LNG Prices & Pricing Mechanisms

6 February 2017
1. LNG’s role in Global Gas Markets

2. Evolution of Global Gas Prices
   - Europe’s Transition

3. Evolution of LNG pricing
   - JERA’s Mandate
   - Current trend towards short-term/spot pricing
   - Challenges of short-term/spot pricing

4. US LNG Pricing Mechanisms
Putting global LNG into perspective

• Lower-48 US Natural Gas Demand:
  • 74Bcf/d (2016)

• Global Natural Gas Demand:
  • 350 Bcf/d (2016)

• Global LNG Demand:
  • 35 Bcf/d (2016)

• % of gas consumed in the country it is produced:
  • ~70%
• Since 2000, LNG demand has grown about 6.6% a year, compared to 2.8% for natural gas.
• About 114 countries use natural gas as a fuel source, while only 36 nations import LNG.

Source: Platts Analytics’ Eclipse Data, IGU, IEA, CIA World Fact Book
‘Market Pricing’: Prices that are based on gas supply/demand dynamics in the country or region where it is sold; such as prices are most often quoted at market hubs or on financial exchanges.

- In 2005, more than 60% of global gas imports were priced in relation to oil, with 20% being market-priced.
- By 2015 49% related to oil, while and 45% market priced.
- But the change was almost entirely in pipeline import pricing, where by 2015, 52% of imports were market priced compared with 38% being oil-linked.
- The share of market-priced LNG only increased from 25 to 31% between 2007 and 2015.

## Europe’s Gas Pricing Transition

<table>
<thead>
<tr>
<th>Region (2015)</th>
<th>% of total European Demand</th>
<th>% of gas that is priced on gas hub levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>North West Europe</td>
<td>50%</td>
<td>90+%</td>
</tr>
<tr>
<td>Central Europe</td>
<td>10%</td>
<td>50+%</td>
</tr>
<tr>
<td>Mediterranean Europe</td>
<td>30%</td>
<td>30+%</td>
</tr>
</tbody>
</table>

North West Europe: Belgium, Denmark, France, Germany, Ireland, Netherlands, UK. Central Europe: Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland. Mediterranean Europe: Portugal, Spain, Italy, Greece, Turkey.

Asian Gas Price Evolution

- JERA looking to lower proportion of oil-linked contracts to around 50%.
  - A quarter will be formed by mid to short-term contracts and the rest (~25%) will be procured on the spot market.
  - Recent agreements with EDF Trading and Centrica to sell LNG into Europe.
  - 1st Japanese reload cargo from Shimizu terminal Taiwan.


S&P Global Platts

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JKM™ swaps – cash settled futures cleared on ICE

Market players are increasingly hedging their exposure to the physical JKM™ through JKM™ swaps

Market participants have also requested
• Extension of the assessed swaps forward curve
• New instruments for Atlantic trade
• New instruments for freight

NB Platts estimates cleared transactions to account for approx. 60-70% of the brokered market

1 lot = 10,000 MMBtu
1 cargo = approx. 300 lots

Source: ICE
JKM™ swaps: key facts

• First ICE cleared futures traded in September 2012

• Sophistication is growing as evidenced by
  - Spread trades (inter-month and to NBP)
  - Trades on tenors further out (quarters, seasons, calendar years)
  - Increased volume size

• Participation is growing (26 active participants in ICE cleared futures Sept 2016)

• 4 financial institutions providing liquidity

• Significantly more volume traded bilaterally (market participants estimate 1 cargo/week)
Benchmark progress: users of the JKM™

**PHYSICAL**

Several east Asian end users, traders and European utilities have used the JKM in the strip and short- and mid-term contracts.

**Chubu Electric and BP**: Chubu Electric's 16-year-long LNG deal with BP partially uses Platts' JKM for up to 10% of supply volumes, according to multiple market sources.

**Chubu Electric and GDF Suez**: Chubu signs SPA for 1.2 million mt/year with GDF Suez in 2014 with a percentage of the deal linked to JKM. Chubu to hedge their exposure to the JKM through the JKM swaps.

**Tepco** signs strip deal with RWE for 2013/2014 winter cargoes against JKM.

**Kansai Electric** bought Alaska's Kenai LNG from ConocoPhillips at the JKM (minus alpha) in deal for winter cargoes in 2014.

**Producers in Asia Pacific and the Middle East** are using the JKM to sell excess cargoes to offtakers and traders, including Qatargas, Sakhalin NWS and Peru.

**Australia’s North West Shelf** introduced the JKM as one of the pricing bases in LNG sell tenders in early 2012, alongside Platts Asian Dated Brent. JKM is also used to sell excess FOB cargoes to the plant's offtakers.

**Thailand’s PTT** concluded a one-year 500,000 mt supply agreement in 2011 with Spain's Repsol, concluded using a formula of the JKM plus 50 cents, various sources said.

India’s PPAC is using JKM to price its domestic gas market for 5 years as part of a basket of fuels including NBP and Henry Hub.

Several traders and sellers concluding spot deals for delivery to the Middle East at JKM + premium in 2016.

**Jordan’s NEPCO** introduces JKM as of the pricing bases for LNG buy tenders in 2015.

**Shell** has exposure to JKM following acquisition of Repsol’s assets.

**Chevron, Trafigura, GALP** and **RWE** using JKM for spot or strip deals.

**Mexico’s CFE** uses JKM as pricing basis for buy tenders. Tendered for 31 cargoes June 2013 through December 2014 at approximately JKM + $1.50/MMBtu. Another tender for 14 cargoes for Feb-Dec 2015 into Mazanillo priced at JKM+$0.10-$0.20/MMBtu

**Brazil’s** most recent downstream power capacity auctions have option to be pegged against Platts assessed NBP, Brent and JKM.
1. Project Financing/ Reaching FID
   - Alliance Bernstein expects just 6 of the over 50 US/Canadian liquefaction projects to move forward.
US LNG Pricing Mechanisms

- Nearly 80% of U.S. LNG export volumes for projects currently under construction have been contracted on pricing terms directly linked to the Henry Hub price, or under a hybrid pricing mechanism with links to Henry Hub.

- Cheniere Marketing agreement with EDF for DES cargoes linked to TTF.
### LNG Pricing Mechanism #1: Henry-Hub linked Sales Purchase Agreement

<table>
<thead>
<tr>
<th>Cheniere Example: 115% of Henry Hub + Liquefaction</th>
<th>$/MMBtu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henry Hub spot ($3.00 for example)* 115%</td>
<td>$3.45</td>
</tr>
<tr>
<td>Liquefaction charge (Customer pays liquefaction charge regardless of lifting LNG cargo or not)</td>
<td>$2.25</td>
</tr>
<tr>
<td>FOB cost</td>
<td>$5.70</td>
</tr>
<tr>
<td>Shipping (Japan via Panama Canal)</td>
<td>$1.10</td>
</tr>
<tr>
<td>DES cost</td>
<td>$6.80</td>
</tr>
</tbody>
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Supply Chain Responsibility: Terminal operators obligation in green. Offtaker’s obligations in red.

- **Source Gas**
- **Deliver Gas to Liquefaction Terminal**
- **Liquefy Gas**
- **Offtake LNG to destination**

**LNG buyer pays:**

1. Liquefaction/usage fee: Paid regardless of whether the customer uses the facility. Covers the project company’s facilities and fixed costs.
2. Gas fee: Payable based on amount of gas liquefied.
LNG Pricing Mechanism #2: Tolling model

Cove Point Example – Cove Point produces LNG but does not take title or market LNG


Source Gas

Deliver Gas to liquefaction Terminal

Liquefy Gas

Offtake LNG to destination

LNG buyer pays:

1. Reservation/capacity fee: Paid regardless of whether the customer uses the facility. Covers the project company’s facilities and fixed costs.
2. Liquefaction/usage fee: Payable based on amount of gas liquefied.

<table>
<thead>
<tr>
<th>Risks</th>
<th>Rewards</th>
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<tbody>
<tr>
<td>Source, secure, nominate &amp; scheduling gas into pipeline &amp; LNG plant</td>
<td>Long-term control of gas supply needs (up to 45 years)</td>
</tr>
<tr>
<td>Contract sufficient pipeline capacity at liquid market points to the LNG plant, ensuring competitive gas supply.</td>
<td>Not competing with the plant owner in marketing LNG</td>
</tr>
<tr>
<td>Manage a new business model with value-chain segments upstream of liquefaction to control</td>
<td>Vertical integration beyond DES and FOB, back to wellhead</td>
</tr>
<tr>
<td>Gas supply interruptions (freeze-offs or hurricanes)</td>
<td>HH – supply gas arbitrage opportunities</td>
</tr>
</tbody>
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Source: Navigant Consulting; Susan L. Sakmar, *Energy for the 21st Century: Opportunities and Challenges for LNG*
# LNG Pricing Mechanism #3: Spot Indexation

Platts announces the launch of Platts GCM (Gulf Coast Marker)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Published each business day, reflecting the close of Asian Markets <em>(13:30 Houston time)</em></td>
</tr>
<tr>
<td>Basis &amp; Location</td>
<td>Cargoes lifted Free On-Board (FOB) from production/reload ports across the US Gulf Coast. Laycan is normalized to the geographical location of <em>Sabine Pass</em>, using an assessed deviation cost.</td>
</tr>
<tr>
<td>Unit</td>
<td>All prices are quoted in US dollars per million British Thermal Units <em>($/MMBtu)</em></td>
</tr>
<tr>
<td>Quality</td>
<td>Price assessments reflect <em>lean and rich</em> gas</td>
</tr>
<tr>
<td>Volume</td>
<td>Standard loading cargoes of <em>135,000-175,000 cu m</em></td>
</tr>
<tr>
<td>Timing</td>
<td>GCM represents the average of the <em>two half-month cycles which represent the first full month.</em></td>
</tr>
<tr>
<td>Contract Roll</td>
<td>GCM rolls on the <em>1st and 16th</em> of each calendar month</td>
</tr>
</tbody>
</table>
Our focus is the spot market

• Spot prices established at the margin
• Term contracts priced on spot assessments
• Derivatives settle off spot prices

1. What is spot trade?
2. Share of spot trade
3. Significance of spot
Q&A

We welcome your feedback

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