



Greener shipping with LNG in your tank



Liquefied natural gas fulfils the new stricter environmental requirements for the shipping industry

New, stricter emissions regulations for shipping means that bunker oil must be replaced with cleaner fuels. Liquefied natural gas (LNG) is a very beneficial alternative, both financially and environmentally.

Since January 2015, new international emissions regulations apply to sulphur in sensitive marine environments, such as the North Sea, Baltic Sea and the English Channel. In the long term, tougher regulations on marine emissions are anticipated on everything from nitrogen oxides and particles to carbon dioxide and other greenhouse gases.

- LNG reduces the greenhouse gas emissions by 15 percent and nitrogen oxide emissions by about 90 percent.
- LNG has virtually no sulphur emissions and particle emissions are small, which also creates a cleaner working environment.

LNG (*liquefied natural gas*) is a natural gas that is cooled to a liquid state to achieve greater energy density. Today, this fuel is an important part of society's adaptation to environmental and climate change, as many industries have already switched from oil to LNG in order to meet stricter environmental requirements.

The emissions from heavy goods vehicles will also decline as more and more trucks are powered by LNG instead of diesel. The shipping industry switching to a cleaner fuel is an important part of a society-wide trend to reduce emissions.

LNG, and ultimately liquefied biogas (LBG), is a valuable contribution to reducing dependence on coal and oil.

Financial support from the EU

The new environmental requirements have a major impact on European shipping, which must now find alternative fuels or purification techniques. The EU has invested a considerable amount of money in technology development and infrastructure for liquefied natural gas as a shipping fuel, and will also support the development and construction of the LNG market. Several new LNG ships have been built with financial support from the EU. Older ships can also be converted to LNG.

A growing market

- LNG is a competitive fuel and the technology is as safe and reliable as oil and diesel.
- By 2025, LNG is expected to account for 14 percent of bunkering volume in Europe, according to estimates from the international consultancy firm Roland Berger.



Liquefied Natural Gas (LNG) requires no further purification to meet the environmental requirements.

PHOTO: GÖTEBORGS HAMN

We have brought customers, ports and authorities on board for this venture.



It shows that they are serious about their environmental goals. We are also grateful for the financial support from the European Union.

Trygve Möller from the shipping company Terntank, which is having four new LNG powered ships built.

Fewer emissions with LNG

The new emissions regulations apply in the Baltic Sea, the North Sea and the English Channel. Emissions from natural gas-powered vessels are very small compared to oil-powered vessels.



More and more shipping companies are choosing to invest in LNG powered ships

Passenger ferries, small car ferries, ferries operating in the archipelago and coastguard patrol boats are all examples of vessels that can be powered by LNG. These ships return regularly to the same port and can easily be bunkered with Liquefied natural gas (LNG).

The cruise liner Viking Grace, which operates between Stockholm and Turku, is the world's largest LNG powered passenger ferry. She is also the first LNG powered passenger ship on the Baltic Sea.

In addition to tankers, there are currently about 100 LNG powered ships around the globe, but by 2020 it is estimated that the number will have at least doubled. Norway invested early in LNG ships and was helped by the so-called Norwegian NOx fund, which was initiated by the Norwegian government.

New LNG ships on the way

Among Swedish shipping companies, Terntank has ordered four LNG ships, using EU funding. One of the vessels will be leased by the oil company Preem, which will enable the company to transport refinery products in a more sustainable way. The Swedish shipping company Sirius has also ordered an LNG ship that will be operated by Skangas.

In 2017, passengers travelling to and from Gotland will be able to sail with Destination Gotland's new LNG ferry, which will operate on the Nynäshamn – Visby route. Other shipping companies that have chosen to invest in LNG vessels include United Car Carriers, Container Ships and Thun.

Well-developed technology and cheaper fuel

The LNG technology for ships is both beneficial and well-developed:

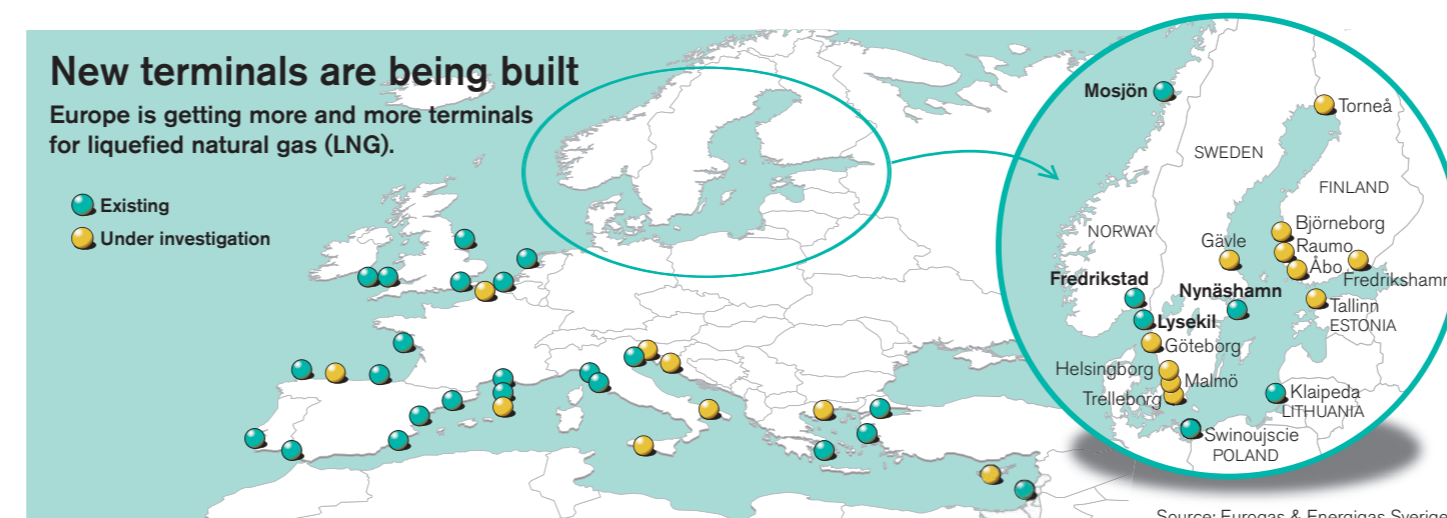
- The engine is highly efficient, has low emissions and is powered by one or two types of fuel (dual fuel). A number of engine manufacturers, such as MAN, Wärtsilä, Rolls-Royce and Caterpillar, currently offer new and converted LNG engines.
- The cargo space may decrease somewhat (no more than 4 percent) depending on the placement of the tanks.
- Historically, the price of LNG has often been lower than the price of oil.

There are strict regulations regarding how LNG should be handled and how the fuel tanks and storage tanks should be designed. The properties of natural gas and the stringent safety requirements make LNG ships as safe as ships that run on oil.



A number of Swedish and foreign shipping companies have ordered ships powered by liquefied natural gas. Viking Grace is the world's largest LNG powered passenger ferry.

PHOTO: PETER HOELSTAD



“ We are incredibly pleased. We have not had a single delay or cancelled departure resulting from refuelling problems or because we use LNG. Now we are saving money and protecting the environment at the same time.



Kari Granberg, Viking Line

Europe will have a filling station for liquefied natural gas in every port

The market for liquefied natural gas (LNG) is about to undergo a dramatic expansion. Today, there are about 30 LNG terminals in Europe and more are planned. This will increase the fuel supply and facilitate bunkering. The demand for LNG is expected to double by 2020.

Liquefied natural gas is one of the alternative fuels in which the European Union has chosen to invest, in order to end our dependency on oil. To meet the growing demand, new options for refuelling are needed, so called bunkering, throughout Europe. The EU's goal is that there will be LNG satellite terminals in all 139 ports included in the EU's core network for transport before 2025.

Cooled to a liquid state

LNG (*liquefied natural gas*) is liquid methane. When the natural gas is cooled to about -160°C , it condenses into a liquid. The volume is decreased 600 times, enabling more energy to be stored in the tank. This makes LNG highly suitable for powering fuel-intensive ships.

Access to LNG is also a prerequisite for building a market and infrastructure for renewable biogas.

LBG (*liquefied biogas*), like LNG, is liquid methane and can therefore complement and, in the long term, replace LNG.

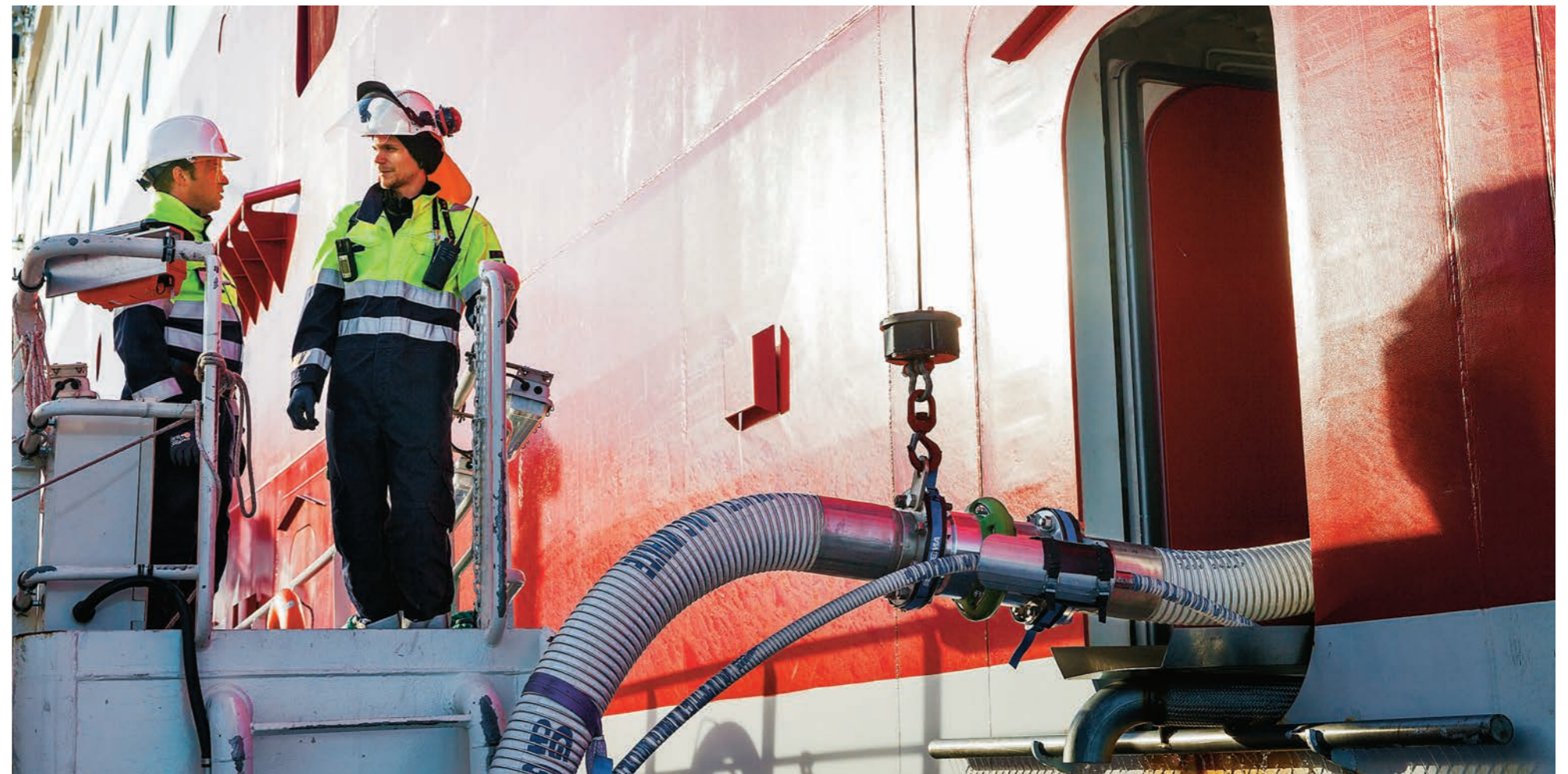
Different bunkering methods

An LNG ship can be bunkered by:

- ship
- tanker truck
- onshore facilities

In Sweden, there are currently two LNG terminals, in Nynäshamn and in Lysekil. More are planned, including in Gothenburg, Gävle and Helsingborg. In Poland, Lithuania and Finland, new LNG terminals are ready, and Estonia also have well-developed building plans.

The unique bunkering of the Baltic Sea's first LNG powered cruise ship, Viking Grace, is performed using the gas supplier Aga's bunkering vessel Seagas. The liquefied natural gas comes from the LNG terminal in Nynäshamn, which in turn imports gas from Norway, as well as other sources, by tanker.



When natural gas is cooled, it converts to a liquid and the volume decreases 600 times. The bunkering of Viking Grace is carried out with the help of a bunkering vessel.

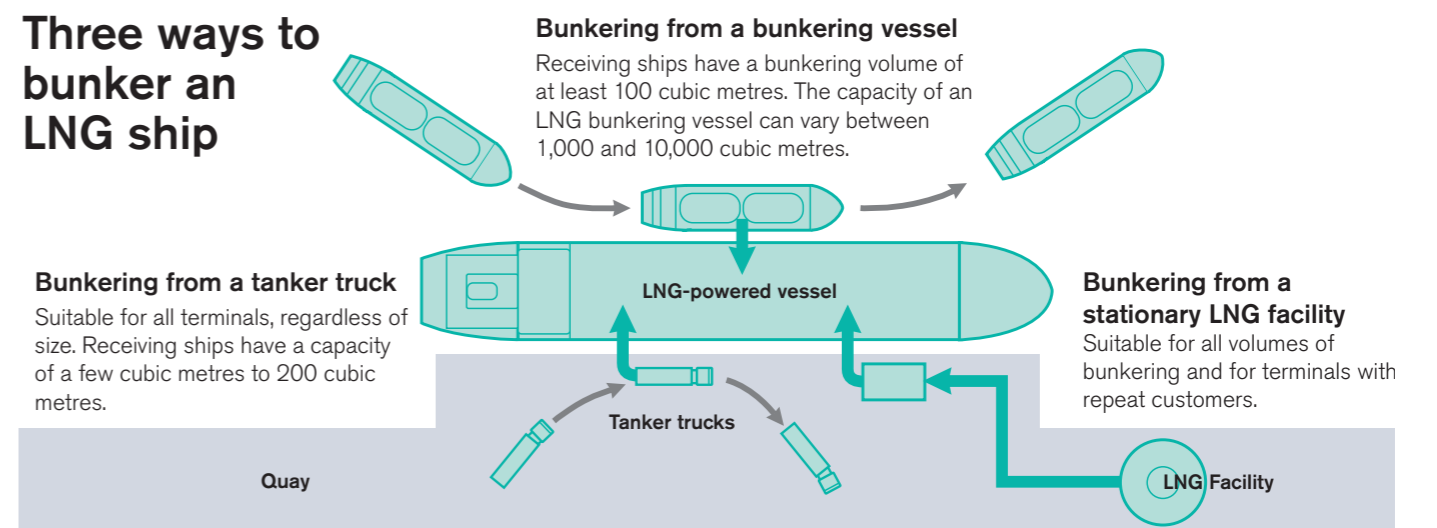
PHOTO: PETER HOELSTAD

There is a great deal of interest in our bunkering solution, both in Sweden and internationally. LNG is the shipping fuel of the future and we are ready to expand capacity to meet the strong demand.



Jonas Åkermark, Aga Gas

Three ways to bunker an LNG ship





For more information about greener shipping
with LNG in your tank, go to:

www.energigas.se



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