Small scale LNG economics
LNG Fuel Forum – 20th September 2011
Stockholm

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- Neutral
- Flexible

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- Quality control

Energy Experts Alliance
- Global reach
- Local expertise

Energy Challenges
- Cost
- Consumption
- Carbon

Tailor-made Services
Procurement & Portfolio management

Bilateral brokerage
- direct market access
  - Best value chain for you
  - Security of supply

Risk management:
- Long term hedging
- Budget predictability
- Short term arbitrage
- Spot exposure

Agenda

LNG is a game changer for European gas prices
Gas pricing models & trends
LNG fuel competitiveness for marine usages
Ample European regasification capacity

Source: Gas Infrastructure Europe, 2011 and BP Statistics, 2011

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Belgium LNG imports

Source: Gas Infrastructure Europe, 2011 and IEA, 2011

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Global gas: 3 different price models

- Pricing models differ from Europe to North America and to Asia-Pacific

And LNG in this game?

HUB = free local market prices
OIL = basket mainly of oil products (HFO/GO) and Brent
JCC = Japan customs-cleared crude oil imports = 'Japan Crude Cocktail'

Agenda

- LNG is a game changer for European gas prices
- Gas pricing models & trends
- LNG fuel competitiveness for marine usages
Prices in Europe, US and Asia decoupled

LNG: a specific price? or many pricing models?

- LNG trading prices depends on:
  - Destinations:
    - US: market price (HH +/- discounts)
    - Asia: oil-parity in Japan (JCC +/- discounts), very low actual prices in China
    - Europe: a mix of both HUB and LTC signals
  - Flexibilities:
    - Long term contracts with secured volumes & destination clauses
    - Off-take from liquefaction plant is secured, but no destination clause
    - Full flexible LNG = spot sales

- Europe:
  - About 80% of LNG imports are long term contracted, with destination regas terminal set ex-ante, and with mostly oil-indexed pricing
    - Traditional South European markets: Spain, Portugal, Italy, France...
  - Only 15 to 20% is real flexible LNG and/or with gas market price indexation (short term maturities)
    - Free market model under development in North-West Europe
    - with expanding regasification terminals: UK, Belgium, Netherlands...

- LNG is for the time being a "price taker"
  - With expanding global LNG trades: possibly LNG becomes "price driver"
    - Specific price signal for LNG? (neither oil-indexed value, nor hub prices)
Supply merit order: which place for LNG?

- Future LNG import pricing will be set by its merit order ranking

- What Europe and importing countries want?
  - LNG = secured base supply?
    - To reach diversity of supply; Middle East, Nigeria, etc...
    - To compensate the European production decline
  - LNG = marginal & back-up supply?
    - To cover peak demand and/or seasonal modulation
    - To react to unexpected shortages in pipeline gas
  - LNG = optional supply?
    - To get arbitrage between LNG prices (short term prices on different hubs) against long term import contracts on borders ( +/- oil indexed value).

- What exporters want?
  - Arbitrage with other LNG importers?
    - Atlantic: arbitrage with Henry Hub (depressed shale prices) ? and South America?
    - Asia: arbitrage with Long term LNG imports contracts (oil parity + premium)?

Market price versus Long term contract value
Hub spot prices vs LTC value (monthly averages)

European gas prices - Long trend from 2002
Hub spot market prices compared to long term contracts' importation value

Seasonality (winter)
- Hub prices (NBP spot monthly averages)
- Long term gas export contract (German border)

To stay exposed to spot price volatility?

Dutch gas market: TTF spot range
Monthly averages of day-ahead prices

Day-ahead range
- Monthly averages range
- Yearly average
To get budget predictability with forward hedges

Dutch gas market - TTF trading range: locking prices forward vs staying spot exposed

Future calendar contracts vs. Actual average spot price

01.09.2011

Agenda

LNG import is a game changer for European gas prices

Gas pricing models & trends

LNG fuel competitiveness for marine usages
Possible value chains for LNG marine fuel

- Sourcing from Nordic production fields
  - Pricing model might be seen as expensive compared to actual hub/LNG prices:
    - Commodity: oil-indexed value: NET-BACK? Competition with other buyers?
    - Liquefaction and transmission: COST+

- Sourcing from existing European LNG import terminals
  - Pricing model should be more transparent
    - Commodity: market pricing is standard model: COST+ (spot ⇔ forward pricing)
    - Shipping & transmission: COST+

- Is there any "natural" monopoly?
  - Need to establish third party access to bunkering facilities?

Reload LNG from European import terminals

- LNG import terminals: enough place for competition?
  - Zeebrugge: reload facility does exist, still some questions:
    - Available slot access when needed to guarantee security of supply
    - Gas quality: calorific value, etc…
    - Reload pricing model.
  - Gate: studies to invest in reload jetty.
  - Future: UK? Poland?

- Commodity access: value proposition to be discussed
  - Long term competitive LNG availability is probably not a bottleneck
  - But: are European large importers interested in small scale LNG?
    - Few importers and traders are in the retailing business
    - Small scale shipping: solutions for spot trades, but for medium term secured deals?
    - Sending gas back to the Nordics?

- Infrastructure access: major bottlenecks
  - Small LNG carriers: few solution and competition for the time being.
  - Coastal bunkering terminal. Or bunker boats?
  - Semi-trailers road redelivery
Small scale LNG competitiveness

- Small scale LNG is not the same market as LNG global trade
  - Small scale LNG and LNG marine fuel are downstream retailing markets, with pricing models closer to standard natural gas marketing.

- European LNG import prices are diverse
  - Long term contracted LNG ↔ Flexible and spot prices LNG
  - Still many regional markets
  - No Global LNG prices
  - Main drivers for the future gas and LNG prices are highly uncertain

- European wholesale natural gas prices are not homogeneous
  - OTC ↔ Transparent organized exchanges
  - HUB prices ↔ Long term import contract pricing

- Retailing LNG: which pricing model will be applied by suppliers?
  - Net-back from alternative marine fuels: MFO, IFO, MDO, MGO...
  - Cost-plus from exploration + liquefaction + shipping
  - Depending on each supplier value chain (and buyer’s power…), a variety of combination of Net-back + Cost-plus approaches.

LNG fuel competitiveness to marine fuels

Net-back from alternative fuels
- MGO
- MDO
- IFO
- MFO

LNG fuel competitiveness increases

Cost plus from sourcing solutions
- Bunkering & Road re-delivery
- Shipping with small scale carriers/bunkers
- Reload at LNG terminal ↔ Liquefaction
- Sourcing molecule & pricing model:
  - local production ↔ long term imports ↔ spot flexible purchases

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Natural Gas competitiveness against MGO

Maritime Gasoil compared to gas prices

Source: Bergen Energi proxies, with Reuters, APX Endex and BAFA quotes

ENOUGH ROOM FOR SHIPPING and/or LIQUEFACTION COSTS?

Small scale LNG: several value chains for Nordic market

100 to 500 SEK/MWh

Supply & Liquefaction

WHICH SOURCE?
1. Imports from small scale LNG production (Norway)?
   Incl. liquefaction costs
2. other European regas terminals (Zeebrugge, Gate, ...)

50 to 100 SEK/MWh

Shipping & Transport

WHICH ROUTE?
LNG costs of transmission depends on:
• Maritime distances
• LNG carriers sizes
• Number of off-takers by carrier

50 to 100 SEK/MWh

Bunkering & Regas

STORAGE CAPACITIES?
How to follow the demand pattern on short term?
• Physical storages
• Flexible supply

WHAT BUNKERING AND DISTRIBUTION INFRASTRUCTURES?
• Costal bunkers: third party access?
• Bunker boats
• Semi-trailers for road re-delivery

Small scale LNG: a local retailing market, with European & global wholesale influences.

LNG marine fuel: a specific price to be based on replacement value toward marine fuels but related to specific costs of dedicated value chains.
Questions?

Alain BOURGEIOS
Vice President, Gas
+47 400 20 915
Bergen Energi AS - Fantoftvegen 38 - N-5072 Bergen – Norway
www.bergen-energi.com

DO YOU BUY ENERGY THE PROFITABLE WAY?
What is smart for others may not be smart for you

Back-up
Nordics: Hub versus Long term contract pricing

GTF spot price development versus Long term import contract value

05.09.11

Delivery date

- GTF (Nordpool gas day ahead, clearing price)
- GTF (Nordpool gas day-ahead, monthly average)
- German border oil indexed proxy (hist=BAFA, default setting=Proxy)

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Competition between hub prices & LTC pricing

Competing dual gas pricing - Front Year
Spread between oil-indexed value and hub market prices

Update: 8.9.2011

LTC proxies, HUB prices and spreads could differ depending on each country. Trends are still valid
Net-back  ⇔  Cost+

<table>
<thead>
<tr>
<th>UP</th>
<th>Gas importation price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sourcing costs</td>
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<td></td>
<td>Transmission &amp; storage costs</td>
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<td>Price formula hedging</td>
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<td></td>
<td>Commercial costs</td>
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<tr>
<td></td>
<td>Resellers margin (protected)</td>
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<tr>
<td>DOWN</td>
<td>Gas retail price</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>UP</th>
<th>Self production and/or wholesale market</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Sourcing costs</td>
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<tr>
<td></td>
<td>Balancing costs</td>
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<tr>
<td></td>
<td>Validity period hedging</td>
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<tr>
<td></td>
<td>Commercial costs</td>
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<tr>
<td></td>
<td>Resellers margin (challenged)</td>
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<tr>
<td>DOWN</td>
<td>Gas or Electricity retail price</td>
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Local production ⇔ Imports  
Pipe ⇔ LNG

Worldwide, main 3 regional gas markets are highly contrasted.

United States

<table>
<thead>
<tr>
<th>Unconventional</th>
<th>Conventional</th>
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<tbody>
<tr>
<td>Imports</td>
<td>Local Production</td>
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<tr>
<td>LNG</td>
<td></td>
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</tbody>
</table>

Source: ExxonMobil

Source: ExxonMobil

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European gas hubs

VIRTUAL POINTS

PHYSICAL POINTS

UK: National Balancing Point
Netherlands: Title Transfer Facility
Belgium: Zeebrugge
Germany: Gaspool (GPL) NetConnect Germany
France: Points d’Echange de Gaz Nord / Sud / Sud-ouest (TIGF)
Austria: Central Europe Gas Hub
Italy: Punto di Scambio Virtuale
Denmark: NordPool Transfert Facility

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LNG ship capacity & proxy conversion factors

<table>
<thead>
<tr>
<th>Proxy conversion factors (High caloric gas)</th>
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<tbody>
<tr>
<td>m³ LNG</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1 m³ LNG</td>
</tr>
<tr>
<td>1000 Nm³ gas (0°C)</td>
</tr>
<tr>
<td>1 MWh gas</td>
</tr>
<tr>
<td>1 metric tonne LNG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LNG vessels (ship class size)</th>
<th>Capacity m³ LNG</th>
<th>Capacity Metric tonne LNG</th>
<th>Capacity gas MMm³ (Nm)</th>
<th>Volume gas GWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small scale LNG</td>
<td>Knutsen</td>
<td>1 100</td>
<td>1 000</td>
<td>0,7</td>
</tr>
<tr>
<td>Coral Methane</td>
<td>7 500</td>
<td>3 400</td>
<td>4,6</td>
<td>53</td>
</tr>
<tr>
<td>NB Coral Energy</td>
<td>15 600</td>
<td>7 100</td>
<td>9,5</td>
<td>109</td>
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<tr>
<td>Global LNG</td>
<td>Standard average capacity</td>
<td>145 000</td>
<td>65 900</td>
<td>88</td>
</tr>
<tr>
<td>Q-flex</td>
<td>217 000</td>
<td>98 600</td>
<td>132</td>
<td>1 520</td>
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<tr>
<td>Q-max</td>
<td>266 000</td>
<td>120 900</td>
<td>162</td>
<td>1 863</td>
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