HOW CAN LNG BUNKER SUPPLY CHAINS BE DEVELOPED IN PORTS

LNG in Baltic Sea Ports II - Final Conference
3. of December 2015 in Port of Trelleborg
Every LNG salesman's dream

MAERSK MC KINNEY MOLLER >> 18.000 TEU
• Propulsion engines: 2X32 MW
• Daily fuel consumption: App. 3 GWh LHV

Equivalent to....... app. 500 m³ LNG/day
Presentation agenda

1. A consultants view on LNG supply chains development targeting the maritime sector

2. Authorities approval processes and how long does it take?

3. A “think out of the box project”

4. Future harbor projects

“Questions are welcome during the presentation”
A CONSULTANTS VIEW ON LNG SUPPLY CHAINS DEVELOPMENT TARGETING THE MARITIME SECTOR
LNG Supply chain - 3 scenarios distributing LNG to maritime industry

Scenario 1: 100% LNG Trailer/container distribution
1. Zeebrugge
2. Rotterdam
3. Swinousje
4. Klaipedia

Scenario 2: LNG Ship distribution
1. Zeebrugge
2. Rotterdam
3. Klaipedia
4. Swinousje

Scenario 3: Local LNG production + LNG Trailer distribution

Transmission grid
1. TSO

Distribution grid
1. Locale

Natural Gas piped
LNG plant storage 250 – 500 m³
Small scale liquefaction
LNG Trailer

Customers

Industrial
LNG Customer storage 20 – 500 m³

Transport
LNG Ferries
LNG bunker facility 0 – 2000 m³
LNG Fueled Truck

Satellite Storage
LNG Satellite storage 2.000 – 30.000 m³
1. Engine load varies over the year
2. Energy efficiency drop by app. 20 % at 50 % load
3. Speed and cargo load are main drives in fuel consumption
4. Operations patterns are important for yearly energy consumption
5. Ships designed for higher speed and having lot’s of low speed has lower efficiency
6. Consumption onboard ships (ferries, tugs, supply vessels) having many maneuvers are challenging to predict

Source: product guide Wärtsila

LHV = 6 MWh/m³
Bunker capacity versus ship type/size
- Ferrys

Engine: 4300 kW
LNG Tank: 40 m³

Engine: 44000 kW
LNG Tank: 2X43 m³

Engine: 21600 kW
LNG Tank: 2X300 m³

Engine: 12380 kW
LNG Tank: 2X125 m³
There is no link between engines size and LNG tk.
– it all about type of trade and speed
Bunker capacity versus ship type/size
Up-coming vessels – Tankers/Drycargo

Engine: 6500 kW
LNG Tank: 580 m³

Engine: 3000 kW
LNG Tank: 112 m³

Engine: 6500 kW
LNG Tank: 580 m³

To be delivered Q2 2017
Engine: 5850 kW
LNG Tank: 630 m³

Engine: 4500 kW
LNG Tank: ??? m³

There begin to be a commend praxis of 10 days LNG bunker capacity
AUTHORITIES APPROVAL PROCESSES AND HOW LONG DOES IT TAKE?
Relevant Authorities
- as an example Denmark

Maritime Authorities
Danish Maritime Authority

Local Authorities
Municipality
Fire brigade

Governmental Authorities
Danish Working Environment Authority
Danish Emergency Management Agency
Danish Energy Agency
Danish Maritime Authority

Source: Danish Maritime Authorities
Largest possible LNG storage project
……..before Seveso II and full Environmental impact assessment

- LNG Storage in Denmark 500 m3 >> 200 tons (below SEVESO 2)
- To bunker Fjordlines 2 LNG ferries Bergenfjord and Stavangerfjord
- Yearly consumption each ferry app. 12,500 tons of LNG
Pre-analysis of approval processes – LNG to the ferry of Samsø

Approval of LNG Storage
Main documents
1. COUNCIL DIRECTIVE 96/82/EC
2. Danish preparedness act
3. “guidelines for technical gasses”

Supportive documents:
EN 13458-1-2-3
EN 13645:2001

Approval of gas installation
Main documents
1. Directive 97/23/EC PED
2. Rules of gas installations

Supportive documents:
EN 1473
EN 12308
EN 1474
EN 13458-1-2

Approval of the ferry’s handling of LNG
Main document
ISO 18683 Guidelines for systems and installations for supply of LNG as fuel to ships
IGF code (not yet ratified)

Supportive documents:
EN 1474-1-2-3
EN 12434
EN 1160
EN 1474
ISO 28460

Requirements for documentation
1. Compliance statements
2. Design, fabrication and commission documentation
3. Operational documentation
4. Maintenance documentation
5. Emergency response documentation
6. Training documentation

Emergency Management Agency
Odder Municipality – fire department
Danish Safety Technology Authority
Danish Maritime Authorities

LNG Customer storage 20 – 500 m³
LNG Ferry

december 2015
The first EU LNG tender process focusing on supply to a vessel - The Samsø ferry

LNG tender issued on TED

Positive answer on RFI

RFP submitted

LNG Supply contract signed

LNG supply start

Tender conditions

- 12 m³ per day 365 d/y = yearly 4380 m³ LNG
- To bunker in 15 min (daily bunkering)
- 5 years contract
- The bunker system has to be movable

Approximately 4 months approval process and a “solution consultation” in early may before the RFP was submitted
A “THINK OUT OF THE BOX PROJECT”
The Samsø solution “in business”
Unloading Trailer

Features
- Liquid/Vapor hose connection
- Air connection
- Cabling (valve controls, level, signal checks)
- Flame and Gas detection
- Spillage tray / self-cleaning grid (snow)

Bunkering Ferry

Features
- Liquid connection
- Liquid parking position
- Flame and Gas detection
- Main valve
LNG self-service at the “forecourt”
NEW PROJECTS
Future developments – dedicated to line businesses and ferries - scaling up 125 m3/hrs

1. Self-service - bunker whenever it fits into vessels schedule
2. No methane emissions during connection/dis-connection
3. Online monitoring of bunker process
4. Better utilization of trucks – no need to be available at a specific time
Future developments – for pier and RO/PAX installations - scaling up 250 m3/hrs >> 1000 m3 in 5 hours

**Designed for:**

1. Tankers
2. Dry bulk
3. Ro/Ro
4. Large Ferries
TOTE has acquired 25 ISO LNG containers
Transfer 750 m3 LNG in 6 – 8 hours
(TOTE’s 2 Marlin type vessels LNG storage capacity is 1.800m3 each)
Making it easy to tender LNG – TOTE owns its own flexible supply chain
MovingEnergy develop your business