of greening transport
measures for LNG use in freight transport in
Emilia Romagna Region Pilot

Version 2
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1. Introduction

The LNG use in freight transport in Emilia Romagna Region Pilot is one of 7 pilot actions of the InterGreen-Nodes project. To demonstrate the infrastructure and technological possibilities for the application of clean fuels at the local level, meaning the last mile, and at the terminal, measures to make transport greener have been assessed and validated through stakeholder inputs.

This concluding report is the final assessment report for the pilot activity (D.T3.2.6 + D.T3.3.2) and includes the evaluation of technical performance and environmental impact measurements, as well as lessons already learned from the mid-term evaluation D.T3.3.1).

The Emilia-Romagna region conducted a series of trials with the port of Bologna using liquefied natural gas (LNG) instead of conventional fuels to support a large-scale (both geographically and institutionally) introduction of LNG.

2. The Basics of LNG use in freight transport in Emilia Romagna

The main goal of this demonstration was the realization of a new LNG station for trucks positioned within the major freight village of the Emilia Romagna region. The output of the demonstrator will be used as reference in the region to be applied in other similar location, in order to create a network of LNG plants serving the road freight transport.

The main target for this investment project are:

- freight transport companies with LNG trucks and medium/small vehicles for city logistics;
- transport companies dealing with people mobility (bus/pullman);
- cars of the people working in Interporto Bologna.

Natural gas has assumed increasing importance in the world energy scene, especially for freight transportation, with prospects for further growth in the coming decades. Compared to other fossil fuels it has a lower environmental impact (both in terms of CO₂ emissions and other pollutants), considerable flexibility of use, and extreme versatility of use.

Interporto Bologna SpA, the managing company of the Bologna Freight Village, in 2020 concluded a new cooperation agreement with the ENI group, the biggest Italian oil and gas company, for the enlargement of the existing fuel station with the implementation of a brand new LGN plant, the new frontier of ecological fuel. This investment finds its roots within the plans that Interporto Bologna designed to undertake a “Green Transformation” of the logistics platform. The strategy designed for this transformation include the following initiatives and investments:

- build new rail and intermodal facilities and modernize the existing ones to boost the intermodal transport and the rail transport of goods and promote the modal shift;
- enhance the digitalization of the intermodal terminal operations to bring more efficiency in the railway transport;
- implement the offer of more sustainable energy sources both for freight transport and logistics buildings such as: LNG station, electric charges points, photovoltaic systems...



- improve the environmental performances of the logistics warehouses through the LEED and BREEAM certification for all the new buildings;
- implement new business collaborations within the hub for the energy management.

The first achievement of this strategy is represented by the new LNG station opened at the beginning of 2022 which widened the offer for the truck companies operating both within the node and in the surrounding area, favouring and encouraging the road transport companies to shift from diesel trucks to LNG trucks.

Furthermore, the Company started in 2021 a project which foresees the upgrading of the intermodal terminal infrastructure, in compliance with the European standards for the TEN-T core network: 750 m rail tracks, high-capacity automatic cranes, new terminal yard and safe parking areas for semitrailers and truck drivers

3. Step by Step description of the implementation

The implementation of a LNG station within the freight village required several steps:

- preliminary market analysis to evaluate the potential demand and the best positioning for the plant;
- preliminary request to the Local Authorities for the environmental authorizations;
- definition of the strategic partnerships necessary for the project delivery, including the definition of the contractual agreements between the stakeholders involved;
- technical design and engineering of the LNG station project;
- request for authorization and building permits;
- civil works execution and installation of LNG station;
- preparation and testing phase of the plant;
- start of the LNG station operations.

The first version of the project foresaw to locate the LNG plant outside the freight village, in the main road that cross the north-east part of the Metropolitan area of Bologna and absorb a significant amount of heavy traffic, being also the main access to the freight village and the link between Interporto and the highway.

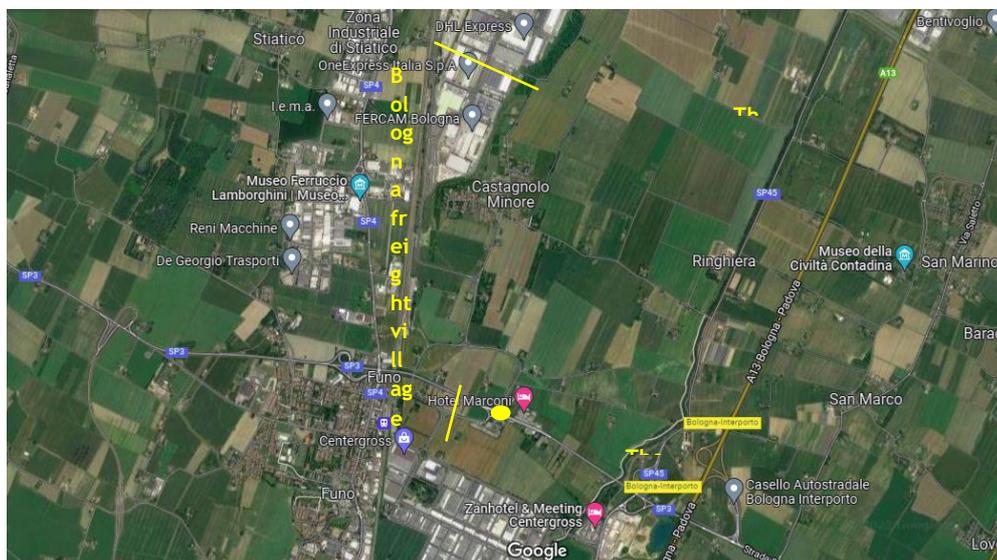
After preliminary discussions with the local authorities and a deeper analysis of the market, the project location changed in favour of Interporto Bologna, thus bringing the LNG plant inside the freight village.

The new project brought some improvements compared to the original one:

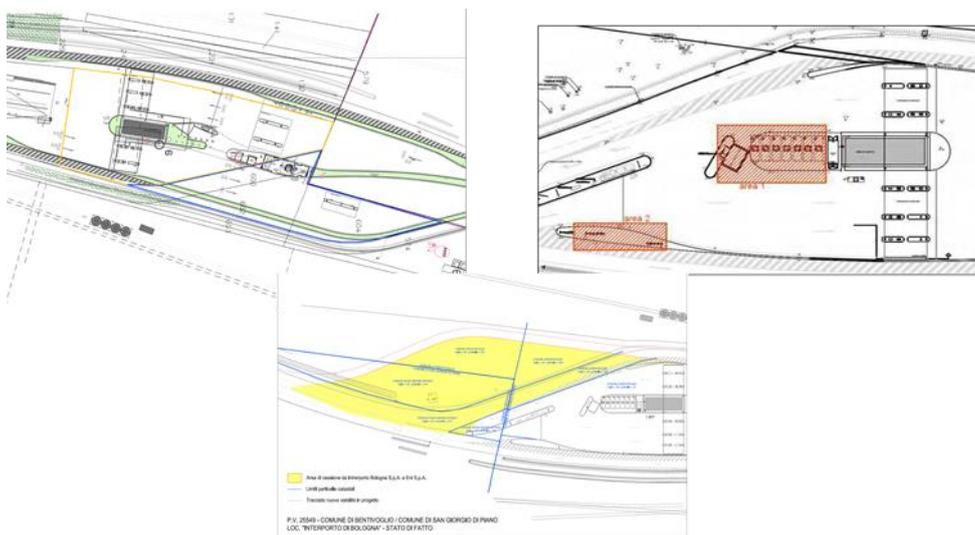
- integration of the offer to the clients (traditional fuels/LNG) in one single spot;
- integrated management of the two plants (traditional fuels/LNG);
- lower environmental impact (land consumption);
- better positioning and accessibility of the plant in relation to the main market (truck companies located within Interporto).



Here below the geographical representation of the project positioning and location:



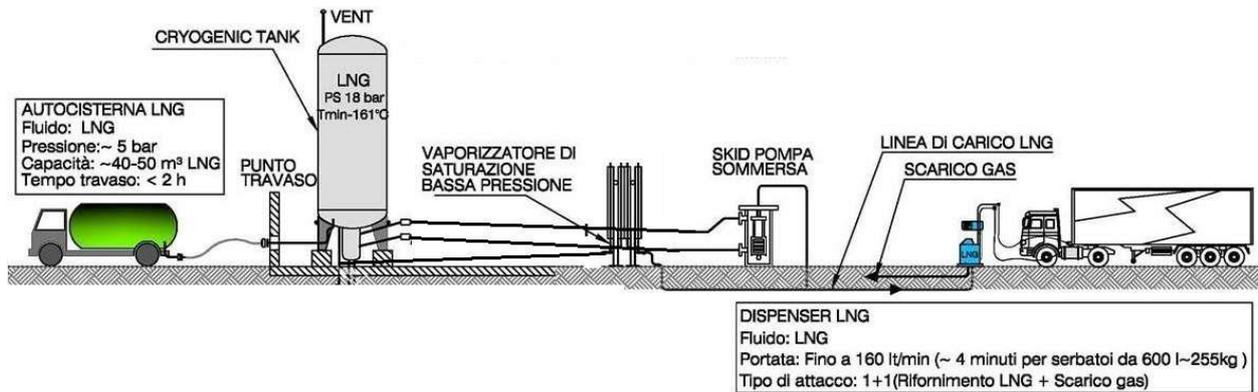
In 2020, Interporto Bologna and ENI signed an agreement focused on the development of a new LNG station within the freight village and close to the traditional fuels station. Following this agreement, in January 2021, Interporto Bologna started the civil works to adapt and modify the internal road network of the freight village to accommodate the LNG station. The main challenge of the project design was the harmonization of the existing road system and the existing fuel distribution plant layout with the new LNG plant to be constructed without interfering with the daily traffic of the trucks.



After the completion of the road network modification, in March 2021, the land adaptation works to host the new plant started and lasted until July 2021. In September 2021, it started the installation of the plant infrastructure formed by external cryogenic tank, pipelines, compressor, cooler and pumps as drafted in the following schema:



Plant diagram for liquid natural gas refuelling



Source: Bernardini (BRN), 2018.

The construction and installation works lasted until the end of November 2021 and the new LNG station finally opened in January 2022, widening the offer to the truck companies operating within the node and in the surrounding area, favoring and encouraging the road transport companies to shift from diesel trucks to LNG trucks.





4. Cost and emission effect

THE INVESTMENT

The LNG project in Interporto Bologna required an investment of nearly 2 million Euro and 1,5 years for completion: ENI was in charge for the LNG plant, while Interporto Bologna has the ownership of the land and took care of the road network system modification.

The LNG plant of Interporto Bologna is the biggest installed by ENI in Italy, it is a new generation plant, integrated into an already existing service station. During its construction, the existing traditional station was revamped, and both are now integrated and both can be controlled and managed remotely.

The investment was driven by the necessity for the freight village but more for the road transport sector to become more green: the use of natural gas in the transport sector is considered, both at the industrial and institutional level, as an inevitable response to the increasing needs for decarbonization of the economy. Despite the progresses of the technological innovation in the progressive development of renewables, CO₂ emissions are in fact expected to increase, albeit at a lower rate than in the past, thus there is the need for more investments in assets and technologies which can favour the decreasing of emissions.

EMISSIONS EFFECTS:

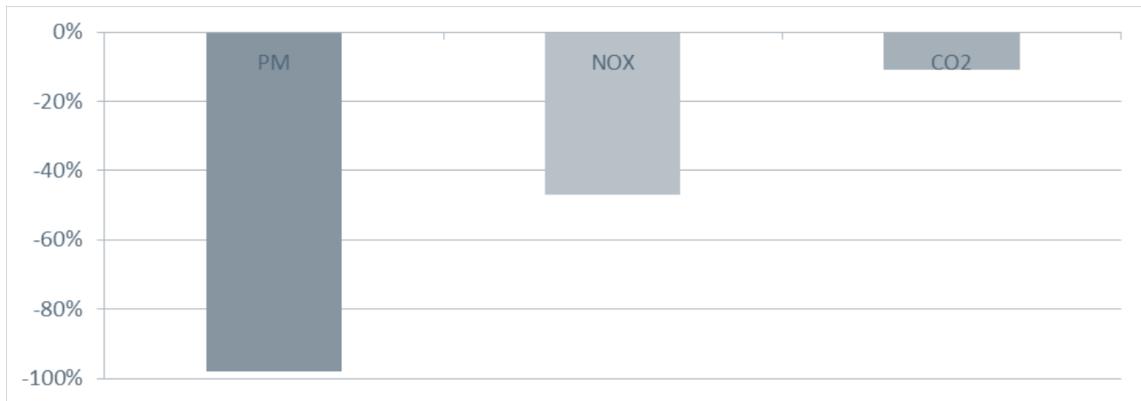
Regarding the heavy road transport sector, the large number of studies carried out on the specific subject, show how the use of LNG, as a replacement for traditional fuels, enables:

- the reduction of SO_x emissions to zero,
- the drastic reduction of NO_x emissions of nearly 50%
- the significant reduction of CO₂ emissions and extremely low particulate emissions, with a reduction close to 90%.

Several surveys related to LNG gas emissions comparing the emissions of industrial vehicles set up with the latest generation of diesel engines, show less pollution from vehicles using liquid gas. The percentage reductions of the various pollution components vary from survey to survey. A reduction of up to 50% in NO_x, almost total (up to 95%) elimination of PM₁₀ and a reduction of up to 15% in CO₂ can be achieved. (Source: Freight Leader Council “Quaderno 28 - Il GNL in Italia per un Trasporto sostenibile”)



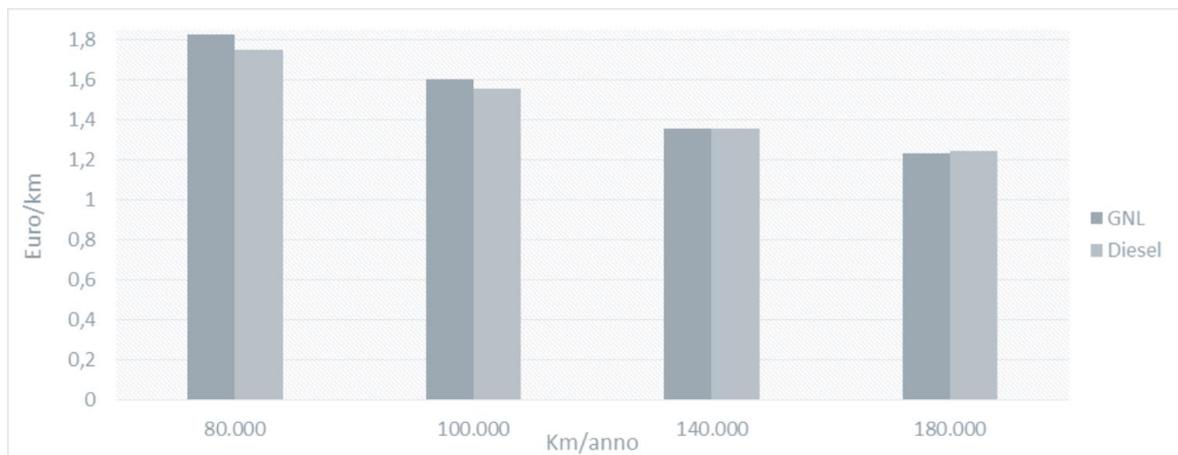
Difference in emissions, all things being equal, between a 40 t industrial vehicle powered by LNG and a diesel one



Source: Tuttotrasporti, 2018.

Having explained the environmental advantages of LNG in transportation, the main challenge is the assurance also of the economic benefits. From the fuel cost point of view, a dry comparison between LNG and diesel would have seen LNG-powered industrial vehicle win easily over a similar diesel model until the 1st semester 2021.

On the contrary, it has to be considered that the purchase price of a natural gas road tractor is still significantly higher than a similar diesel model. This resulted in LNG becoming more cost-effective once the annual mileage exceeds 140,000 km.



Source: Tuttotrasporti, 2018.

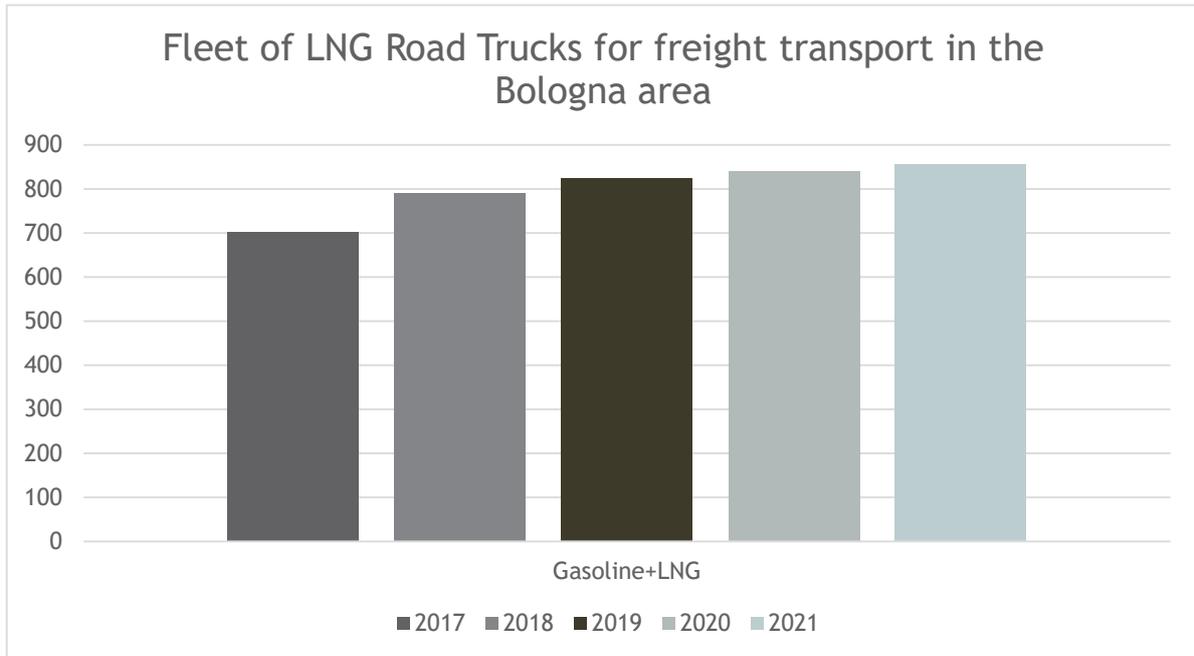
Nowadays, in 2022, both the costs of gas and diesel ramped up to incredibly high prices, due to the ongoing energy crisis worsen by the war in Ukraine, making the gas even more costly than the diesel.

This current situation led to an inversion of the growing trend of LNG vehicle for road transportation which has slowed down together with the transport sector greening transition.

In the table below it is reported the composition of road trucks for freight transport in the last 5 years and a graph representing the trend of LNG fleet in the metropolitan area of Bologna:



Year	Gasoline	Gasoline+LNG	Gasoline+Methane	Electric	Diesel	Methane	Other	Total
2017	1016	702	1449	38	14550	0	15	17770
2018	974	791	1456	37	15019	0	19	18296
2019	947	824	1437	34	14957	0	22	18221
2020	920	841	1222	42	14854	205	33	18117
2021	901	856	1173	53	15114	206	82	18385



Source: Automobile Club d'Italia

5. Lesson Learned and Experiences

What did go well, what did not work? Were your expectations met? What could others learn from your experience?

The plant started the operations in January 2022, but unfortunately the energy crisis that hit Europe in early 2022, further worsened by the war in Ukraine, heavily increased the price of LNG. As the LNG is now more expensive than diesel (€2.8/liter vs. €2/liter approx.), companies have decided to temporarily suspend their LNG vehicles in favor of the diesel ones.

Thus, despite the positive feedback collected by the customers and the expectations towards this plant, the market response was very low due to the energy crisis. This fact created and is creating a significant impact both on the economic projections but also on the operations of the plant.

Compared to the budget planned at the beginning of the project, that foresaw to reach 2,5 million Kg/year of LNG after the start up phase, the current situation imposed a revision of the goals set.

	Budget (kg)	Budget revised (kg)
Year 1	800.000,00	250.000,00
Year 2	1.500.000,00	800.000,00
Year 3	2.500.000,00	1.500.000,00



Indeed, the LNG is filled in the external silo/tank and stored at the temperature of -162°C . It must be sold/used within 15 days, otherwise, it must be discarded with huge economical loss. For this reason, the managing company decided to keep the plant closed in the second bimester (from march to mid May 2022) of the year, waiting for better market conditions. The plant has been re-opened again in May 2022 and Interporto Bologna is planning, together with ENI, to organize a promotional event (probably by the end of July 2022) to celebrate the plant opening and disseminate some key information on the activities performed thanks to InterGreen-Nodes project.