LNG as a Business Opportunity for the South Baltic Sea Area

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1. **Know WHY?**
   - Role of Gas in the E-27 Energy Mix
   - Price Developments of Natural Gas & LNG
   - Why LNG and LNG Role in the EU Gas Imports

2. **Know WHAT?**
   - MarTech LNG Project

3. **Know HOW?**
   - MarTech LNG Project activities
Wealth flows from Energy and Ideas.

William Feather
History of Natural Gas

- China first to use Methane 2500 years ago the Chinese started to hardness (pipe) the natural gas for the purpose of heating water to obtain salt*

- In England since 1659
  - Lenoir-Gas-Engine (1860)

- In USA first mass use since 1816 in gas lamps to illuminate the streets of Baltimore

http://www.autofoundry.com/

Wealth flows from Energy and Ideas
William Feather
EU-27 Energy Mix in 1995 (%)
EU-27 Gross Inland Consumption: 1668 Mtoe

EU-27 Energy Mix in 2010 (%)
EU-27 Gross Inland Consumption: 1759 Mtoe

Source: EU Energy in Figures, 2012
Growth in total primary energy demand

http://www.iea.org/
EU-27 gas consumption by sector

EU 27 GAS CONSUMPTION, IMPORTS AND PRODUCTION (IN TWH)

Source: Eurostat
EU 27 GAS CONSUMPTION Q/Q-4 CHANGE (%)

Source: Eurostat
EU 27 GDP CHANGE (%)

Source: Eurostat
EU Imports of Gas – 2010 (%)

Total EU-27 Gas Imports: 371,783 million cubic metres

Source: http://ec.europa.eu/energy/
Routes of LNG Transport 2010

http://www.eon.com/
COMPARISON OF WHOLESALE GAS PRICES
UK vs. US

Source: Platts and Thompson Reuters
LNG GAS PRICES IN EU MEMBER STATES

Source: Eurostat COMEXT
LNG PRICES IN EU, US, JAPAN AND KOREA

Source: Eurostat Comext, Gas Strategies
LNG Prices (2012)

RETAIL GAS PRICES IN EU MEMBER STATES FOR INDUSTRIAL CONSUMERS (2012)

http://ec.europa.eu/energy/observatory/gas
EU-27 gas consumption by sector

2011

Power generation: 35.00%
Households: 25.00%
Industry: 20.00%
Services: 10.00%
Transport: 0.00%

Ratio of industrial energy prices relative to the US prices due to LNG imports

Source: World Energy Outlook 2013
Shale-gas share in total gas production
- from 2000 to 2010
- from 0% to 29%

2010 USA totally refused from gas import due to home shale gas production

Earlier imported gas to USA goes now to
- Asia & Europe
- non-pipeline transport
- → LNG transport

Gas handling increase in 2010
- Via pipelines: 5.4%
- Via LNG: 22.6%

In 2016 USA and Canada will start to export gas via LNG
Indicative economics of LNG export from the US Gulf Coast (at current prices)

http://www.iea.org/
E.ON signs medium-term LNG supply agreement

By CHESTER DAWSON And HENDRIK VARNHOLT
June 3, 2013 1:10 p.m. ET

News » Others » LNG to be available in Hamburg and Bremerhaven by 2015: Bomin Linde LNG starts the implementation process for both terminals

LNG to be available in Hamburg and Bremerhaven by 2015: Bomin Linde LNG starts the implementation process for both terminals

Starting from the strategic hubs Hamburg and Bremerhaven, neighbouring ports such as Kiel, Lübeck, Rostock or Wilhelmshaven can be reliably supplied with LNG. "We are fully on track with the projects and will be able to provide ships in all German ports along the North and Baltic Sea with LNG as a clean fuel," said Bomin Linde LNG Managing Director Ruben Benders. "This is an important step to establishing LNG as a marine fuel," added Mahinde Abeynaike, also Managing Director of Bomin Linde LNG. "The shipping industry needs secured supply of LNG at ports. This is crucial for the success of this economically attractive and green fuel."

"An LNG terminal in Hamburg is key for the long term sustainability of the port – both from an economic and ecological point of view. As a part of our strategic reorientation 'smartPORT Energy', it will support the reduction of air pollutants and carbon dioxide emissions," said Jens Meier, CEO of the Hamburg Port Authority (HPA).

It marks the first contract for a Canadian LNG export plant with a major end-user of gas, something that has so far eluded several proposed liquefaction facilities envisioned for Canada's Pacific coast, which are geared toward Asian markets.
Selected LNG Projects in Mass Media

Overview of RWE LNG Business

LNG Fleet
- Excalibur (traditional vessel)
- Excelsior
- Excellence
- Excelerate
- Explorer
- Express (due Q2 09)
- Exquisite (estimated Q3 09)
- Exemplar (estimated Q4 09)
- Expedient (estimated Q1 10)

> Total capacity at Excelerate entry points ~154 cargoes per year
> RWE Dea upstream positions with LNG potential

http://www.rwe.com/
RELEASE

Gazprom and Enagas: Baltic LNG to Europe and Latin America

December 12, 2013, 20:05

The Gazprom headquarters hosted today a working meeting between Alexey Miller, Chairman of the Company's Management Committee and Marcelino Oreja, Chief Executive Officer of Enagas.

The parties considered the possibilities of cooperation in liquefied natural gas (LNG) supplies, particularly from the Baltic LNG project to the European and Latin American markets. The meeting noted that Spain had a potential to become one of the major consumers of LNG from the project.
LNG facts

- 600 m³ become one cubic metre
  - Natural gas (Methane / Ethane) cooled to -162 °C

- LNG can be transported at near atmospheric pressure in special tanker vessels with insulated storage tanks.

- In the port of destination, it is heated in a simple process and returned to its gaseous state so it can be transported by pipeline to the end users

- Low-cost alternative to pipeline gas
  - While the demand for natural gas is continuing to rise in both Germany and the EU, European gas production is declining

- Now (2012) LNG accounts for one quarter (ca. 25%) of the world's natural gas trade
Gas and ship fuel prices (monthly averages)
LNG as Shipping Fuel

Source: Norwegian Maritime Authority
Emissions

Source: Norwegian Maritime Authority
Problem of LNG Infrastructure Development

Reduced sulphur content requirement

Port Developers
- Continue normal bunkering operations (MDO & HFO)
- Construct LNG port

Ship Owners
- Shift to MDO Consumption
- Shift to HFO Consumption
- Build LNG Fueled Ships

The classic Chicken-and-Egg Problem: who will act first?
LNG Shiping fuel

Opportunities
- LNG may replace heavy fuel oil and marine gas oil

Challenges
- Gas / LNG fuel safety shall be further developed
- Underdeveloped LNG supply chain and deficit in bunkering station in ports

Source: Norwegian Maritime Authority
Methane / LNG as Shipping Fuel

- **A clean fuel** Can meet the IMO tier 3 requirements on emissions

- **Economical**
  - LNG has the potential to be economical competitive to heavy fuel oil (HFO)

- **Quantity**
  - The predicted amount of natural gas is huge. May last for the next 1000 years if Gas Hydrates are included
50 year Safety record on LNG Shipping

180 Ship-LNG accidents;
- 1 fatality – valve material
- 5 gas fires
- 2 fires engine/insulation
- 2 explosion engine room
- 1 explosion cargo compress
- 21 spills w/cracks
- 24 collisions no spill
- 8 ground-/stranding no spill
- 11 barrier failure no spill
- 7 mooring failure no spill
- 9 cargo pumps no accident
- 89 Engine/shaft/rudder and other ship systems.

Source: Norwegian Maritime Authority
Accidents in conjunction with bunkering

- One problem with valve system on semitrailer. Very small spill onshore.
- One leakage on hose and a small spill of LNG onshore (1 liter)
- No other accident recorded in BSR till 01.09.2013
- One LNG accident resulting in need to rebuild steel happened at one Yard before delivery
Know - WHAT
Maritime Technology & Knowledge Transfer for LNG

- EU Project
- South Baltic Cross-border Co-operation Programme 2007 - 2013

- Project time
  - Jan 2012 - Dec 2014
  - poss. Extension to 2015

Know-Who? - Partner-Network
- Klaipeda Science and Technology Park (LT)
- Klaipeda State Seaport Authority (LT)
- Klaipeda Shipping Research Centre (LT)
- Wismar University of Applied Sciences (DE)
- ATI erc gGmbH (DE)
- Maritime University of Szczecin (PL)
- Blekinge Institute of Technology (SE)
- Maritime Development Center of Europe (DK)
Know - HOW
MarTech LNG Project’s Main Activities

- Mapping of regional LNG related interests & potential
- Promoting LNG technologies in the region
- Ensuring the durability of LNG content in the region
- Networking platform for future cooperation proposals and industry related tenders

Outputs:
- Analysis of Supply chain for LNG infrastructure in the part. Regions
- LNG Promotion and competence building
- Training programmes
- Stimulation LNG related entrepreneurial activities
Tracing LNG development in the SBSR
MT LNG - Marine Competence, Technology and Knowledge Transfer for LNG (Liquid Natural Gas) in the South Baltic Sea Region

The project aims at transferring tested and proven LNG knowledge and technology to implement into the South Baltic countries that are currently building LNG terminals.

The problematic nature of the project initiative is based on a current situation indicating that declared investments in Poland and Lithuania will not be a big benefit for the regional maritime industries because of the lack of technologies and relevant competences in respects of terminal construction and operation. This will instead be outsourced out of the countries of the SBR.

Supplying the local maritime industries with the LNG building and operation knowledge will allow them to benefit from the investments and support the development of new products and services that are demanded in the global market thus strengthening the Baltic maritime Sector.

Further more the creation of a Baltic supply chain will establish cooperation in between regional maritime industries and scientific institutions – locally, nationally and internationally and support the creation of cluster development being able to respond to international trends in the future.
Thank you!

Energy is the key to Creativity. Energy is the key to Life
William Shatner