DANISH MARITIME AUTHORITY

TEN-T Motorways of the Sea

The North Europe LNG Infrastructure Project - Martech LNG

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Outline

Introduction – the overall project

An LNG infrastructure

A shipowners economic perspective

An infrastructure economic perspective

Recommendations

Elements in the way ahead

Sum up

The full project: An infrastructure of filling stations and deployment in ships

AN EU TEN-T Motorways of the Sea project

- LNG as fuel for international short sea shipping
- Total costs 26 mill. euro

A pilot project – Fjord Line Danmark A/S

- 9.0 mill. euro from TEN-T

An LNG infrastructure project

- 0.6 mill. euro from TEN-T

A combined top-down and bottom-up approach

The full-scale pilot project

Supporting and developing a transport corridor

- From the South Western part of Norway
- ➢ … to the Northern part of Jutland
- ➢ … and further to the Continent

Ports

- Hirtshals base port
- Bergen, Stavanger, Langesund

The project

- Two new cruise ferries with LNG propulsion – 2013 deliveries
- A full-scale pilot project
- Deployment in international short sea shipping
- An extensive measuring programme
- A maritime LNG infrastructure is needed!

The infrastructure project

The new sulphur regulation in North Europe

- Competitiveness of shipping and regions

Distribution, storage and use as fuel of natural gas - LNG

From the LNG import terminal to LNG used as fuel in ships

The LNG supply chain

- ”Hard” on maritime filling stations/infrastructures
- ”Soft” on regulations, industry standards, etc.

The business case as a horizontal issue

How can we create this infrastructure?

- Recommendations to central stakeholders

Partners – the infrastructure project

States: Belgium, Denmark (the Danish Maritime Fund), Finland, Norway and Sweden

Regional: Council of Nordic Ministers

Ports: Port of Hirtshals (DK), Port of Zeebrugge (BE), Szczecin and Swinoujscie Seaports Authority (PL) and Port of Rotterdam

LNG terminals and gas distribution companies: Fluxys (BE), Gasum (FI), Gasunie (NL), Energinet.dk (DK), Energigas Sverige (SE), Gasnor (NO) and GazpromLNG (RUS)

The maritime cluster: Germanischer Lloyd (DE), Bureau Veritas (DK), MAN Diesel and Turbo (DK), Lauritzen Kosan A/S (DK)

LNG infrastructure outlay

Large LNG terminal

Truck

Bunker/feeder vessel

Truck

Bunker/feeder vessel

Photo: Gasunie

Gas pipeline

Liquefaction plant

Photo: Gasunie

Intermediary LNG Terminal

Onshore, e.g.
•Tank
•Container

Offshore, e.g.
•Vessel
•Barge

Small-scale liquefaction plant

Photo: SSPA

Bunker barge

Bunker/feeder vessel

Truck

Pipeline/direct filling

End users

SHIPS

Trucks

Cars

Industry/power generation

Gas grid

Etc.

Photo: SSPA

LNG infrastructure essentials

Migration strategies must be chosen

- E.g. from floating to fixed

Cost components for LNG as fuel

- The price of fuel at major European import hubs
- The costs of storage
- The cost of transhipment between hubs and local port facilities and further to the end user

Availability of LNG at a competitive price

Generic ”LNG infrastructure” port cases

	Large scale import terminal	Medium scale port	Small scale port
Storage	An import terminal	A 50.000 m3 tank	Two 700 m3 tanks
Bunkering	Ship to Ship Direct filling Tank Truck	Ship to Ship Direct filling Tank Truck	Direct filling Tank Truck
Annual throughput	300,000 m3	400,000 m3	19,000 m3
Total investment costs – m EURO	69	137	15
Infrastructure costs from a pay back perspective (EURO pr tonnes) 8 years 12 years OUR BASELINE	 136 95 170 + 440 = 610	 157 112 170 + 440 = 610	 211 172 170 + 440 = 610

Small and medium scale LNG

- Large scale regulations and standards not applicable
- Safety must not bee jeopardized

	Large scale	Medium scale	Small scale
Terminal storage capacity	+ 100,000 m3	10–100,000 m3	- 10,000 m3
Ship seize	+ 100,000 m3	10–100,000 m3	1,0-10.000 m3
Tank trucks			40-80 m3
Pipe dimension	+16 inches	8-15 inches	2-7 inches

A shipowners economic perspective

The overall conclusion

- LNG a viable compliance strategy
- 1 – 3 years pay back time for newbuilts
- 2 – 4 years for retrofit
- **Different picture for different shiptypes**

Only viable because of the 2015 sulphur regulation

Financing a big issue for the shipowners'

- The LNG propulsion technology is mature

An infrastructure economic perspective

Big investment costs

Uncertainty with regard to demand

The price of LNG from a shipowner point of view?

Shipowners' wait and see strategy (MGO)

Possible business models

- Public, e.g a public utility
- Contractual
- Incremental
- Merchanting

Recommendations

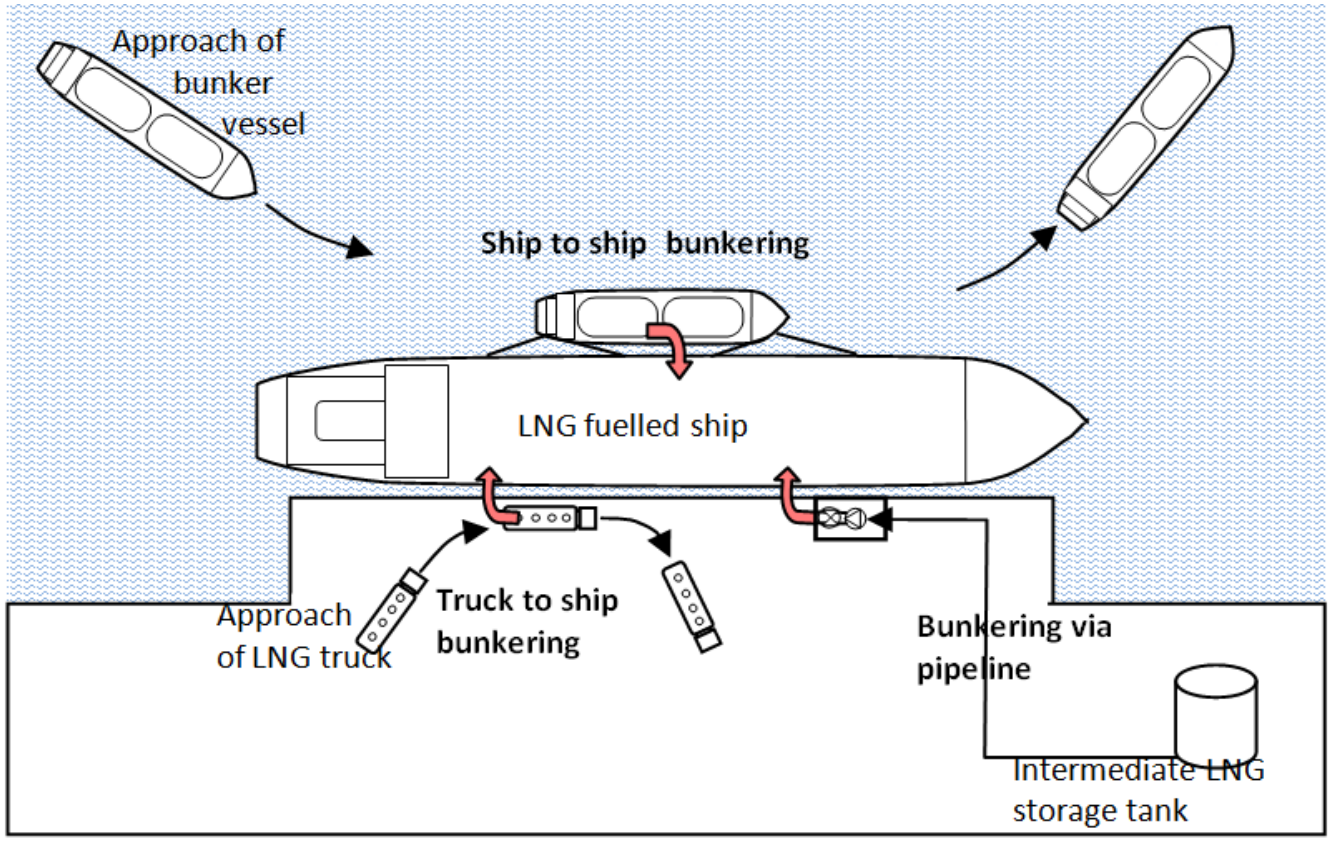
Aim: To establish a cost efficient LNG infrastructure

- What are the problems
- What are the solutions
- Who must take the initiative
- The time schedule

Grouping of recommendations

- Bunkering solutions
- Economic and financial aspects
- Safety
- Technical and operational aspects
- The permit process

Bunkering solutions (+ fuel tank containers)



Economic and financial aspects - 1/3

Max 12% Internal Rate of Return for making LNG competitive with MGO

Development of business cases on infrastructure and operation

- Demand analysis
- Integration with land-based LNG
- Co-operation needed to reach a marked potential
  - ➢ Within and between ports
- International/regional dimension
- Rough financial and economic calculations

Port clusters or similar as drivers for infrastructure development

- Port authorities

Business models with flexible partner participation

Economic and financial aspects - 2/3

The need for floating infrastructures

- Create funding incentives for construction and operation of bunker vessels/barges in the early stages

Supplementary EU/ Member State funds/guarantees for fixed infrastructure

Accumulatet investment need – central scenario

- 2015: 1,2 billion EURO
- 2020: 1,5 billion EURO

Central demand scenario in mill. tonnes

- 2 in 2015 and 4,2 in 2020 as maritime demand
- Demand from non maritime users needed

Economic and financial aspects - 3/3

Create a ”minimal infrastructure and secured marked”

- Wider regional scope
  - North Europe and/or the EU?
- Co-operation instead of rivalry needed for development of
  - Transparency
  - Framework conditions
- Stakeholders in the LNG supply chain

Safety

Define small scale LNG, e.g.

- Ship seizes
- Tank capacities
- Bunkering pipe hose dimensions

Guidelines for risk modelling

- For bunkering concepts and facilities

Routines for accident and incident reporting

Harmonisation of land- and sea-based regulation

- Consistent safety level

Avoid specific regulations for traffic with LNG feeder and LNG bunker vessels

Technical and operational aspects

Guidelines and standards for LNG bunkering

- ISO TC 67/WG10
- National administrations

Emergency Shut Down Systems and Communication

Emergency Release Systems

Training of crew onboard small- and medium-scale vessels

- Carrying LNG as cargo

Training of personell on board LNG fuelled vessels and bunkering facilities

Minimising of methane slip in the LNG supply chain

The permit process

Communication during the public consultation process

- Early good co-operation
- Define the project
- Adequate safety analysis
- Demystify LNG
- LNG has advantages as fuel
- Target group specific information

Guidelines for siting of small and medium scale LNG terminals

- Large scale siting guidelines are not applicable

A coordinated permit process

- Close co-operation within the public sector

Elements in the way ahead, e.g.

EU/EMSA dialogue with central stakeholders

- Technical, operational and safety issues
- Ongoing GAB analysis - will be finalized this year
- Policy initiatives ?

EU financial instruments

- TEN-T MoS calls
- Marco Polo calls
- EIB

LNG in the Baltic Sea

- Pre investment analyses for 8 ports
- TEN-T MoS financing

COSTA

- Mediterranean, Atlantic and Black Sea areas/TEN-T
- Framework Conditions for the use of LNG ships
- TEN-T MoS financing

PRIVATE INVESTMENTS

- Gearing possibilities!

SUM UP: Infrastructure and commercial requirements for an effective LNG network

”Soft ” infrastructure

- Missing regulation, standardization, best practice, etc. must be worked out
- Regulation, etc. must be appropriate (no overregulation)
- **Recommendations to the ”problem owner” on what must be done?**

Hard infrastructure

- Possible components and investment cost indications
- Migration thinking/increasing demand
- **Business opportunities outlined**

Recommendation validated through industrial partners and port authorities

Scenarios for LNG investment costs in the ECA area

Business case thinking and first movers needed

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Thank you for your attendance

Further information on

www.dma.dk

"In focus"

North European LNG Infrastructure Project