

The European Green Deal aims to reduce 55% of the EU's greenhouse gas (GHG) emissions by 2030, and will turn Europe into the first climate-neutral continent.

A swift decarbonisation of the EU economy is needed in order to reach that goal: this will require a deep transformation of the energy system

to accommodate increasing shares of renewable and low carbon energy sources, such as biomethane or hydrogen.

This process will encompass all sectors of the economy, including transport; which is responsible for nearly one-quarter of Europe's GHG emissions. The sector continues to grow at high-speed, with more than

78 bio-LNG plants confirmed to be ready by 2024.

The role of bio-LNG

Bio-LNG is a solution that is available today, and will continue to play an important role by cutting carbon dioxide emissions for heavy-duty trucks and shipping during the coming decades, and post-2050.

TEAMWORK MAKES THE

COVER STORY

But, to achieve this goal, a dynamic team involving partners of excellence is required. Gas and Heat and Trelleborg have realised this and are starting their co-operation to achieve this goal.

Both are convinced of the crucial role LNG will and is playing in achieving this goal – both better and faster.

To operate a 40 t truck for over 1000 km, an electric truck would require a 6.4 t battery with today's best technology, while the same distance can be covered with approximately 280 kg (620 l) of (bio)-LNG.

The synergy between the two companies is aimed at maximising market opportunities for

Gas and Heat SpA, Italy, highlights the importance of working together to make the European Green Deal a reality.



GREEN DREAM WORK

LNG4Speed: a solution developed by Gas and Heat for small scale LNG applications – a sector where Trelleborg has been playing a leading role for more than a decade through the technology provided by Klaw LNG, leading company part of Trelleborg Group.

This offers a complementary business partnership that realises the potential of a holistic technical approach – together with tangible commercial enhancements.

The LNG4Speed technologies applied to cryogenic loading systems by Gas and Heat will benefit from Trelleborg's experience in hose transfer systems and its existing worldwide customer servicing network.

This partnership is designed to widen the prospect base for LNG4Speed by offering integrated LNG loading to an emerging variety of small scale and bunkering applications, including:

- Ship-to-truck (STT).

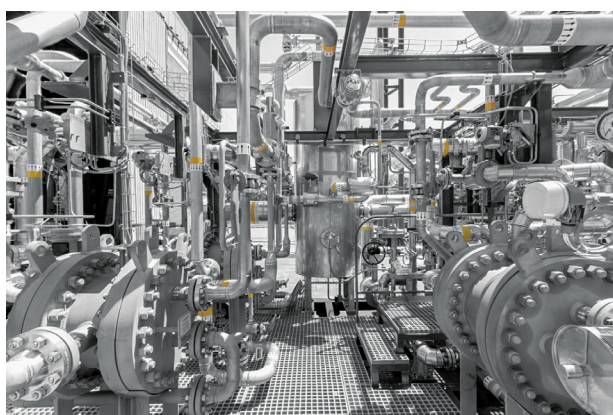


Figure 1. LNG4Speed ship-to-truck (STT).

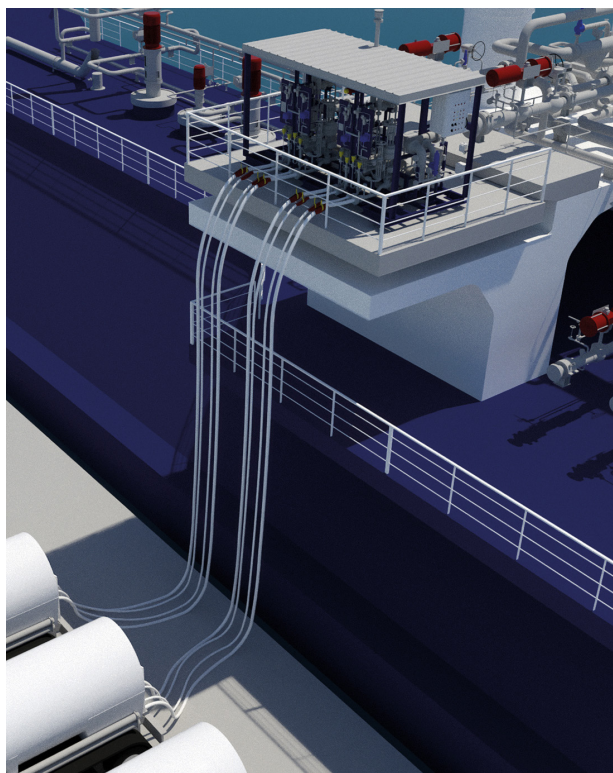


Figure 2. LNG transfer from STT/Iso-container (LNG4Speed STT onboard).

- Truck-to-ship.
- Reloading from FSRUs or FLNG-to-shore and temporary LNG loading bays.

A fast-track solution

LNG4Speed STT is a solution that was designed, manufactured, and tested at Gas and Heat SpA's premises in Pisa, Italy. It is designed to supply LNG directly from ships to trucks/ISO containers with no need for LNG storage facilities. This solution is fitted into a portable skid (with a footprint of a 15 – 20 ft container, depending on its position) for its flexible transportation by marine or road and for easy installation. It is intended as a plug-and-play solution, to be used with any ship and in any port.

Where is it positioned?

LNG4Speed STT is available in two different versions: one to be installed and used onboard an LNG tanker, and the other to be deployed and operated directly on the jetty between the ship and the trucks.

A suitable solution depends on how the operation is planned, the space available, and the respective permissions and approvals given from the local authorities. The onboard solution requires marine approved certification according to class society rules. Alternatively, the onshore positioned version is provided with CE approval.

How does it work?

Once the LNG4Speed STT is connected to both the ship and trucks/ISO containers, it is ready for operation. It will communicate with both ship and trucks and will safely manage the operation. In less than one hour, breakbulk LNG will be available for delivery by truck to end users, wherever they are located.

LNG4Speed STT typically suitable for the following applications:

- Line inerting and leak test.
- Line cool down.
- LNG transfer.
- Line drainage and warming up.
- Line purging.

Safety

Safety is the core consideration of this solution. It works as an interface between the supplier (LNG tanker) and the receiver (trucks/ISO container). The automation system is designed to receive and send signals from/to the truck/ISO container and the LNG tanker to manage the main variables that drive the LNG transfer operation i.e., flowrate, pressure, and temperature. As an additional layer of safety, the operators can also read the data in real time and can stop and restart the operation manually if necessary.

The system is equipped with valves that can automatically de-energise through their actuators according to the failure mode. These can also be opened or closed manually by the operator.

Another safety function is the emergency shutdown system (ESD) that has been designed to automatically turn down the LNG transfer operation once activated. This can be activated through ESD push buttons in three different locations i.e. on the ship, the truck (through a jetty panel), and the LNG4Speed itself. Therefore, after the appropriate training and following the manual and procedures, safe and successful operations are guaranteed.

Ship and truck connections

The LNG4Speed STT is mechanically connected through cryogenic hoses and quick dry couplings, including dry



Figure 3. A closer look at the LNG4Speed STT.



Figure 4. LNG transfer system trucks/Iso-container.

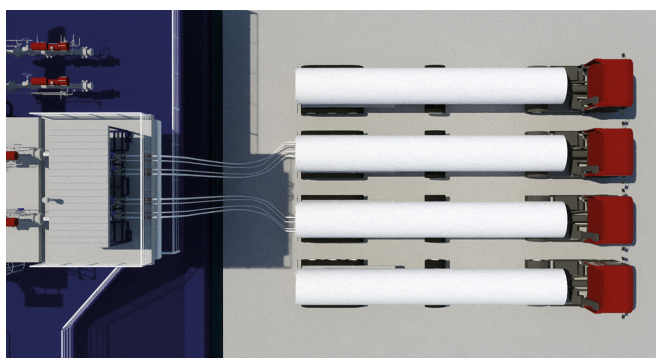


Figure 5. The LNG4Speed STT is designed to load up to four trucks/ISO containers in parallel.

breakaway couplings. This maximises safety and minimises risk of leakage scenarios.

The utilities needed for its operation are minimal. Power is required for the LNG4Speed STT control panel and this can be supplied either with a power cable from the ship or the jetty. The actuation system is pneumatic and is supplied either by sourcing nitrogen from the ship, from nitrogen cylinders or from a nitrogen generator system on the jetty.

Boil-off gas management

The LNG transfer operation is performed without any gas emissions due to its closed-loop and carefully designed boil-off gas (BOG) management system.

Gas and Heat SpA's experience in offshore and onshore systems has made such an interface possible and by providing the necessary tools, manuals, and basic training to the ship's crew and port operators, safe operations can be repeated time after time.

LNG transfer capacity

The LNG4Speed STT is designed to load up to four trucks/ISO containers in parallel – the flowrate is according to their volume capacity which is normally from 45 – 50 m³. Thus, 60 m³/h is considered a normal loading rate per truck. Nonetheless, the estimated loading time may vary from 60 – 90 mins. depending on the conditions at the truck's arrival.

Considering a working day of eight hours, this means it is possible to achieve at the very minimum 20 truck loadings per day. Nonetheless, the product is fully available for modification and can be tailor-made according to each client's needs.

Throughput

Considering a continuous operation for one labour year, meaning approximately 240 days per year, the result is a total number of 4800 trucks/ISO containers of LNG loaded and made ready to be distributed to its end users. In terms of energy, the equivalent capacity for a day is approximately 5.3 GWh. Considering the full operation for the labour year, capacity is 1.3 TWh (as a minimum).

A rising market with green perspectives

It is not surprising that LNG-fuelled trucks are fast developing in European markets. In 2020, over 15 000 LNG vehicles were driving on European roads, and fleet development is happening at a fast pace, as confirmed with annual sales reaching 5000 new registrations in 2020 (France, Germany, Italy, and Poland drive the market). The European LNG truck market is becoming increasingly dynamic, with continuously rising sales and an ever-expanding range of models. By 2030, NGVA Europe expects that 280 000 LNG trucks will be on the roads, representing at least 25% of the EU market share for trucks.¹ LNG

References

1. 'Fuelling clean mobility with bio-LNG: Market developments and policy implications of using bio-LNG in transport', NGVA Europe, (February 2022), www.ngva.eu/wp-content/uploads/2022/05/Fuelling-clean-mobility-with-bio-LNG_EBA-GIE-NGVAEurope-SEA-LNG.pdf