Port of Helsingborg; LNG in Helsingborg

Roland Brodin, HELGA, Sweden
HELGA – Four partners in HELSINGBORGS

* Öresundskraft – energy company
* KEMIRA – large industry and site owner
* Port of Helsingborg
* NSR – producer of biogas
Why Helsingborg?

Helsingborg is a strategic site
- 3 million heavy goods vehicles passes by every year
- Appr. 50,000 ships passes by every year
- Good conditions in Öresund for bunkering
- Industries that could use LNG/CNG

- City of Helsingborg has a great environmental awareness
  - The air quality in the centre of Helsingborg is a problem
  - LBG production in a large scale
HELGA will serve both off shore and on shore transport with LNG/ LBG. Market changes between transport on shore and off shore can be handled because of the strategic location.

Main corridors where modal shift may occur due to new IMO regulations
Source: COMPASS The COMPetitiveness of EuropeAn Short-sea freight Shipping compared with road and rail transport, commissioned by European Commission DG Environment, 2010

Co-financed by the European Union
Trans-European Transport Network (TEN-T)
Market area - transports
Overview of HELGA’s LNG Projects

LNG Filling station for heavy trucks installed 2014.

Projects Co-financed by EU

• LNG in Baltic Sea Ports Project I – HELGA I (Studies)
• LNG in BSP II – HELGA II (Design multi functional bunker ship)
• HEKLA – LNG project in cooperation with Klaipedos Nafta
Goal

- To establish a LNG/LBG infrastructure in the south of Sweden
Performed work in Helsingborg:

- Market, Profitability analysis, sourcing, location and stake holder’s analysis.
- Basic Design of the terminal and quay and investment calculation.
- Risk assessment project and check of process for permits
- Design of terminal and quay
- Preparation of permits and tender documents
Key success factors

• Location that fulfill all parameters
• The shipping segment is crucial for critical volumes
• Control of the value chain before a final decision of business model
• The terminal must be established in steps and co-financing from EU is required.
• Co-operation with partners and stakeholders necessary for making an reliable infrastructure.
Step 1,
✓ A liquefaction plant condensing LNG/ LBG from the grid with limited storage capacity.

*LNG to heavy vehicles and small ships.*

Step 2,
✓ Extended storage capacity of 3000 – 5000 m³ (steel tanks)
✓ Rebuilding of existing berth
✓ A multifunctional bunker vessel

*LNG to heavy vehicles, industry and ships*

Step 3,
✓ A full 15 000 m³ storage (full containment type)
✓ Decommissioning of steel tanks

*LNG to heavy vehicles, industries and ships*

Step 4,
✓ New Jetty suitable for feeder vessels up to 40 000 m³

*LNG to heavy vehicles, industries and ships*
Step one- HEKLA, Liquefaction plant
Step two
Step three
Step four
Project activities:

Activity 2. LNG in Helsingborg:

• Develop a design for a multi-purpose LNG bunker ship in the area

  • The objective of this activity is to design a multifunctional bunker ship solution in south of Sweden

  • The multi-function ship will be able to provide – LNG bunkering; MGO bunkering & Other ship supply services

• LNG bunker ship study will describe the following: size, number fuel tanks, type of bunker fuel that the ship shall carry (the ship shall be running on LNG), type of other services that should be performed by the ship and crew, etc.
LNG BUNKER TANKER
SUITABLE THE MARKET AREA OF HELSINGBORG

Designed by OMT based on the result from in depth discussions with project HELGA and after a scenario investigation.
SCENARIO INVESTIGATION

Scenario 1A
Description: An existing bunkering ship will be retrofitted to carry MGO, LS HFO and, as the new part, LNG. The total cargo fuel capacity of the ship shall be 2000-3000 m³. The LNG capacity shall be 500-1000 m³, the first being the basis for calculations.
Investering: ca 50 - 70 milj SEK.

Scenario 1B
Description: As Scenario 1A but converting the main and auxiliary engines to gas fuelled. The engines can be dual fuelled engines or gas engines (i.e. spark plug installed for ignition).
Investering: ca 70 – 90 milj SEK.

Scenario 2
Description: A new bunker ship carrying LNG, MGO and HFO with high flexibility to adjust to new market conditions. Tank volume 2000-3000 m³ (MGO, LS HFO and LNG in total). As adjustable to a new market situation the ship shall be classed for worldwide trade.
Investering: ca 210 -220 milj SEK

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Trans-European Transport Network (TEN-T)
Scenario 3
Description: A new self-propelled bunker barge for LNG and MGO. Some possibilities for a restricted service notation that has to be further agreed with the class and authorities.
Investering: ca 130 -140 milj. SEK

Scenario 4
Description: Retrofitting an existing bunker barge to carry MGO and LNG. An existing tug boat will transport the barge. LNG tank shall be approximately 500 m³ and the MGO tank approximately 500 m³.
The tug is hired from external company when needed and could differ from time to time.
The tank type can be one large type-C or several 40” ISO containers.
It is assumed that it is not an articulated barge and tug as the tugs in Helsingborg Port shall be used.
Investering: ca 72- 75 milj. SEK
Scenario 5
Description: A 2nd hand transport barge is acquired and equipped with 40" ISO insulated LNG containers in the deck. The concept enables the client, as a supplement to their own LNG plant, to import LNG from external sources in containers that are landed in Helsingborg port. The containers can be transported by container ships arriving in Helsingborg where the infrastructure in the port allows the containers to be unloaded, stored and loaded onto the bunker barge.
On-board the barge the containers are stowed in guides with bridges for access to the connection hoses if loaded in 2 tiers. Taking the stability of a barge into consideration 2 tiers (layer) of containers is assumed to be max without an actual barge selected. This means that free slots can be incorporated in order to allow filled LNG tanks to be taking on-board without removing the normal installed containers.

The capacity of the barge is assumed to be 500 m3 LNG gross for normal installed containers. The gross warm volume of one container is 43.5 m3; hence 12 containers to be installed on-board.

Investering: ca 63 - 65 milj. SEK
## Port Restrictions In Local Area – Around Øresund

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<tr>
<th>Port</th>
<th>Draught m</th>
<th>Length m</th>
<th>Beam m</th>
<th>Air m</th>
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MULTI-FUNCTIONAL BUNKERSHIP

DESIGNED BY ODENSE MARITIME TECHNOLOGY A/S

SHIP - GENERAL

The purpose of the vessel has been to design a highly flexible platform that enables the operator to:
- Start with a small number of LNG storage tanks and increase the number of LNG storage tanks as the market develops
- Transport a large amount of diesel bunker on-board enabling a diesel bunker trade in the beginning (more tanks than the shown can be installed if requested)
- Carry a number of 40” ISO gas containers on the upper deck enables the operator to provide LNG to ports very fast e.g. between a ferry departure and arrival. The containers are designated as “swift containers”
- The open deck installation allows a high degree of independent design of the top-side

The vessel shall be designed and constructed as an environmentally friendly, all welded steel ship with gas/diesel electrical twin thruster propulsion.

The engine room is located below the superstructure aft. The forward mooring platform is located on the foc’sle deck.

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Trans-European Transport Network (TEN-T)
10 GENERAL DESIGN

MAIN DIMENSIONS

Length over all 95.3 m
Length between perpendiculares 93.10 m
Breadth moulded 18.0 m
Depth moulded 6.0 m
Design draft moulded 3.5 m
Scantling draft moulded 3.5 m
Air draft (from baseline) Approx. 21.6 m

DEADWEIGHT

Deadweight at design draft Abt. 2,082 t

SPEED

The speed is subject to final power predictions but is expected to provide a service speed on 8-10 knots with 15% sea margin, on the design draught 3.5, in calm weather and with clean hull.
MANOEUVRING MACHINERY AND EQUIPMENT

401 RUDDER
The ship is equipped with two (2) steerable thrusters with integrated gearbox serving as rudders.

404 THRUSTERS
One (1) bow thruster:
- El-motor 690 kW with frequency drive
- Fixed pitch propeller, diameter app. 1.2 m

DIESEL ENGINES FOR PROPULSION

601 MAIN ENGINE
Two (2) 4-stroke generator sets are installed for supplying power to the electrical propulsion system and auxiliary systems. The engines are of the dual-fuel type with integrated double wall piping designed for running on natural gas with pilot diesel fuel or running on diesel. When running on natural gas the engines fulfils TIER III. The engines also serves as BOG removing devices.

FUEL
Natural gas or diesel.
The engines are capable of running at low sulphur DO with a viscosity of minimum 1.8 cSt at engine inlet.
HEKLA – Development of LNG bunker Network

HEKLA – Helsingborg & Klaipėda LNG Infrastructure

Real investment;

Helsingborg – Construction of LNG liquefaction plant
Klaipeda – Construction of on-shore LNG reloading station

An important step forward towards creating the LNG bunkering infrastructure network in the BSR.

Co-financed by the European Union
Trans-European Transport Network (TEN-T)
LNG demand forecast
Base scenario HBG terminal

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Trans-European Transport Network (TEN-T)
Assumption 2014
Reality 2016

ROAD TRANSPORT

Waiting for heavy LNG Vehicles

MARITIME TRANSPORT

Dual fuel engines
VERY LOW MGO PRICE

REALITY 2016