North American LNG Exports: Global Market Disruption and Opportunity Cost of Supply to LAC

– Agenda –

All times are Pacific Daylight Times

10:00 am Review of the agenda and logistics by Alexis Arthur, Energy Policy Associate, Institute of the Americas

10:05 am Opening remarks by Jeremy Martin, Energy Program Director, Institute of the Americas

10:10 am Presentation by Christopher Goncalves, Director Berkeley Research Group, LLC

10:30 am Question and answer session

11:00 am Session close
Disclaimer

The opinions expressed in this report are those of the individual author and do not represent the opinions of BRG or its other employees and affiliates. The information provided is not intended to and does not render legal, accounting, tax, or other professional advice or services, and no client relationship is established with BRG by making any information available in this presentation. None of the information contained herein should be used as a substitute for consultation with competent advisors.
Agenda

• A Disruptive Proposition

• North American Drivers and Impacts

• Global Market Implications
New Trade, New Terminology

“Pacific Shale Spread”
The difference between low US prices and Pacific prices historically indexed to oil

“Atlantic Shale Spread”
The difference between low US prices and “hybrid” European prices that oscillate between oil benchmarking and gas hub pricing
“America is Shaking Things Up”…

A high level of North American LNG exports could be a game-changing force in the industry

“America is shaking things up…Japanese, Korean, and Chinese buyers are pulling back from supporting pricey …LNG projects that need the old Asian pricing formula to turn a profit…”
- March 4, 2013, Bloomberg citation of Hartland Shipping Services

“We want to create a system that serves as a new indicator, reflecting the true supply-and-demand conditions of LNG and to stabilise its price.”
- April 3, 2013, AFP citation of an official from the Japanese Minister of Economy, Trade, and Industry

“What we are trying to do is to introduce alternative pricing benchmarks to the complete oil-indexed [contracts, enabling us] to negotiate prices of the current contracts more equally.”
- January 21, 2013, Koichiro Age, General Manager of LNG Trading Department, Osaka Gas
LNG Export Window of Opportunity

Game On!

Atlantic shale spreads still over $6
Pacific shale spreads over $12
The window of opportunity for North American LNG exports is wide open.

Continuity or Collapse?

How long can this last?
Will the North American LNG exports collapse the shale spreads and close the window?
If so when and to what extent?
A Complex Problem of Reciprocal Impacts

**North American Impacts**

**Industry Questions**
How will LNG exports impact shale spreads, demand, GDP, and jobs?

**Underlying Issues**
How much demand growth and LNG exports can shale sustain at low prices?

**Global LNG Impacts**

**Industry Questions**
How much LNG will be exported and will this impact liquidity and pricing?

**Underlying Issues**
How will global supply respond and can LNG demand absorb more supply?

**Bottom line**
The sustainability of shale production and the scalability of global LNG demand will drive Shale Spreads and thus both LNG and industrial trade economics. US price impacts alone are NOT as critical an issue as Shale Spread impacts.
Agenda

- A Disruptive Proposition
- **North American Drivers and Impacts**
- Global Market Implications
Drillers Fleeing Low Demand and Prices

As shale production boomed and prices collapsed, drillers first retrenched to “wet” or NGL-rich plays, but have recently reduced drilling there as well.

By January 2013 record shale production represented over 40% of the total 65 Bcfd net dry gas production in the lower 48.
LNG Exports Could Double “Demand” Growth

An moderate 7 Bcfd of LNG exports could almost double domestic demand growth

US Gas Consumption Scenarios – 2025*

CAGR = 0.6%

CAGR = 1.5%

* BRG base case forecasts are calibrated based on AEO 2013 early release. This is an un-integrated, exogenous demand scenario for each sector.
LNG Export Ambitions are Large

Including Canada, at least 9 Bcfd of LNG export capacity is under construction or in advanced development, with another 33 Bcfd of capacity proposed.

Note: Existing and Under Construction refers to the projects with permits and advanced commercial development including contracts and financing; Advanced Development refers to 6 projects with permits and commercial development including contracts; Under Development refers to 21 projects with permits or filed permits only.

Source: FERC, March 20, 2013; DOE, March 7, 2013; Global LNG Info
Can Shale Handle It?

Our Shale Resource Potential (“ShaRP”) model divides plays into several classes of wells with differing productive features and economics – the Class I “sweet spots” and Class II “economic” wells account for almost half of total reserves.

Note: The gross costs include environmental capex, capital / drilling costs, other non-drill costs, direct operating costs, royalties and production taxes. The net costs equal to gross costs minus total NGL revenue.
Sweet Spot Surrender?

The output for Class 1 “sweet spot” wells is still growing but could peak by the end of the decade, giving way to greater focus on the economic Class 2 wells.
LNG Export Price Impacts

With 6 Bcfd more North American LNG exports, HH price impacts could approach $1 around 2020, but then subside while “sweet spot” shale production remains high.
Agenda

- A Disruptive Proposition
- North American Drivers and Impacts
- Global Market Implications
Global Industry Drivers

<table>
<thead>
<tr>
<th>Global Supply Drivers</th>
<th>Global Demand Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• US Export Growth</td>
<td>• Regas Terminals for New Markets</td>
</tr>
<tr>
<td>• Australian Production Delays</td>
<td>• Chinese Shale Production</td>
</tr>
<tr>
<td>• East Africa and East Med LNG</td>
<td>• Japanese Nuclear Policy</td>
</tr>
</tbody>
</table>

Global supply-demand balances and increased supply liquidity could impact pricing practices, especially in East Asia and Europe.

In 2015-25 in the JKT markets, 60% of LNG contracts (8 Bcfd or 61 MMtpa) will expire, enabling buyers to drop oil-indexed supplies.
Global Production Implications

North American LNG exports compete favorably with more expensive Australian LNG projects and greenfield East African and East Mediterranean projects.

North American Impacts on Global LNG Supply

5.7 Bcfd
Increase in North American exports

minus

2.5 Bcfd
Liquefaction delays or cancellations (Australia, East Africa, East Med)

equals

3.2 Bcfd
Net supply increase
China and Japan Demand Wildcards

By 2025, China and Japan could add LNG imports of up to 12 Bcfd – or 9 Bcfd and 3 Bcfd, respectively.
Emerging Market Upside

The emerging LNG markets could add over 10 Bcfd – with almost 6 Bcfd from South/Southeast Asia and over 4 Bcfd combined from Eastern Europe and Latin America.

East Europe
New Regas LNG Range (Bcfd)

<table>
<thead>
<tr>
<th>Range</th>
<th>Est. Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0.6</td>
</tr>
<tr>
<td>High</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Central & South America
New Regas LNG Range (Bcfd)

<table>
<thead>
<tr>
<th>Range</th>
<th>Est. Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1.4</td>
</tr>
<tr>
<td>High</td>
<td>1.9</td>
</tr>
</tbody>
</table>

South/Southeast Asia
New Regas LNG Range (Bcfd)

<table>
<thead>
<tr>
<th>Range</th>
<th>Est. Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4.2</td>
</tr>
<tr>
<td>High</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Note: Low range includes the projects under construction, engineering, and planning. High range adds speculative projects. The estimated consumption yields an average capacity utilization for new regas terminals of approximately 65%.
Substantial Demand Uncertainty

The 6 Bcf/d variation in LNG demand scenarios doubles the 3 Bcf/d supply uncertainty.
Can Demand Absorb the New Supply?

Substantial surpluses could develop if demand is low, but if demand is robust then markets could remain tight through 2015 and then rebalance in 2020-2025

Global Supply / Demand Balance Scenarios

**Balanced Scenario**
(High Supply / Demand)

**Surplus Scenario**
(Low Supply / Demand)

Surplus: 2.8 Bcfd
Surplus: 8.8 Bcfd
How Much Shale Spread Shrinkage?

Even if not “needed” for consumption, North American LNG is “wanted” to reduce prices and/or stimulate new spot markets.

Game Over?

Lower shale spreads would erode LNG export drivers

~$6 / MMBtu
Uncertainty in Japanese LNG prices

~$0.9 / MMBtu
Uncertainty in HH prices

Note: US DES Prices to Japan = HH*(1+15% Trading Margins) + $3 Fixed Fees for liquefaction costs & Terminal Fuel + Shipping Costs to Japan + Panama Canal toll fees.
Implications for Latin America

The future outlook for Pacific Shale Spreads will affect LNG suppliers’ opportunity cost of supplying Latin America and the Caribbean.

### Tight Market (2025)

<table>
<thead>
<tr>
<th>LNG Opportunity Costs ($/MMBtu)</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominican Republic</td>
<td>$10.34</td>
<td>$16.58</td>
</tr>
<tr>
<td>Brazil</td>
<td>$10.72</td>
<td>$16.96</td>
</tr>
<tr>
<td>Uruguay</td>
<td>$10.83</td>
<td>$17.07</td>
</tr>
<tr>
<td>Argentina</td>
<td>$10.87</td>
<td>$17.11</td>
</tr>
<tr>
<td>Chile</td>
<td>$10.76</td>
<td>$17.00</td>
</tr>
</tbody>
</table>

### Surplus Market (2025)

<table>
<thead>
<tr>
<th>LNG Opportunity Costs ($/MMBtu)</th>
<th>Low Range</th>
<th>High Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominican Republic</td>
<td>$8.94</td>
<td>$9.37</td>
</tr>
<tr>
<td>Brazil</td>
<td>$9.32</td>
<td>$9.75</td>
</tr>
<tr>
<td>Uruguay</td>
<td>$9.43</td>
<td>$9.86</td>
</tr>
<tr>
<td>Argentina</td>
<td>$9.47</td>
<td>$9.90</td>
</tr>
<tr>
<td>Chile</td>
<td>$9.36</td>
<td>$9.79</td>
</tr>
</tbody>
</table>

Notes: LNG opportunity costs are calculated based on Japan LNG DES prices minus shipping costs from US Gulf to Japan and plus shipping costs from US Gulf to various Latin American markets. Panama Canal toll fees apply to Japan and Chile shipping costs. Tight market refers to a market with robust LNG demand and low North American LNG exports. Surplus market refers to a market with softer LNG demand and higher North American LNG exports.
THANK YOU

Please let us know how we can help

Chris Goncalves
Director
Natural Gas & LNG
+1 - 202 - 480 - 2703
+1 - 240 - 505 - 6162
cgoncalves@brg-expert.com
UPCOMING EVENTS

Institute of the Americas Energy Program

August 27: Peru Energy Roundtable, Lima, Peru

October 2: 2nd Annual Forum on Prospects for LNG & Natural Gas in Central America, San José, Costa Rica
http://bit.ly/11e5OtB

Follow us on twitter @IOA_Energy