Liquiefied Natural Gas

ESPO’s view and selected ongoing projects in European ports

European Bunker Fuel Conference, Rotterdam, 22-23 May

Dr Antonis Michail, Senior Advisor, ESPO
1. ESPO’s view on LNG

2. Selected projects in European ports

3. Conclusions
European Sea Ports Organisation

- Founded in 1993
- Represents European seaport authorities
- Members from EU and neighbouring countries
- Secretariat in Brussels
- Recognised counterpart of EU institutions
- A lobby and a knowledge network
ESPO & the Environment

Encouraging ports to be **proactive in protecting the environment** by:

- Providing guidance and preparing recommendations on environmental management (Green Guide)
- Drafting guidelines on specific issues (e.g. nature protection)
- Developing and promoting tools and methodologies for port environmental management (EcoPorts tools)
- Providing the platform for port cooperation and sharing of environmental experience (EcoPorts network)
- Visibility and credit to frontrunners (ESPO Award, EcoPorts labeling and certification)
Why LNG?

★ New regulations:
  □ SOx, 0.1% by 2015, 0.5% globally by 2020
  □ NOx, Tier III limitations for all ships built after January 2016*
  □ CO2 emissions – MRV directive
  □ Directive on the deployment of alternative fuels infrastructure

★ LNG as a ship fuel would comply with all new regulations
  □ NOx: 85-90%
  □ SOx: 100%
  □ Soot/particles: 100%
  □ CO2 reduction (20-25%)

★ Proven technology
  □ Around 30 LNG fuelled vessels in operation
  □ Boil-off used on LNG carriers

LNG appears to be the most complete medium term viable solution
Port perspective

★ Maintaining / restoring the green image of shipping...
★ ...while maintaining its competitiveness
★ Reducing impact on local air quality (SOx, NOx, PM) – Top priority 2013!
★ Maintaining good environmental conditions in the port area to ensure license to operate and to grow
★ LNG appears to be a very promising medium term solution

Source: ESPO Environmental Review 2013
Directive on alternative fuels

★ Member States shall ensure, through their national policy frameworks, that an appropriate number of refuelling points for LNG are put in place at maritime ports to enable LNG inland waterway vessels or sea-going ships to circulate throughout the TEN-T Core Network by 31 December 2025 at the latest.

★ "Refuelling point for LNG" means a refuelling facility for the provision of LNG, consisting of either fixed or mobile facility, offshore facility, or other systems.
Main challenges for LNG

- Safety concerns
  - On-board vessels and in relation to port operations
- LNG bunkering
  - Port regulations and impact on operations
- Infrastructure
  - Development of supply chain
  - Chicken-and-egg cycle
- Vessel application
  - Added costs for a new build
- LNG price

What can be done by ports?
Content

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WPCI LNG – focus safety and awareness

Harmonization of the approach of ports towards developing rules and regulations regarding LNG as fuel and creating LNG awareness.

3 main areas of focus:
- WP 1: Bunker checklists and accreditation
- WP 2: Risk perimeters
- WP 3: LNG Awareness
# WPCI LNG Fuelled Vessels Working Group

<table>
<thead>
<tr>
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<th>2013</th>
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<td>Q1</td>
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- SWG 1: Draft bunker checklists
- SWG 1: Draft accreditation guideline
- Industry reference group meeting 8th of October in Antwerp
- SWG 2: Report LNG risk perimeters
- IMO 0,1% Sulfur Regulation within SECA
- SWG 3: Launching LNG website
WPCI LNG – open to all interested ports

**Active**
- Amsterdam
- Antwerp
- Bremen
- Brunsbuttel
- Fujairah
- Gijon
- Gothenburg
- Hamburg
- Le Havre
- Long Beach
- Los Angeles
- Rotterdam
- Stockholm
- Wilhelmshaven
- Zeebrugge

**Consulting**
- Broome
- Flinderports
- La Spezia
- NY and NJ
- Singapore
- Taranaki
- Valencia
- Tallinn

For questions/comments or to join the project contact: Tessa.Major@haven.antwerpen.be
Baltic ports LNG TEN-T project

- 7 ports around the Baltic Sea plus supporting ports; supported by BPO, ESPO and many industry organizations (ship-owners, national ports organizations)

www.lnginbalticseaports.com
Focus on pre-investment studies such as environmental impact assessments, feasibility analyses for LNG terminals or bunkering vessels, project designs, regional market studies, safety manuals, etc.

Project works include a ‘stakeholder platform’ which will facilitate a discussion among various actors, such as port authorities, shipowners, gas infrastructure providers, energy traders and bunkering companies.

Stockholm – actual LNG bunkering!

- Viking Grace – daily service from Stockholm to Turku
- Daily bunkering in Stockholm
Stockholm - LNG bunkering chain

LNG terminal Nynäshamn

3 trucks with trailer

Bunker vessel SEAGAS

Loudden Energy Port

Stadsgården
Gothenburg – New LNG terminal

Construction 2014
Planned services to be offered

<table>
<thead>
<tr>
<th>Product/services</th>
<th>Description</th>
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<tr>
<td>(Un) loading slots for ships</td>
<td>Unloading and loading of all LNG vessels at the coastal quay’s will be possible up to 16,400 m³ vessels. If needs grow, the Jetty 519 can take ships up to 75,000 m³ (max draft 12.5 meters)</td>
</tr>
<tr>
<td>Storage capacity</td>
<td>Firm and temporary storage entitlements 7,000 – 30,000 m³</td>
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<tr>
<td>Ship bunkering</td>
<td>Loading of bunkering vessels, minimum size 300 m³. It will also be possible to load within the Energy harbour at quay from truck.</td>
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<td>Regasification</td>
<td>Injection to grid up to 90,000 Nm³/hour</td>
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<td>Truck loading</td>
<td>Loading of trucks up to 14,000 trucks/year</td>
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<tr>
<td>Railcar loading</td>
<td>Loading of rail cars up to 1,850 per year</td>
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Rotterdam – LNG hub

**Gate terminal:**
- 2013: Export facility

**Breakbulk terminal:**
- 2014: Start up truckfilling station
- 2015: Start-up LNG BB terminal

**Bunkering Seinehaven:**
- 2011: Argonon: 1st inland vessel on LNG
- 2013: Greenstream: 1st single fuel vessel

**LNG small scale infrastructure:**
- 2014: Commercial LNG Bunker station for inland vessels
- 2014: 3 LNG tankstations for trucks

**Ambition:**
- 2015: LNG bunker barge operational in Rotterdam
Rotterdam – LNG safety assumptions

- LNG carrier/bunker vessel = normal tanker carrying dangerous goods
- LNG fuelled ship = normal ship, no extra port regulations
- LNG bunker company: accreditation
- Port Bye Laws in Rotterdam:
  - Shore-to-Ship bunkering: 1st July 2013
  - Ship-to Ship bunkering: 2014
Rotterdam – Gothenburg TEN-T project

- Market catalyst, small scale distribution chain
- Preparations ongoing, total budget €184 mln
- Submitted to MoS TEN-T 2012-2015
- Operational 2015, 2017
Zeebrugge – existing LNG terminal

- Operational since 1986
- Bunker vessel (port, FLUXYS, private parties) 2015
- Second jetty construction 2015

LNG storage capacity: 324,000 m³

2nd LNG-jetty for reloading smaller LNG ships and bunker ships under construction
Port of Antwerp

“In 2015 pioneer shipping owners should be able to bunker LNG as a fuel for their vessels in the same way as conventional fuels are being bunkered today.”

★ Phased approach:
- Develop bunkering procedures and assess the safety aspects of LNG in the port environment (implemented – March 2014)
- Develop required supply chain and needed infrastructure
- Influence public awareness (WPCI LNG Leader)
- Support LNG pioneers
Port of Antwerp – LNG bunker vessel

★ Kick-start market development
  □ Share the risks
  □ Break the chicken-and-egg cycle
  □ Non-discriminatory exploitation

★ Call for tender
  □ Conceptualising, build and operation of an LNG bunker vessel
  □ WITH participation of the Port of Antwerp
  □ Awarded to Exmar Marine NV
Port of Hamburg

- Ongoing assessments for LNG storage facility, berth for a bunker barge and bunkering locations
- Approval process - LNG barges for providing electricity to vessels at berth
Tallinn – LNG terminal

- Full third party access
- Re-gas capacity (regional consumption)
- **LNG bunkering**, truck loading facilities
- Approval pending, Estonia or Finland
- 2016-2020
Finland – Bay of Bothnia project

SHIP UNLOADING
30000 m³

SHIP BUNKERING
300-800 m³

SHIP LOADING
3000-5000 m³

SATELLITE TERMINAL

TRUCK LOADING

70 000 m³

LNG VAPORIZATION FOR FUEL GAS
BOG
LNG

LNG VAPORIZATION FOR POWER PLANT
LNG
Finland – other ongoing projects

- Large scale LNG import terminal to be connected to the natural gas transmission network (Inkoo)
- Mid-scale LNG terminal(s) to serve new markets (e.g. maritime transport)
- Gassum is carrying out LNG import terminal projects in various locations
LNG Action Plan for shipping 2013 – 2017

This Action Plan, prepared under the leadership of the Finnish Ministry of Transport and Communications, is aimed at promoting the use of liquefied natural gas (LNG) in shipping on the basis of the following guidelines:

- **focus resources on providing LNG bunkering in Finland**, taking into consideration synergies with domestic industry and heavy vehicles, and the need for an EU-wide LNG infrastructure;

- **examine the use of financial incentives**, such as investment aid and guarantees for ship acquisitions, in the construction of LNG infrastructure and procurement of LNG-powered ships; and

- **work actively at international level** (IMO, EU and HELCOM) to promote the use of LNG as ship fuel, including efforts to establish LNG infrastructure and draft the associated regulations and guidelines, particularly for LNG bunkering.
Danish ports – ongoing projects

5 ports:
- Port of Skagen
- Port of Hirtshals
- Port of Aarhus
- Samsø Island ferry
- Copenhagen Malmö Port
Denmark’s first LNG fuelled Domestic ferry
October 2014

May 2012
National project with EU funding on the need for LNG infrastructure

LNG bunkering for cruise vessels April 2015

TEN-T project 2010 – Dec 2014
Ports in Copenhagen-Malmö, Helsingborg, Stockholm, Helsinki, Turku and Tallinn
Feasibility studies are finalised.
Next step: Operators

May 2013 LNG ferry Bunkering in Norway
Port of Vigo

- February 2014: LNG bunkering by truck to towboat “Borgoy”
- Internal regulations on LNG Bunkering were developed
Port of Vigo

- Project: LNG containers for generating and providing electricity to vessels at berth (2013 – 2014, around 2 mln Euro)
- Bunkergas project: Developing a bunker vessel to serve the Spanish Atlantic coast
Content

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Conclusions

- LNG is at the present the most complete medium term viable solution – still not a “silver bullet”
- Several ongoing port projects in Europe
- Ongoing EC, EMSA initiatives (ESSF)
- Good progress but also remaining challenges
- Pressing timetables, complementarity of compliance strategies and solutions
Thank you for your attention!

European Bunker Fuel Conference, Rotterdam, 22-23 May

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