The International Gas Union

Council Meeting, Cartagena, Colombia

Global Gas Markets – Growth and Challenges

Edward Kelly, Managing Director, IHS Energy, ed.kelly@ihs.com

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Key messages

• The global gas market is encountering numerous challenges in an overall growth context. Whether the current weakness is cyclical (the IHS view) or structural remains to be seen.

• LNG developers are in a competitive game of ‘musical chairs’
  • Lower oil prices make project development more challenging
  • US Lower-48 projects remain commercially competitive and most easily executable

• Producers need new business models and applications in order to monetize growing global gas reserve inventories

• Contract and trading structures are evolving

Source: IHS Energy
Supply and demand drivers for LNG are moving in opposite directions

One year ago, we saw supply exceeding demand. This tension is increasing.

### LNG DEMAND
- China manufacturing hard landing
- Korean reset
- Low coal prices
- Oil substitution driver less strong

### LNG SUPPLY
- US LNG moving ahead, including greenfields
- Canadian, East African, Australian developers still talking up their projects
- Iran/Egypt possible low cost additions around 2025?
- Potential small scale and floating fast-track under the radar

Source: IHS
Macro – The Economy, Oil, and COP-21
World economic growth outlook—not bad but…

World real GDP growth rates, 2009–17

Notes: Global GDP growth calculated using real local currency growth rates, aggregated using real exchange rate-based weights.

Source: IHS

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Key messages for the global crude oil market: Q3/4 will be stress point for oversupplied market

- **Low prices are imperiling high cost non-OPEC supply**, but impact will be slow.

- There is little pressure – yet - for Saudi Arabia and its Gulf allies to change their market share production policy, particularly given the possible Iran deal. However, chatter of a reversal in OPEC strategy could support prices temporarily.

- If WTI stays below the $45/bbl level, as we expect, then US production will slow sharply in the next few months, but news-driven price rallies in paper markets could delay the balancing of the markets beyond mid–2016.

- China’s economic and stock market stumbles have taken bullishness out of some demand forecasts. IHS has consistently held that Chinese demand will slow in the second half of 2015 but will still account for significant growth.
  - about 413,000 b/d of demand growth in 2015, 287,000 b/d in 2016.
Annual global demand growth improves but supply overhang remains through 2016

Change from previous year in world oil supply and demand

Notes: Annual changes are changes from the previous year. Liquids demand includes LPG and biofuels. Liquids supply includes natural gas liquids and biofuels.
Long term real oil prices revert to $100/bbl+ by next decade, supporting marginal supply

Note: Brent-WTI price relationship assumes liberalized export of US crude oil by 2017
LNG Market Trends
Global gas snapshot, October 2015

Key regional trends shaping the LNG market

- Canadian LNG stuck on starting blocks
- Henry Hub-based LNG exports lead post Australian wave
- ‘Residual market’ for LNG
- LNG imports for power
- East Africa stuck on starting blocks
- Growing LNG dependence
- China slowdown and strong coal competition across Asia
- Russia’s drive for LNG and pivot East
- Nuclear policy uncertainty
- Supply surge hitting the market

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Short-term LNG supply growth

Note: Other Pacific includes Australia, Russia, Peru, Canada, and Papua New Guinea.

Source: IHS Energy © 2015 IHS
Short-term LNG demand growth

Short-term LNG demand growth

Incremental short-term demand growth

Source: IHS Energy © 2015 IHS

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Market opportunity gap: can new projects compete with existing contract extensions?

Contracted supply and viable un-contracted supply vs. global LNG demand

Source: IHS Energy, Sept 2015 © 2015 IHS
Room for only one in 15 projects

IHS LNG supply and demand outlook to 2025

- **2014 Demand**
  - China and India
  - Other Asia-Pacific
  - Europe

- **Incremental Demand to 2025**
  - Other

- **Supply from Retiring Capacity**

- **Extra LNG Capacity Needed**

- **Potential New LNG Supply Projects by 2025**
  - Russia
  - Australia
  - North America
  - Committed*

Notes: Including projects sanctioned in 2014
Source: IHS Energy

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Future supply additions most likely to come from US and floating projects

Achieved and projected FIDs, 2015-2017

<table>
<thead>
<tr>
<th>Project</th>
<th>Capacity (MMtpa)</th>
<th>Country</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achieved</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freeport LNG T3</td>
<td>4.4</td>
<td>United States</td>
<td>April 2015</td>
</tr>
<tr>
<td>Corpus Christi LNG T1-2</td>
<td>9.0</td>
<td>United States</td>
<td>May 2015</td>
</tr>
<tr>
<td>Sabine Pass LNG T5</td>
<td>4.5</td>
<td>United States</td>
<td>July 2015</td>
</tr>
<tr>
<td>Conditional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameroon FLNG</td>
<td>1.2</td>
<td>Cameroon</td>
<td>2015</td>
</tr>
<tr>
<td>Pacific NW LNG T1-2</td>
<td>12.0</td>
<td>Canada</td>
<td>June 2015*</td>
</tr>
<tr>
<td>Project</td>
<td></td>
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<tr>
<td>Elba Island</td>
<td>2.5</td>
<td>United States</td>
<td>2016</td>
</tr>
<tr>
<td>Douglas Channel FLNG</td>
<td>0.6</td>
<td>Canada</td>
<td>2017</td>
</tr>
<tr>
<td>Border-line</td>
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<tr>
<td>Mozambique (Area 1) T1-2</td>
<td>12.0</td>
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<td>2017-18</td>
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<td>Wildcard</td>
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<tr>
<td>Fortuna FLNG</td>
<td>2.2</td>
<td>Equatorial Guinea</td>
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<tr>
<td>Coral FLNG</td>
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<tr>
<td>Magnolia LNG T1</td>
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<tr>
<td>Jordan Cove T1-4</td>
<td>6.0</td>
<td>United States</td>
<td>---</td>
</tr>
</tbody>
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Note: PETRONAS reached a conditional FID on Pacific Northwest LNG in June 2015, but still needs to reach a final FID.
North America: The largest source of new LNG supply?

Regasification facilities and potential liquefaction projects in US Lower 48 and Canada*

Notes: *New projects not included in this map: Live Oak LNG, G@ LNG, Por Arthur LNG, Rio Grande LNG in the US gulf Coast; and North Shore LNG and NewTimes Energy LNG in Canada

Source: IHS Energy

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North American LNG projects actually expected to move to completion

North American regasification facilities and advanced liquefaction projects

[Map of North America with markers for potential export sites, existing regas and potential export sites, and under construction export sites.]

Source: IHS Energy
North American LNG exports in the current outlook

US lower 48 and Canada liquefaction capacity and exports

- **Canada capacity**
- **Canada volumes**
- **US lower-48 capacity**
- **US lower-48 volumes**

Source: IHS Energy

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The gas price is defined by the tension between rapid demand growth, and the strong resource base. Demand growth supports higher natural gas prices, but still under $4 per MMBtu until late 2021.

<table>
<thead>
<tr>
<th>Real averages</th>
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<tr>
<td>2010–15:</td>
<td>$ 3.77</td>
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<tr>
<td>2015–20</td>
<td>$ 2.94</td>
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<tr>
<td>2021–30:</td>
<td>$ 3.63</td>
</tr>
<tr>
<td>2031–40:</td>
<td>$ 4.21</td>
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Source: IHS

### September 2015 Henry Hub history and forecast

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<th>$/MMBtu</th>
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Source: IHS, CME, Intelligence Press

Notes: MMBtu = million Btu.