



# Liquefied Natural Gas (LNG): fuel for inland navigation

*Challenges and solutions*

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# Holland Shipbuilding Association

- Holland Shipbuilding Association (2008) is a private co-operation of
  - Shipyards: VNSI
  - Equipment: HME
- 400 member companies, 30+ staff
- Offices in Holland, Belgium (Brussels), Brazil, Vietnam, China and Russia
- Activities in government lobbying, finance, innovation, export promotion, working methods, international regulations, human resources and PR

## LNG as marine fuel: target groups

- Deep sea vessels
- Short sea vessels
- Offshore vessels
- Fishery vessels
- Ferries/passenger vessels
- Harbour bound vessels
- **Inland navigation vessels**

# LNG, fuel for inland navigation?

Basic attitudes NL authorities:

- Ministry of Infrastructure & Environment: very positive. Invites and receives proposals. If positive, recommendation to CCNR / EU
- Port of Rotterdam: yes please! Is looking for suitable bunkering locations
- Province of Zuid-Holland (including Rotterdam area): absolutely positive. Pro-active role in realizing bunkering locations. Aims to become a knowledge center in this respect

Challenge:

- Creating public acceptance for nearby potential LNG bunkering locations (coping with NIMBY)

## TNO/DNV/NEN Legal and Safety Assessment

Objectives and method of the LESAS project:

- Roadmap to develop a small-scale supply chain for LNG as marine fuel (Case: Rotterdam)
- Outline possible legal barriers
- Supply recommendations for public authorities and industry on legislation and safety
- Based on stakeholder viewpoints on how an economically stable supply chain should look like

Major participants a.o.

- Port of Rotterdam
- Ship owners (sea and inland waters)
- LNG suppliers, terminals, transporters, retail, constructors, equipment suppliers, engine manufacturers, shipyards
- Province of Zuid-Holland
- Ministry of Infrastructure and Environment

Conclusion: a very important project

- Start: February 2011
- Final report: 3<sup>rd</sup> quarter 2011

## Topics to be addressed

- Quality requirements LNG / LBG (biogas)
- Distribution
- Bunkering facilities
- Bunkering procedure
- LNG storage onboard
- LNG technique onboard
- Types of combustion engines
- Energy management onboard
- Emissions
- Safety onboard
- External safety
- Education & training
- Coping with NIMBY

## Quality requirements LNG / LBG

- Fuel requirements to be specified by engine manufacturers
- Questions have been raised about mixing different LNG qualities and their effect on engine performance
- Both items will be addressed in aforementioned LESAS project

# Distribution and Bunkering

## Options:

- Load bunkering barges at terminal and distribute to other vessels (*ship/ship*)
- Distribute LNG to bunkering station, from there to inland navigation vessel (*bunkering station/ship*)
- Most likely intermediate bunkering solution for inland navigation: fuelling by LNG trucks (*truck/ship*)
  
- Subsidy scheme for bunker locations very recently made available by Ministry of Infrastructure & Environment



# Bunkering procedure

- Standard procedures to be elaborated for all bunkering options
- Draft procedure for ship/ship bunkering is available at <http://www.Inggot.com/tags/Ing-bunkering/>  
(concept in principle accepted and approved by DNV)

## LNG storage onboard

### Options:

- Above or below deck
- Within or outside cargo zone

(Safety requirements vary on location of tanks and machinery)

### Design challenge:

- How to lose as little cargo space as possible, while retaining the vessel's size characteristics (dimensions, draft, air draft)
- Cylindrical tanks are standard. Pressure is low (< 10 bar), other tank forms might be introduced within a few years.

## Engine types / Energy management / Emissions

Options:

- Dual fuel (diesel/gas) – direct propulsion drive
- Gas – direct propulsion drive
- Diesel/gas electric – indirect propulsion drive
- Gas electric – indirect propulsion drive

Uncertainty:

- NOx emissions of dual fuel engines in real operation (effects of various diesel/gas ratios)

Challenge for technique suppliers and ship owners:

- Optimise energy management on board (propulsion, generator sets, cargo heating etc.). Learn from other industries!

# LNG technique onboard

## Availability:

- A lot of proven technique is available
- Experience especially in Norway: about 20 ships operational with LNG as marine fuel (all DNV classed)

## Regulations:

- Installations must comply with regulations for LNG as marine fuel
- But: there are no regulations for inland navigation yet. Temporary solution: copy them from IMO sea regulations, being a.o.
- IGF Interim Guidelines, IGF Code, IMO-FP Fire Protection
- Class rules (DNV, Lloyd's, BV, GL), which are based on IMO regulations

# Safety information, education, training

To be included in project proposals:

- Operational management procedures
- Crew education and training

Challenges:

- For suppliers and users: harmonize procedures, instructions, education and training where possible
- For regulatory bodies and local authorities, in collaboration with business community: elaborate good information material for public use (coping with NIMBY !!)

## Available reports and information

- “Natural Gas for Ship Propulsion: Report on the current rules and regulations” (*Holland Shipbuilding Association, March 2011*)
- Feasibility study “LNG als brandstof voor de binnenvaart”, (CMTI / Holland Shipbuilding Association, January 2011)  
*Both available on request, mail to Bert de Vries at [bvr@scheepsbouw.nl](mailto:bvr@scheepsbouw.nl)*
- Various reports and presentations can be downloaded on <http://scheepsemisies.nl/> , among which: “Sustainability in Inland Shipping - The use of LNG as Marine Fuel” (*Delft University of Technology, December 2010*)
- LinkedIn group: LNG as marine fuel (*highly recommended*)
- And many others .....

# LNG as marine fuel: a practical challenge for all of us!

*Thank you for your attention*

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