LNG Shipping Symposium Northern Germany

Small scale distribution for coastal and short-sea shipping
Session II – The economic aspect

Klaipeda, 17. Oktober 2014
Trond Jerve - Bomin Linde LNG
Dr. Thomas Tork - Linde Gas AG
Example of LNG pricing, delivered as ship fuel in Europe

<table>
<thead>
<tr>
<th>Gasprice &amp; Liquefaction</th>
<th>Large Scale Logistics / Import Terminal</th>
<th>Small-Scale Logistics</th>
</tr>
</thead>
</table>

Source: Bomin Linde LNG
Spread between oil and gas has been growing for years – U.S. LNG exports to support this trend

Price development of selected fuel types [Euro/MWh]

Comments

- Additional demand for MGO as of 2015 could lead to higher prices
- Significant potential for decrease of LNG prices:
  1. Start of U.S. LNG export
  2. Restart of nuclear plants in Japan
  3. Large LNG projects in Australia going live
  4. Russian-Chinese pipeline to reduce future LNG demand in China

23/10/2014 Source: Reuters, Platts, Datagenic, Bloomberg, BominLinde LNG
A wide variety of LNG price indexations and flexible contract durations can be offered

### Contract Durations

<table>
<thead>
<tr>
<th>Duration</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term contract (&lt;3 years)</td>
<td>Offered by Bomin Linde LNG including specific conditions</td>
</tr>
<tr>
<td>Mid-term contract (3-5 years)</td>
<td>Offered by Bomin Linde LNG</td>
</tr>
<tr>
<td>Long-term contract (5 – 10 years)</td>
<td>Offered by Bomin Linde LNG</td>
</tr>
<tr>
<td>Spot cargos</td>
<td>Not standard offer – to be discussed</td>
</tr>
</tbody>
</table>

### LNG Indexations

<table>
<thead>
<tr>
<th>Indexation</th>
<th>Type</th>
<th>Hub/Index Location</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title Transfer Facility (TTF)</td>
<td>Gas</td>
<td>The Netherlands</td>
<td>Default</td>
</tr>
<tr>
<td>National Balancing Point (NBP)</td>
<td>Gas</td>
<td>United Kingdom</td>
<td>Default</td>
</tr>
<tr>
<td>Henry Hub (HH)</td>
<td>Gas</td>
<td>U.S.A.</td>
<td>Default</td>
</tr>
<tr>
<td>Marine Gas Oil Futures (ICE)</td>
<td>Oil</td>
<td>Europe/USA/Canada</td>
<td>Optional</td>
</tr>
<tr>
<td>Brent Futures (ICE)</td>
<td>Oil</td>
<td>Europe/USA/Canada</td>
<td>Optional</td>
</tr>
</tbody>
</table>
Important drivers for LNG Price: supply chain, bunkering location, -method and -frequency

Most common Small-Scale LNG Supply Chains

Comments

- Bomin Linde LNG optimizes the LNG supply chain jointly with the customer
- Wide range of LNG prices due to different customer requirements
- LNG supply chain should be considered in early project stage
LNG today competitive with Marine Gasoil – economies of scale and location essential

Fuel: Cost perspective in shipping (MWh)  
Costs + optimisation from supplier perspective

- Optimal mix of A, B and C
- Cost of capital
- Fuel costs
- Small Scale Logistics
- Small scale mark-up
- Gasprice

Levers: Subsidies & learning effects
- Economies of scale
- Spread Oil-Gas (→ Shale Gas)

23/10/2014 Source: Bomin Linde LNG
Depending on volume demand, bunkering location and method BLLNG offers LNG prices in MGO & HFO range

Overview: price quotes¹) for LNG supplied by Bomin Linde LNG

1) Note: price quotes heavily dependent on bunkering location, bunkering method as well as volume demand – quotes depicted include supply via terminal, truck, ship and containers

Source: Bomin Linde LNG
Differentiate yourself with LNG as a financially superior and clean marine solution.

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Mail: info@bominlinde.com
Web: www.bominlinde.com
Bomin Linde LNG is backed by solid and highly committed shareholders

Key facts

- **EUR 17 bn in revenue (2013), ca. 9,280 employees**
- Businesses: oil trading, tank terminal storage, aviation fueling, gas supply, biogas, biofuels, quality management
- Offices in 30 countries on 5 continents
- 60+ years of experience in oil and energy business
- Largest privately owned natural resource trader in Europe

- **EUR 16.7 bn in revenue (2013), ca. 63,500 employees**
- World-leading gases and engineering company: industrial and medical gases sales, plant engineering, end-to-end supply chain solutions
- German blue chip company (DAX listed)
- 452 offices on 5 continents
- 130+ years of experience in gases and engineering industry
Oiltanking and Linde Industrial Gases jointly have a strong strategic presence with 326 locations worldwide.

Locations: Oiltanking and Linde Industrial Gases

- Oiltanking owns and operates 73 tank terminals in 23 countries in Europe, North and South America, as well as in the Middle East, India and Asia.

- Linde Industrial Gases operates 253 facilities in 84 countries on 6 continents.
Impressions: layout of a Bomin Linde LNG fueling terminal
Impressions:

*SEAGAS* fueling vessel traveling near Stockholm
Impressions:
Fuelling of the Viking Grace via *SEAGAS* fueling vessel
Together with its partners Bomin Linde LNG developed the procedure for truck-to-ship purging operations

Truck purging operation – impressions

Comments

- Bomin Linde LNG performed a purging operation for AGA AB, a Scandinavian subsidiary of the Linde AG, which is one of the shareholders of Bomin Linde LNG

- Together with Euroservices, Bomin Linde LNG developed the procedure for truck-to-ship purging operations

- BLLNG also designed the equipment used for purging operation – tailor-made couplings, hoses and valves

- Operation lasted ca. 50 hours with 7 people involved and 2 trucks operating around the clock (24/7)
Higher LNG prices in Asia due to shut-down of nuclear plants – Lower prices in North America due to shale gas

U.S. pipe-gas and landed LNG prices in selected countries [USD/MMBtu]

- Cove Point USD 2.44
- Lake Charles USD 3.40
- United Kingdom USD 6.60
- Spain 9.15 Euro
- Belgium USD 6.78
- Japan USD 10.50
- Rio de Janeiro USD 9.92

Actual landed LNG prices for September 2014
Excluding the cost of liquefaction (natural gas)

Small Scale LNG track record: Linde has been involved in many milestones of small scale LNG development

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity (tpd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gablingen, Germany</td>
<td>21</td>
</tr>
<tr>
<td>Tasmania, Australia</td>
<td>50</td>
</tr>
<tr>
<td>Bergen, Norway</td>
<td>120</td>
</tr>
<tr>
<td>Kwinana, Australia</td>
<td>175</td>
</tr>
<tr>
<td>Stavanger, Norway</td>
<td>900</td>
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<td>Shan Shan, China</td>
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Small to mid-scale liquefaction plants

Distribution & storage, refuelling equipment and components

Linde owned small scale LNG operations

Australia

Altamont, CA, USA

Scandinavia

23/10/2014 Source: Linde AG, Bomin Linde LNG
Bomin Linde LNG covers the entire value chain and develops the infrastructure for marine LNG bunkering.

Small-Scale LNG Supply Chain

- LNG Source
- Railcar
- Transport Vessel
- LNG Storage
- Loading Arm
- Container
- Fueling Vessel
- Customer Vessel
- Truck
- Vessel

Comments

- Bomin Linde LNG is covering the entire LNG value chain.
- This is enabled through unique competences as well as financial commitment internally as well as from the shareholder side.
- “Tailor made solutions” such as small terminals, containerized solutions and dedicated bunker vessels at individual bunkering locations can be realized depending on volume demand.
- “Economies of scale” is key for intermediate storage and transportation.
LNG bunkering operations in ports have to be jointly developed by several parties – checklists already exist

### Overview: LNG bunker operations in practice

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<table>
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<tr>
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<tbody>
<tr>
<td><strong>1</strong></td>
<td>Request allowance for LNG bunkering operations in port from harbour master and from local port authorities</td>
</tr>
<tr>
<td><strong>2a</strong></td>
<td>Refer to harbour master and port authorities to determine port specific safety requirements (e.g. tugboats, safety distances, specific location etc.)</td>
</tr>
<tr>
<td><strong>2b</strong></td>
<td>Depending on bunkering method, refer to supporting documents i.e. checklists &amp; guidelines published by <em>International Association of Ports and Harbours (IAPH)</em></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Determine and develop bunkering procedure with all parties involved (i.e. port authorities, client, LNG supplier &amp; other service providers etc.)</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Register the arrival of the LNG-fuelled vessel at the port where bunkering should occur in advance depending on local port operators</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Perform LNG bunker operation at designated location according to <em>IAPH</em> guidelines and local port regulations</td>
</tr>
</tbody>
</table>

### Comments

- **Regulations for LNG bunkering** (e.g. tugboats required, safety distances and buffer time) depend on *harbour master and local port authorities* (e.g. port of Antwerp requires 48 hours prior notice)

- **Regulations and safety requirements** as well as *IAPH checklists will differ depending on bunkering method* (e.g. shore-to-ship, truck-to-ship and ship-to-ship)

23/10/2014  Source: International Association of Ports and Harbours (IAPH), Bomin Linde LNG