ZEEBRUGGE LNG TERMINAL: FROM REGAS TERMINAL TO VERITABLE LNG HUB IN NORTH-WESTERN EUROPE

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ABSTRACT

The Zeebrugge LNG terminal is a fully regulated open access terminal with a regasification capacity of 9 bcm per year. More than 1,300 LNG carriers have docked at the terminal since commissioning of the facility in 1987. The Zeebrugge LNG terminal has the advantage of offering optimum destination flexibility for regasified LNG: natural gas can either be traded on the Zeebrugge Hub, delivered for consumption on the Belgian market, or redelivered at the border for onward transmission to the largest consumer markets in continental Europe: the UK, Germany, France and the Netherlands. As early as 2008 Fluxys started loading LNG carriers at the Zeebrugge terminal enabling shippers to benefit from global gas price differences, so far attracting 30 carriers to be loaded. In 2010 the first small scale LNG ship, the Coral Methane, was loaded in Zeebrugge. Another threshold was crossed in 2010 with the loading of LNG trucks for LNG transportation to truck fuelling stations. And the first inland barge in North-Western Europe running on LNG was filled up at the Zeebrugge terminal in November 2011. Since LNG has the potential to become an important fuel for ships and trucks, strengthening the role of Zeebrugge as a veritable LNG hub has been a key element in Fluxys’ strategy. In pursuit of this goal, a multifunctional jetty is currently under construction to supply all kinds of barges with LNG.

INTRODUCTION

In the space of 35 years, the Zeebrugge area has developed into the very heart of both the Belgian natural gas transmission grid and the Western European natural gas system. Zeebrugge harbours a terminal for ships carrying liquefied natural gas (LNG) and serves as a crossroads of two major axes in European natural gas flows: the east/west axis from Russia to the United Kingdom and the north/south axis from Norway to Southern Europe. Natural gas can easily be traded at the Zeebrugge Beach trading point or can be transported from Zeebrugge for consumption in Belgium or moved to other gas exchange location points at the Belgian border for onward transmission throughout Western Europe. It has developed into the cornerstone for security of supply and diversification of sources for Belgium and Western Europe.

Since LNG has the potential to become an important fuel for ships and trucks, strengthening the role of Zeebrugge as a veritable LNG hub has been a key element in the terminal operator’s strategy. In pursuit of this goal, a multifunctional jetty is under construction to supply all kinds of barges with LNG.

THE ZEEBRUGGE LNG TERMINAL: FROM NATIONAL TO INTERNATIONAL FACILITY

Successful private/public partnership

The Zeebrugge LNG terminal is a prime example of a successful private/public partnership for the development new gas infrastructure. Against the backdrop of the oil crisis, the Belgian government decided in 1976 that Belgium needed its own LNG import terminal so as to diversify its energy portfolio and enhance the country’s security of supply. A contract was signed with Algerian supplier Sonatrach to deliver 100 billion cubic meters (bcm) of gas over a 20-year period in the form of LNG. The Ministry of Public Works started work on creating a peninsula in Zeebrugge’s Outer Port in 1978 and construction of the LNG terminal on the peninsula began in 1982. In 1987 the terminal was completed and in the autumn the first LNG ship unloaded its cargo at one of the first import terminals in Europe. Today the Zeebrugge LNG terminal is a fully regulated
open access terminal with a regasification capacity of 9 bcm per year. More than 1,300 LNG carriers have docked at the terminal since its commissioning.

![Construction of the peninsula in the Outer Port of Zeebrugge, 1978](image)

**Open access, multi-shipper environment**

Conceived as an instrument of security of supply for Belgium, the terminal kept this basic role until expiry of the initial supply contract. In the meantime, the European Commission thought the time was ripe to abrogate the natural gas monopolies and introduced with its first energy directive the concept of liberalization in the energy market.

The Zeebrugge LNG terminal closely kept its finger on the pulse of market needs when developing its service offer. In 2004, terminal operator Fluxys LNG concluded long-term contracts with three terminal users: Qatar Petroleum/ExxonMobil, Distigas and SUEZ LNG Trading. Zeebrugge became a multi-shipper terminal, but total demand of the three shippers outranged the terminal's capacity and extension works on the terminal were started. A fourth LNG cycling storage unit was built and new regasification facilities were added. In 2008 the new installations were commissioned and the terminal’s capacity was doubled from 4.5 to 9 bcm of import capacity and from 60 to 110 slots on offer. The terminal developed into a multi-shipper terminal with North-West European vocation, developing its services on the rhythm of the market’s needs.

**Up-scaling to Q-Max**

The Zeebrugge LNG terminal is also one of the few in the world that can accept all types of LNG carries: from the smallest bunker ships to the enormous Q-Flex and Q-Max type ships. For the large LNG carriers to be able to moor at the terminal’s jetty, the Port Authority of Zeebrugge carried out dredging works. Since 2008, about 60 Q-Flex LNG carriers have unloaded at the terminal. 2010 saw the first mooring of a small scale LNG ship: the Coral Methane was loaded in Zeebrugge.
MAXIMUM DESTINATION FLEXIBILITY

Zeebrugge area: a crossroads of pipelines

In the space of 30 years, the Zeebrugge area was developed into the very heart of both the Belgian gas transmission grid and the Western European natural gas system. Natural gas is transported from Zeebrugge for consumption in Belgium or moved to other gas exchange location points at the Belgian border for onward transmission throughout Western Europe.

Zeebrugge harbours an LNG terminal and serves as a crossroads of two major axes in European natural gas flows: the east/west axis from Russia to the United Kingdom and the north/south axis from Norway to Southern Europe. In Zeebrugge, the Interconnector terminal connects the Belgian grid to the underwater Interconnector pipeline which runs to Bacton in the United Kingdom. And the Zeepipe terminal connects Norway’s Troll and Sleipner gas fields to the Belgian grid via the underwater Zeepipe pipeline. Last but not least, from Zeebrugge, LNG can be transported via small ships to all ports in Belgium and Northwest Europe.

Open transfer of gas in the Zeebrugge area

In 2008, the Belgian transmission network operator introduced a new service entitling shippers to easily transfer gas between all entry points in the Zeebrugge area. This open transfer of natural gas boosts liquidity and enables for a Zeebrugge Beach price reference to be created. Currently 82 shippers are active in the Zeebrugge area and more than 2,000 GWh, or about 2 standard LNG ships, is traded on a daily basis.

![Graph showing monthly volume net traded and physical throughput in GWh per month from January 2012 to December 2012.](image)
**Key strength of the Zeebrugge LNG terminal: optimum destination flexibility and price setting at the Zeebrugge Beach trading point.**

**Loading services: a new outlet for LNG**

In 2008, LNG loading services were introduced in response to demand from terminal users to be able to capitalize more effectively on commercial opportunities on the LNG market. If the price of LNG were sufficiently high somewhere else in the world, then they could ship LNG from Zeebrugge to another end consumer market if they could re-load it at the terminal, so far attracting more than 50 carriers to be loaded. 2012 saw a sharp increase in the interest for the loading service: 25 ships have been loaded in 2012.
Another threshold was crossed in 2010 with the loading of LNG trucks for LNG transportation to truck fuelling stations. The truck loading station, commissioned in 1995 was used by Fluxys LNG to transport LNG from the terminal to the Peak Shaving Facility in the Inner Port of Zeebrugge, where LNG was held in storage for peak demand. After the decommissioning of the Peak Shaving Facility, the truck loading service was commercialized in 2010 and a fast growing interest is shown from companies in the UK, Northern and Continental Europe. The Zeebrugge truck loading services broaden the options for terminal users in terms of destination flexibility for the LNG they have shipped to the terminal. The terminal’s truck loading facility has sufficient capacity to accommodate more than 3,000 LNG truck loadings per year.
Studies

The Zeebrugge LNG terminal is participating in different studies examining what form the basic downstream infrastructure for supplying LNG to ships and trucks should take. In addition to bunkering LNG with ships, another option is for tanker trucks to load up with LNG at the terminal’s loading station. The trucks can bring the LNG inland to supply ships directly or to supply other LNG storage sites, where ships can take LNG onboard. The first truck-to-ship bunkering operation in Belgium took place early December 2012 in the port of Antwerp.

In 2011-2012, Zeebrugge was part of the comprehensive study, *Northern LNG Infrastructure Project*, under guidance of the Danish Maritime Authority. This study gives a clear overview of the status and gaps in order to develop a small scale LNG supply chain in the Baltic and the North Sea.

Next to this, a working group composed of Flemish Harbor- and Water Policy, the ports of Antwerp, Zeebrugge and Ghent, and Fluxys LNG, investigated in 2012 the aspects related to the small scale LNG development on Flemish level. The study was split up in three parts.

- The first two parts comprise an economical-logistical analysis and regulatory analysis. The outcome of the logistical analysis is a tool, allowing to make simulations based upon demand scenario’s, in order to assess the most optimal LNG infrastructure chain for the Flemish ports.

- The third part of the study consists of a safety and risk study. This safety study is a generic study, and analyses component by component of the small scale LNG supply chain, starting from realistic assumptions on sizes, volumes and flows, and determines the risk and maximum effect distances. The study allows, based upon flows, volumes and usage rate, assessment of locations for small scale LNG activities.
With these tools in hand, Fluxys is looking into various possibilities to further develop the small scale LNG chain. More specifically, Fluxys in cooperation with potential partners, is investigating to develop the first LNG fuelling station, intermediate storage and LNG bunker barge in Belgium.

The small scale LNG chain from the Zeebrugge LNG terminal.

**LNG as a fuel for ships**

The LNG terminal’s ambitions are based on the benefits of using LNG as a fuel for ships and long-haul trucks. Switching to LNG will result in significantly lower emissions, immediately contributing to Europe’s efforts to hit its climate targets.

Ships powered by LNG — instead of the usual heavy fuel oil — emit 15 to 20% less CO2, 85 to 90% less nitrogen oxides and emissions of sulphur and fine particles are negligible. This makes LNG a major alternative ship fuel once the more stringent emission standards for sulphur take effect for the English Channel, the North Sea and the Baltic Sea in 2015.

Liquefied natural gas also offers major benefits as a fuel for long-haul trucks. Switching to liquefied natural gas reduces CO2 emissions by more than 10% and emissions of nitrogen oxides by 50 to 60%, while emissions of sulphur and fine particles are negligible.
The Argonon is the bunkering ship that successfully introduced LNG in inland shipping in Belgium. The LNG for the Argonon was loaded onto trucks in Zeebrugge and delivered in the port of Antwerp.

Construction works for a second jetty make good progress

In 2007, Fluxys LNG launched an international market consultation to assess the level of interest in additional terminalising capacity at the Zeebrugge LNG terminal. In response, many shippers active in the LNG business registered interest in a variety of services: discharging carriers with on-board regasification facilities, loading and unloading of different types and sizes of LNG carriers, additional flexibility and throughput capacity. Starting from this spectrum of demand, Fluxys LNG established the outline for the second capacity enhancement at the terminal: together with the Port Authority Zeebrugge, construction of a second jetty for berthing of LNG ships with a capacity from 2,000 cubic metres up to 217,000 cubic metres, is to be made available in 2015.

At the second jetty currently under construction, end 2012, long-term capacity was booked for more than 200 loading slots for small LNG ships while at this time there are just a couple of these ships in circulation. This also marks the first time in Northwest Europe that long-term contracts have been concluded for loading LNG ships at a regasification terminal such as in Zeebrugge.

With the second jetty and the newly booked capacity for loading small LNG ships, the Zeebrugge LNG terminal is paving the way towards becoming a hub for small-scale LNG use. This means using LNG as an alternative fuel for ships and long-haul trucks.
CONCLUSIONS

The development of small scale LNG infrastructure is becoming reality. At the LNG terminal of Zeebrugge, important buckles of the supply chain are present, namely a secure supply of LNG through long term commitments of LNG suppliers, an existing jetty allowing unloading and loading of LNG, a wide variety of vessel types can moor, and from 2015 on, a second jetty, and a truck loading station allowing to load up to thousands of truck loads per year. Zeebrugge LNG terminal is evolving from a regas terminal to a veritable LNG hub in North-Western Europe.

The Zeebrugge LNG terminal is ready to develop other buckles of the small scale LNG supply chain in harbors, for LNG trucking or for other applications, but will do this always taking into account the highest safety standards and based upon thorough risk analysis.