DANISH MARITIME AUTHORITY

MarTech LNG

Facilitation of the Way ahead for LNG and the EU perspective

MS Stavangerfjord 18 September 2012

Mogens Schrøder Bech
Danish Maritime Authority (DMA)

Outline

Point of departure

North Europe LNG Infrastructure of Filling Stations and Deployment in ships

- Infrastructure part

Green Ship of the Future ECA retrofit Study

European Union initiatives

Plan for Growth in The Blue Denmark

Conclusions

The Danish Maritime Authority (DMA)

An Authority within the Ministry of Business and Growth

Mission:

- To promote health and safety on clean seas
- To increase growth and strengthen the competitiveness and employment opportunities of maritime industries – The Blue Denmark
- A global perspective – IMO, ILO and WTO etc

Point of departure

The new sulphur regulation in North Europe from 2015

- The ECA max of 0.1 % Sulphor instead of 1.0 %
- Competitiveness of shipping and regions

The EU Trans European Network for Transport

- Efficient transport corridors
- Fostering growth and cohesion
- Innovation
- Motorways of the Sea the maritime dimension of the network

The EU Motorways of the Sea concept

- Concentration of cargo on sea based routes
- Efficient ports
- Good hinterland connections; rail, inland waterways and trucks
- Infrastructure and facilities
- A logistic point of view

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Co-financed by the European Union
Trans-European Transport Network (TEN-T)

The infrastructure part of the project

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

The LNG supply chain

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

The business case as a horizontal issue

- The infrastructure provider
- The shipowner

How can we create this infrastructure?

- Recommendations to central stakeholders

Partners

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

Photo: Gasunie

Gas pipeline

Photo: Gasunie

Truck

Bunker/feeder vessel

Truck

Bunker/feeder vessel

Liquefaction plant

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

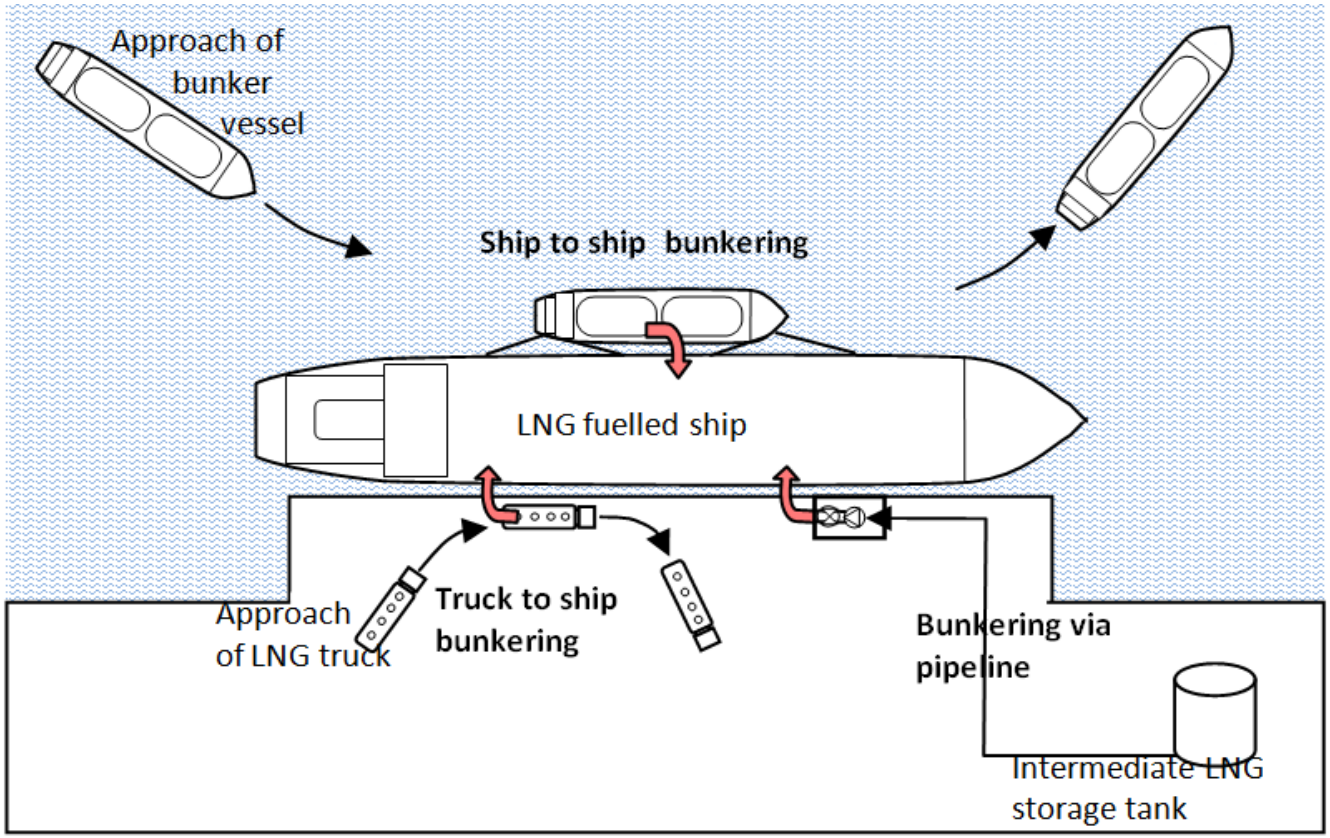
Etc.

Photo: SSPA

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	 136 95	 157 112	 211 172
BASELINE in EURO	170 + 440 = 610	170 + 440 = 610	170 + 440 = 610

Bunkering *systems* (+ fuel tank containers)



LNG infrastructure essentials

Migration strategies must be chosen

- E.g. from mobile to 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

Decentralized NG Liquefaction

- A game changer
- A workshop in the Innovation Network for Transport (TINV)

An infrastructure economic perspective

Big investment costs

Uncertainty with regard to demand

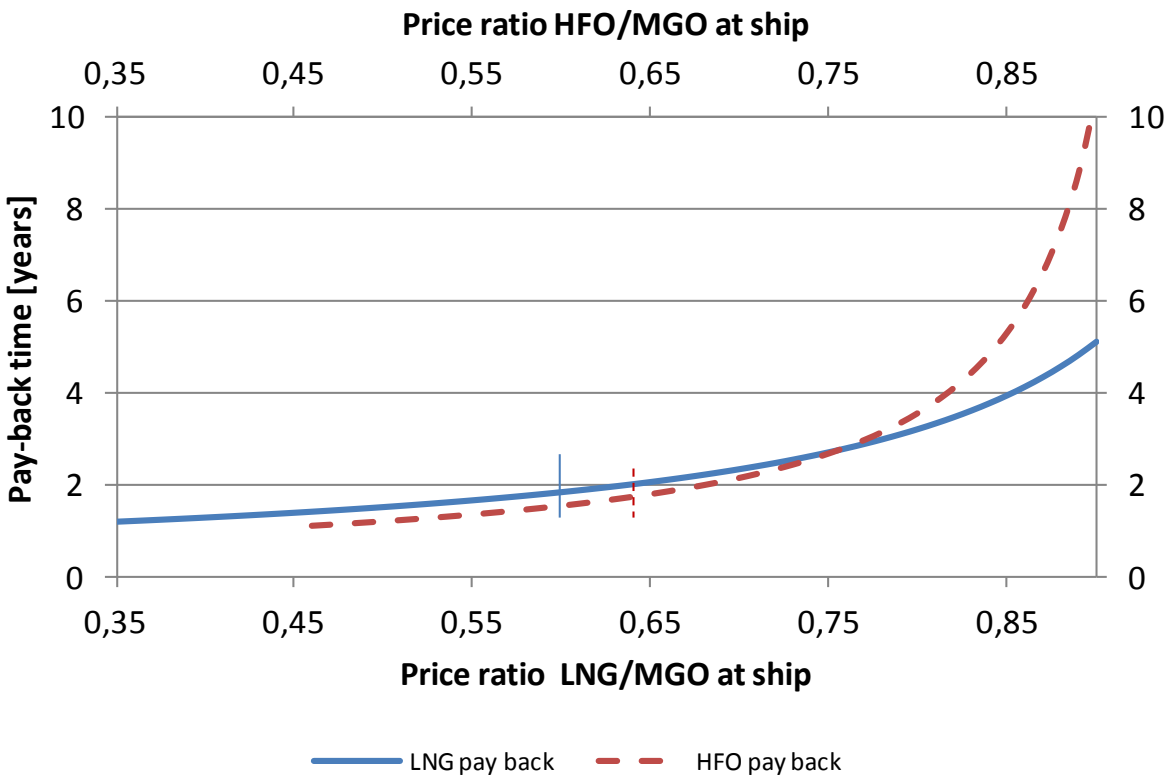
The price of LNG from a shipowner point of view?

Shipowners' wait and see strategy (MGO)

Possible business models

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

Sensitivity analysis - shipowners pay back time



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

Recommendations – the way ahead

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

Green Ship of the Future

Green Ship of the Future* results

- **Green Ship of the Future a Public Private Partnership**
- **A retrofit study of Norden Butterfly from the shipowner NORDEN**
- **Different assumptions on**
  - Operating time in the Emission Control Area
  - Fuel prices
- **The results are basically in alignment with the results from the LNG Infrastructure Project**

*www.greenship.org

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Germanischer Lloyd

Final report

European Maritime Safety Agency (EMSA)

Study on Standards and Rules for Bunkering of Gas-Fuelled Ships

European Union Study for Bunkering of Gas-Fuelled Ships

Gaps relating to bunkering LNG as Ship Fuel

- 16 gabs identified

More targeted focus than the North Europe LNG Infrastructure Project

The existing ”patchwork” offers assistance!

- Guidelines
- Technical standards
- Best practices
- (Many)different bodies
- Everything seems on move!

ISO TC 67 Working Group 10

- Guidelines for systems and installations for supply of LNG as fuel for ships

LNG in Baltic Sea Ports

LNG in Baltic Sea Ports

Aim

- Foster a harmonised approach towards LNG bunker filling infrastructure

Ports

- Aarhus, CMP, Helsingborg, Helsinki, Stockholm, Tallinn and Turku

Pre-investment studies

- Evironmental impact assessments
- Feasibility analyses for LNG terminals or bunkering vessels
- Project designs
- Regional market studies
- Safety manuals
- Etc.

Finalization 31 December 2014

- ’LNG Guidebook’ containing best practices

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TEN-T 2012 Multi-Annual Call

Proposal for an Implementing Decision on the selection of projects

July 2013

TEN-T Executive Agency

LNG Motorways of the Sea projects

LNG Rotterdam Gothenburg - works

- The LNG break bulk facility at the Port of Rotterdam
- The small-scale satellite terminal in Skarvikshamnen

LNG bunkering infrastructure solution and pilot actions for ships operating on the Motorway of the Baltic Sea - pilot

- An LNG bunker supply infrastructure for the Port of Brofjorden, Lysekil Sweden.
- Technical studies for deployment of new LNG technologies in full scale pilot actions (studies) in commercial vessels operating in the Baltic and North Seas.

SEAGAS feasibility study

- LNG bunkering facilities in the
  Port of Roscoff (northwestern France) and the Port of Santander (northern Spain)

Two not recommended for funding projects

(Methanol: the Marine fuel of the future – pilot)

TEN-T 2012 Multi-Annual Call

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TEN-T Executive Agency

Innovation and new technologies

Flexible LNG bunkering value chain on the Spanish Mediterranean coast - study

- To overcome existing barriers
- Technical, operational ans legal aspects

LNG hub in the northwestern Iberian Peninsula – design

- A hub for LNG as fuel

Nine not recommended for funding projects

Commission initiatives

EU Directive on deployment of alternative fuels infrastructure

Hydrogen

Electricity

Natural Gas

- CNG
- LNG

CNG

- Cars, busses and light weight trucks

LNG

- Long haul heavy truck transport
- Ships
- LNG bunkering facility in core network ports

National policy frameworks for market developments and infrastructures

European Sustainable Shipping Platform -ESSF

The ESSF stakeholder platform representation, around 70 members

- Subgroup on LNG
- Subgroup on scrubbers
- Subgroup on innovation
- Subgroup on financing

The Subgroup on LNG (first meeting)

- The DMA Infrastructure Study
- The GL GAB analysis
- CEN/CENELEC discussions
- Guidelines for systems and installations for supply of LNG as fuel for ships
  - SGMF (Society for Gas and Marine Fuel)
  - ISO
- Etc

EU TEN-T calls etc.

Supportive for LNG

- A trend towards infrastructure
- Innovative financing instruments
- TEN-T Ports; especially core ports

Marco Polo

- From 2014 a part of the TEN-T system

The Commission toolbox for development of short sea shipping!


Denmark at Work
Plan for Growth in the Blue Denmark
December 2012
The Danish Government

LNG activities

Ensure swift, efficient appoval procedures concerning LNG bunker stations

- A ”guidance document” under development

Support specific projects on establishing LNG bunker stations ashore and offshore in Danish ports

- Project maturement/realization
- Funding possibilities

Conclusions

Appropriate ”Soft ” infrastructure must be put into place

Market driven “Hard” infrastructure

- Public funding instruments for initial investments
- Migration thinking/increasing demand must be applied

A shipowners’ point of view

- The regulations on sulphor (2015) and NOX (2016) a game changer!
- Development in price ratios
  - LNG/Marine Gas Oil
  - LNG/HFO - from a scrubber perspective
- Financial stress
- Basically a wait and see strategy up to 2016

How to align supply and demand?????

- Who will be the driver – industry, trucks. ships
- When will the ketchup effect occur?

Thank you for your attendance