

LNG Infrastructure Development in European Ports

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BOMIN LINDE LNG

Introduction: Bomin Linde LNG is a 50-50 joint venture between Bomin and Linde – Founded in October 2012



Comments

§ Bomin: bunker supplier

§ Linde: manufacturer of industrial gases

§ Aim: Establishment of an LNG supply chain to supply safe and environmentally friendly fuel to shipowners and operators

§ Projects for the establishment of three small-scale terminals already in progress:

§ Hamburg

§ Bremerhaven

§ Rotterdam



Introduction: Bomin Linde LNG has strong shareholders with experiences in all areas relevant for LNG bunkering



Company

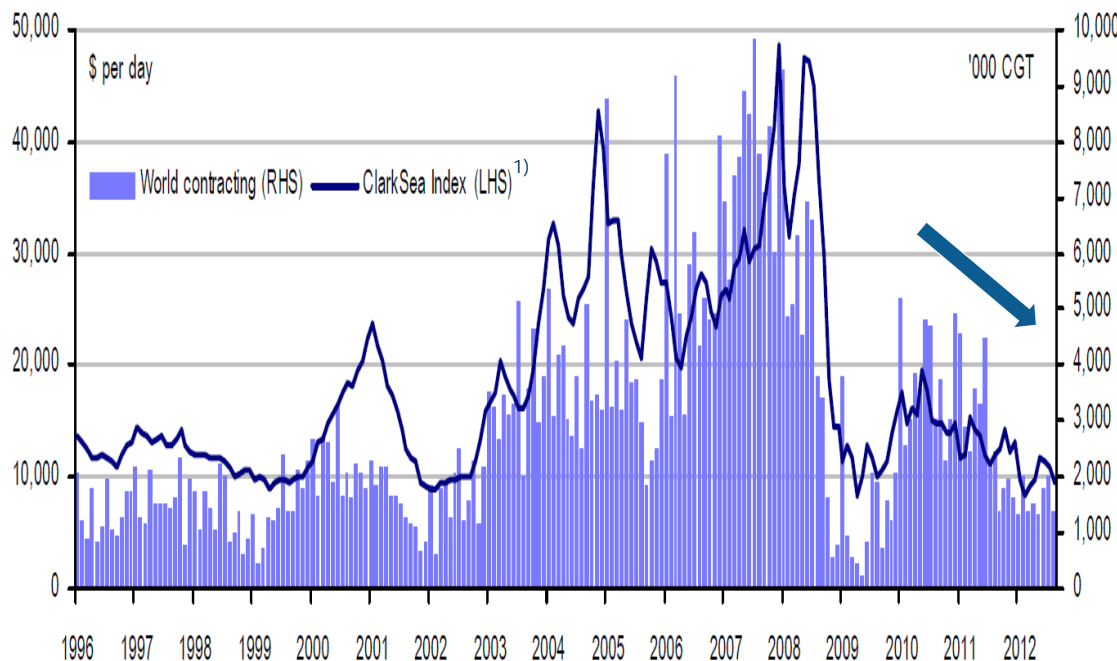


Key facts

§ EUR 17,3 bn in revenue (2011), ca. 4.200 FTE	ü 60+ years of experience in oil and energy business
§ Businesses: oil trading, tank terminal storage, aviation fueling, gas supply, biogas, biofuels, quality management	ü Largest privately owned natural resource trader in Europe
§ Offices in 30 countries on 5 continents	ü Fortune Global 500 company
§ EUR 4.6 bn+ in revenue (2011), ca. 300 FTE	ü 35+ years of experience in the bunker industry
§ Businesses: cargo trading, bunker fuel and lubricants supply, services to shipping industry	ü Reputation of reliable and responsible supplier
§ 36 offices on 5 continents	ü Physical presence in strategic locations worldwide
§ EUR 13,8 bn in revenue (2011), ca. 62.000 FTE	ü 130 years of experience in gas and engineering industry
§ Businesses: industrial and medical gas sales, plant engineering, end-to-end supply chain solutions	ü World-leading gas and engineering company
§ 407 offices on 5 continents	ü S&P credit rating: A with stable outlook

Market: Shipping crisis poses a serious challenge for investments in LNG engines or tanks

Global ship contracting activity compared with freight rates 1996 – Sep 2012 [000 CGT] [USD/day]



Comments

- § Crisis in the shipping sector still remains challenging
- § Ship owners and funds struggling with high debt levels – approx. 800 funds threatened by insolvency
- § Banks unwilling to provide financing – most of the 20 top ship financing banks have stopped / significantly decreased activities

¹⁾ ClarkSea Index is a weighted index indicating average earnings of Tanker, Bulk, Gas and Container vessels - commonly used indicator to assess the development of the global shipping industry

Three possibilities to meet the new emission limits but LNG is by far the most environmentally friendly solution

Liquid Natural Gas (LNG)



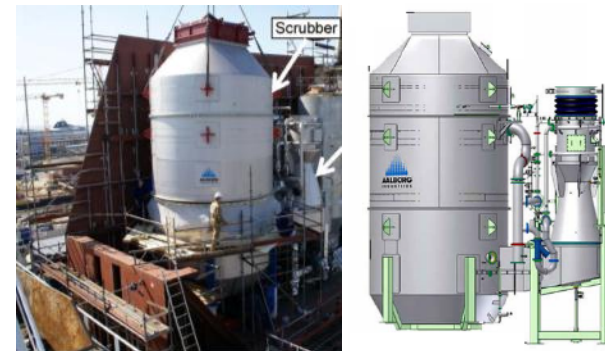
- § Natural gas liquified via cooling and concentrated by factor 1/600 – stored at -160°C
- § Main component: methane
- § Reduces sulphur- and nitrogen-oxide emissions

Marine Gas Oil (MGO)



- § Marine fuel with a lower sulphur content ($<0.1\%$)
- § Distillate of heavy fuel oil
- § Reduces sulphur-oxide emissions – no effect on nitrogen-oxides

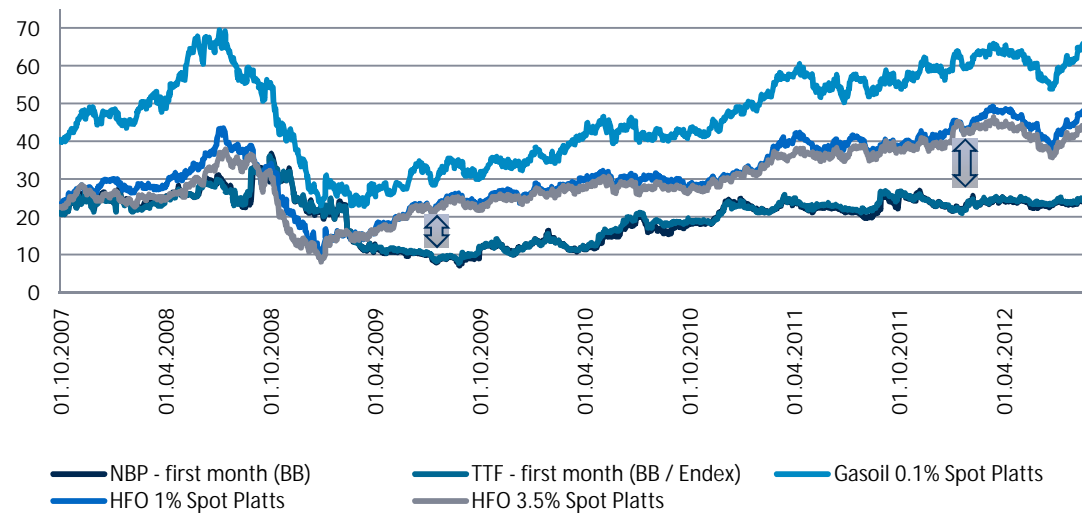
Scrubber



- § Fixed system built into the exhaust of a vessel
- § Retrofit, tests and certification requires ca. 6-7 weeks
- § Reduces sulphur-oxide emissions through filtering exhaust fumes – no effect on nitrogen-oxides

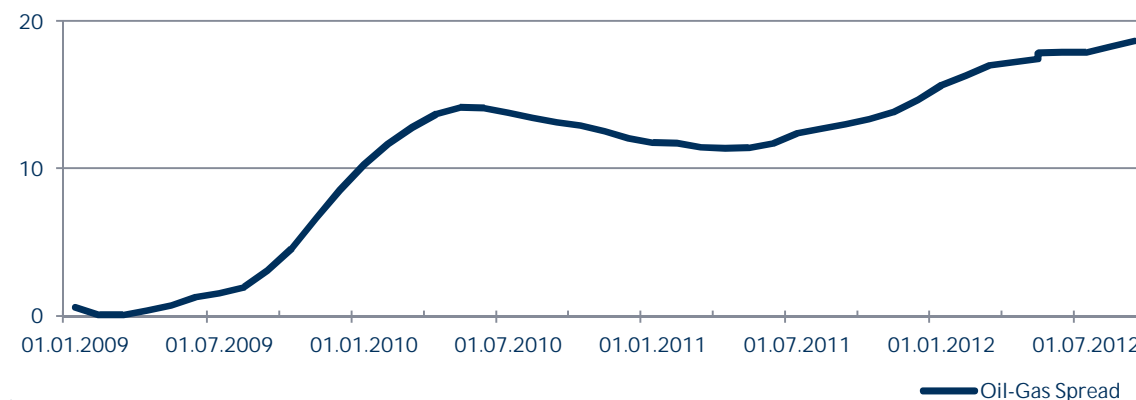
Increasing price difference between gas and oil strengthens USP of LNG as bunker fuel

Fuel Type Spot Prices & Oil-Gas Spread¹⁾ [EUR/MWh]



Comments

- § Since 2009 price differences between MGO, HFO and gas products are increasing
- § Especially since the beginning of 2011 oil and gas prices have developed into opposite directions
- § Further increase of the gas-oil spread not unlikely in the future due developments like shale gas exploration



¹⁾ 12 months moving average of NBP and TTF vs. Average HFO 1% and HFO 3.5%

Strong political support for LNG has been expressed, but how will the roll-out look like?

SECA: Northern- and Baltic Sea



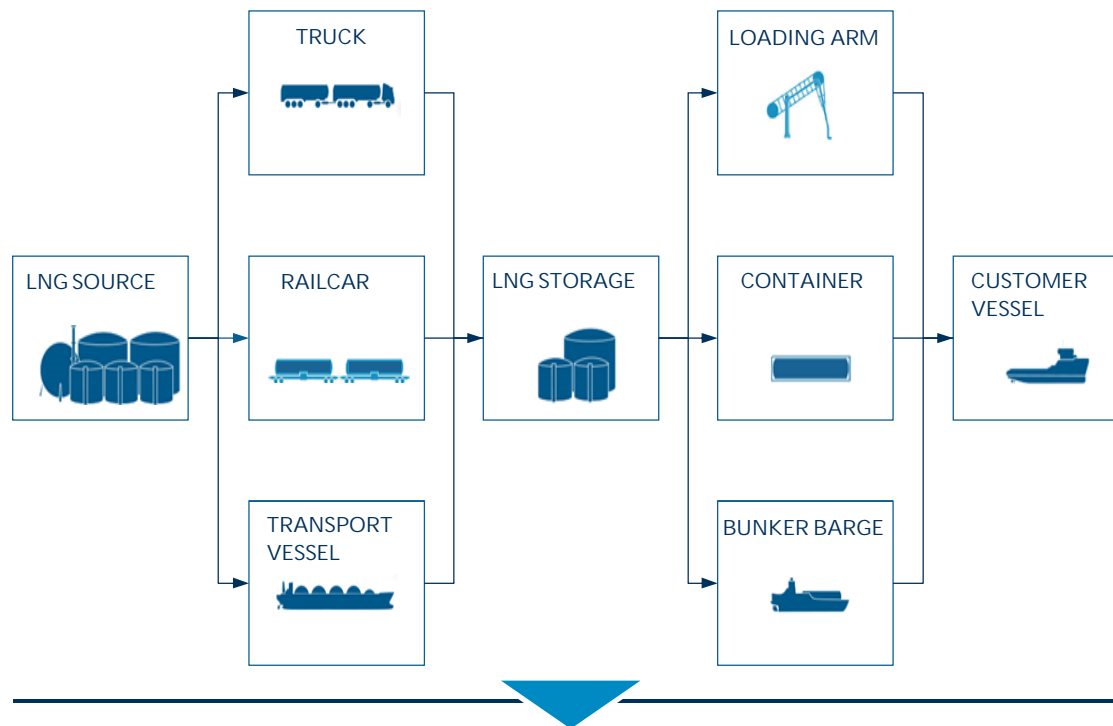
"The Commission is proposing that LNG refueling stations be installed in all 139 maritime and inland ports on the Trans European Core Network by 2020 [...]. This covers all major EU ports."

European Commission

What is the likely scheme to be followed when rolling out LNG infrastructure in European ports?

Economies of scale make roll-out starting in selected ports with high demand to be a very likely scenario

Liquid Natural Gas Supply Chain



Local economies of scale: Roll-out likely to start in selected ports („anchor points“) and then „spread“ to surrounding locations

Comments

§ LNG infrastructure involves several volume-dependent elements:

§ Transport – decreasing costs per ton with increasing volumes

§ Tanks – decreasing costs per additional tank due to modular construction

§ Bunkering – increased utilization of bunker barges will recoup high initial investments

Backup: storage and logistics of LNG more expensive and complex than for traditional bunker fuels

HFO/MGO Tank



- § Heated storage with temperatures from 60° - 80° C
- § Atmospheric pressure
- § Conventional pipes – highly flexible

Liquid Natural Gas Bullet Tanks



- § Cryogenic tanks with temperature at -160° C
- § Highly pressurized at ca. 4 -7 bars
- § Vacuum-insulated piping – limited flexibility

How can local institutions foster LNG infrastructure investments in their port?



Measure to be taken by port operators / local institutions

Marketing support

- § Actively promote LNG as a marine bunker fuel in the local community
- § Identify potential customers planning LNG-fuelled or dual-fuelled ships and set up joint pilot projects
- § Operate port-owned vessels on LNG

LNG infrastructure project support

- § Support in search for suitable premises
 - § Unloading LNG from truck, vessel or from railcar to storage tank possible
 - § Direct bunkering from shore (e.g. from truck or loading arm) possible
 - § Loading LNG on a bunker barge possible
- § Port fee reduction, e.g. for ships supplying LNG to SSC terminals and / or LNG fueled ships

Regulatory / permitting support

- § Foster closing of regulatory gaps, e.g. for ship-to-ship bunkering
- § Local support in permitting processes

Thank you for your attention.



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