Moving parts in the LNG Value Chain

SPE / AIPN / SEAPEX Seminar
May 2018
Global presence in the Americas, Europe and Asia Pacific

- Houston
- London
- Buenos Aires
- Dubai
- Singapore
- Sydney
“Exploration” for gas means something different now...exploring for somewhere to burn it!

Assisting Resource Developers
- Gas Monetisation
- Master Plans
- Regulatory and License Support
- Asset Valuation
- Project Economics
- Financing
- Fiscal Terms
- Risk Identification
- Quantification
- Management
- Review
- Acquisitions and Divestitures
- Buyer and Seller Due Diligence

Assisting Gas Buyers
- Markets and Pricing
- Distribution
- Transport
- GSA/SPA
- Gas Utilisation
- Reservoir Development
- Delivery Infrastructure
- Upstream E&P
What's happening in LNG

- Energy market reform and unbundling in Asia
- US LNG
- Price convergence
- Marine developments
Energy Market Reform in Asia

- Energy Market Reform / unbundling well underway
- Government mandated TPA is slow to be adopted by major players
- Remote gas to power and smaller scale applications for islands
- Wholesale electricity market developing, gas unbundling planned
- Gas market reform underway. Numerous IPPs since 1990s
- IPPs are now permitted to bypass KOGAS to procure LNG
- EGAT becoming an LNG importer and shipper on PTTs system
Energy Market Reform can take many different forms

- **In the US and Canada, market reform has been generally state/province specific**
  - Federal government in US/Canada deals with import export
  - Also interstate/inter-province flow of gas
  - US failed to implement Standard Market Design (SMD) in 2002-4
  - Canada connects to US power pools

- **Europe has chosen to adopt a federally mandated arrangement**
  - European competition policy is perhaps the most “pure” globally
  - Seeks to put in place a perfect market
  - As with many cross-European policies, it may not be perfect for all member states

- **Asia is learning from others experience**
  - Typically country specific so far
  - Potential for regional integration
  - Use of LNG to connect markets

- **There are geopolitical forces at work**
  - The arrival of US LNG will foster price discovery in European gas markets
  - May also support greater competition in power markets
  - Assists in security of supply issues
Why does unbundling affect gas procurement?

- **Customers become connected to suppliers, bypassing previous monopoly**
  - End-users, such as IPPs, are able to secure their own gas supplies, delivered via common carrier terminal / pipeline system
  - No longer obliged to purchase gas from the monopoly supplier

- **Cost of Gas affects market share**
  - A low cost of gas equals a high market share
  - A high cost of gas equals a dwindling market share
  - Take or pay, and out-of-the-money gas contracts become stranded asset
  - US, Canada, Britain and Europe littered with litigation and arbitration associated with stranded gas contracts

- **Long Term SPAs are changing materially**
  - Oil indexation is under severe pressure
  - Take or pay terms are becoming more heavily negotiated
  - Price reopeners are becoming widespread
### Real life examples of big companies getting into big trouble…

#### Gas buyers adversely impacted by changes in pricing model

<table>
<thead>
<tr>
<th>Year</th>
<th>Company</th>
<th>Issue</th>
<th>Financial loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>Transcanada</td>
<td>Take or pay liabilities accrued – unsold gas</td>
<td>~ $2 bn</td>
</tr>
<tr>
<td>1996</td>
<td>British Gas</td>
<td>Take or pay and stranded costs</td>
<td>~ £7bn (pre-tax)</td>
</tr>
<tr>
<td>2010-12</td>
<td>Eon / RWE</td>
<td>Trading losses on long term ToP contracts</td>
<td>~ €1bn</td>
</tr>
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</table>

#### Gas sellers experiencing hub related negotiated / arbitrated contract changes

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<td>2012</td>
<td>ENI</td>
<td>Gas price refund</td>
<td>~€450m</td>
</tr>
<tr>
<td>2012-14</td>
<td>Gazprom</td>
<td>Long term contract price led to turn-down</td>
<td>~7-13% price rebate ToP reduction to 70%</td>
</tr>
<tr>
<td>2012</td>
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Global gas prices...

...have historically seen only loose correlation
On an Asia delivery base...

...convergence is clear
US and European LNG (freight adjusted)

US LNG has only been competitive in the winter

US LNG is not as competitive as first thought...
Higher freight could undermine US LNG…

If LNG freight rates had not been so low, US LNG would represent the highest available pricing

…but lower liquefaction toll may come to the rescue
LNG Freight rates have been on the increase…maybe
Lower prices are fueling LNG demand

An extended period of low LNG prices seems less likely

Source: GCA analysis of estimated deal price vs duration

Below c.$8 buyers will make a volume commitment of multiple cargoes

Tipping point at around $10

Reported transaction (multiple sources and proprietary data)

Typical breakeven price for post 2010 greenfield LNG

Above c.$12 buyers will only commit to one or two cargoes

Price $/MMBtu

5 10 15 20

# of LNG cargoes committed to

5 10 15

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The LNG cargo dilemma for buyers

- Delivered under LT ToP
- Oil indexed pricing
- Buyer obliged to purchase

- Available on spot market for delivery anywhere
- Price negotiable, market

* Based on a 160,000 cu.m carrier at an May 2018 Brent curve and Spot Asian prices

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Migration towards “Gas on Gas” pricing
Over time, distinction between pricing models will become increasingly blurred

Pricing Model Evolution

Long Term Oil Indexed

Hybrid, Long Term Henry Hub/Tolling

Short/ Medium Term Spot

Long Term Oil Indexed

Hybrid, Long Term Henry Hub/Tolling

Short/ Medium Term Spot

Hub Pricing

If so, process would mirror that of Continental Europe over last few years
The strange tale of the LNG Carrier “Gaselys”

- First cargo from Yamal LNG in Russia in early December
- Should have gone to China
- Went to the UK
- Malaysian trader
- Bought by French
- Delivered in the US in late January

Source: WSJ
Global LNG Supply/Demand: High Demand Case Forecast

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<th>Country</th>
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<th>2017-2021 (%)</th>
<th>2022-2026 (%)</th>
<th>2027+ (%)</th>
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<tr>
<td></td>
<td>High</td>
<td>15%</td>
<td>10%</td>
<td>3%</td>
</tr>
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<td>27 MMTPA</td>
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LNG Supply Demand Balance (+ve = over supply in market) vs High Case Demand

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### Global LNG Supply/Demand: LNG Growth Rate Increase in India and China

**Scenario: Increased Rate of LNG Demand Growth in India & China**

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<td>High</td>
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<td>20%</td>
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**LNG Supply Demand Balance (+ve = over supply in market) vs High Case Demand**

- 2017: 10
- 2018: 17
- 2019: 7
- 2020: -33
- 2021: -76
- 2022: -118
- 2023: -142
- 2024: -196
- 2025: -277
- 2026: -351
- 2027: -385
- 2028: -421
- 2029: -459
- 2030: -514
Southern Hemisphere Gas: London vs. Buenos Aires

Comparison of Energy Requirements

- As Vaca Muerta production increases, LNG imports will become increasingly seasonal
- Potential for LNG swaps and reloads

Argentine heating season is short, but represents a material gas load
Small scale opportunities – ship bunkering, transportation, FLNG, FSRU

- Small scale systems are becoming the “design of choice”

- Floating, smaller systems are also better aligned with emerging markets

- New financial settlement solutions may mitigate the credit risk/take or pay aspects of a distributed market with multiple offtakers

Preferred midstream (liquefaction/regas) solutions are dovetailing well with emerging new markets in smaller scale LNG
What will 2019 onward bring…?

- More disruption from US LNG
- Price discovery in Asia and worldwide
- Growth in new markets
- Perhaps… one or two FIDs for LNG export projects
Thank you!

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