NCSL: Task Force on Energy Supply
Pipeline Infrastructure Trends

December 3, 2013

Paul Smith
Senior Director, Infrastructure
ANGA Members
The Shale Gas Revolution

Potential Gas Committee: 2012

1,073 TCF shale
2,688 TCF total
24% INCREASE in just two years

Includes Proved Reserves
Henry Hub Spot Natural Gas Price

(2010$/ MMBtu)

Historic

Projected

Actuals

AEO 2010

AEO 2011

AEO 2012

AEO 2013

Henry Hub Spot prices (EIA reported actual prices included 2000 to 2010)
A Decade of Significant Expansion

• Between 2000 and 2010, the FERC approved more than 16,000 miles of new interstate pipelines, with capacity to transport an additional 113 billion cubic feet per day.

• Pipeline system connects the U.S. with Canada and Mexico.

• Storage capacity grew 22% from 2006 – 2010.

• About half of new storage is flexible, high-turnover salt dome, ideal for supporting growing power generation loads.

Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System
Expansion Slows, Shifts Northeast

- Significant expansion activity beginning with the shale revolution in 2006, with nearly 45 Bcf/d of expansion capacity added in 2008 alone.
- Emerging new shale plays connect to growing markets as the decade closes, with minimal activity in 2012 – With the notable exception of the Northeast.
Adapting to Supply/Demand Dynamics

Source: EIA
Infrastructure Market Trends
Major Pipelines and Storage Fields
Before the Shale Revolution
Shale Development = Game Changer
(Especially the Marcellus/Utica)
Supply Push Pipelines
Barnett-Woodford-Fayetteville-Haynesville to SE

~10 Bcf/d to the Southeast & Major Interconnects
Demand Pulls from New Locations
Supply-Push Pipelines
Rockies

Rockies Express Pipeline

1.8 Bcf/d of Rockies Gas to the Midwest

Marcellus/Utica Shale Ramp-Up
Supply-Push Pipelines
Marcellus

0.8 Bcf/d of Marcellus Gas to NJ/NYC
Marcellus to NYC – Price Impact

- October 31, 2013 – Natural gas prices in Manhattan were nearly 40¢ cheaper than in Louisiana – That hasn’t happened in eight years ($3.18 per MMBtu versus $3.58)
- Project effectively doubled the amount of natural gas flowing into Manhattan and steadily pulled down the island’s delivery price.
- Consumers are now seeing the benefits of affordable natural gas in Manhattan.
- Lower natural gas prices are expected to reduce energy costs by $350 million per year in NY and by the same amount in NJ.
New Options Coming for New England

Algonquin Incremental Market (AIM)
- 342 MMcf/d by Q4 2016
- Sponsored by four LDCs

Tennessee Gas Northeast Expansion
- Up to 1.2 Bcf/d (2017?)
- New third pipeline into region

Stakeholders working diligently to find ways to develop new pipelines to support growing regional demand.
NATURAL GAS EXPORTS
Export Developers Have Responded (~30 Bcf/d of Capacity Proposed)

<table>
<thead>
<tr>
<th>Company (&gt; 0.5 Bcf/d)</th>
<th>Quantity</th>
<th>FTA Application</th>
<th>Non-FTA Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sabine Pass Liquefaction, LLC</td>
<td>2.2 billion cubic feet per day (Bcf/d)</td>
<td>Approved</td>
<td>Approved</td>
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<tr>
<td>Freeport LNG Expansion LP; FLNG Liquefaction, LLC</td>
<td>1.4 Bcf/d</td>
<td>Approved</td>
<td>Approved</td>
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<tr>
<td>Lake Charles Exports, LLC</td>
<td>2.0 Bcf/d</td>
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<tr>
<td>Dominion Cove Point LNG, LP</td>
<td>1.0 Bcf/d</td>
<td>Approved</td>
<td>Approved</td>
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<tr>
<td>Jordon Cove Energy Project, LP</td>
<td>1.2 Bcf/d – FTA; 0.8 Bcf/d – non-FTA</td>
<td>Approved</td>
<td>Under DOE Review</td>
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<td>Cameron LNG, LLC</td>
<td>1.7 Bcf/d</td>
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<td>Freeport LNG Expansion LP; FLNG Liquefaction, LLC</td>
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<td>Gulf Coast LNG Export, LLC</td>
<td>2.8 Bcf/d</td>
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<td>Under DOE Review</td>
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<tr>
<td>Gulf LNG Liquefaction Company LLC</td>
<td>1.5 Bcf/d</td>
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<td>Under DOE Review</td>
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<td>LNG Development Company LLC (d/b/a Oregon LNG)</td>
<td>1.25 Bcf/d</td>
<td>Approved</td>
<td>Under DOE Review</td>
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<td>Southern LNG Company, LLC</td>
<td>0.5 Bcf/d</td>
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<tr>
<td>Excelerate Liquefaction Solutions I, LLC</td>
<td>1.38 Bcf/d</td>
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<td>Golden Pass Products LLC</td>
<td>2.6 Bcf/d</td>
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<td>Cheniere Marketing LLC</td>
<td>2.1 Bcf/d</td>
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<td>Under DOE Review</td>
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<td>Main Pass Energy Hub, LLC</td>
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<td>CE FLNG, LLC</td>
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<td>Pangea LNG (North America) Holdings, LLC</td>
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<tr>
<td>Magnolia LNG, LLC</td>
<td>0.54 Bcf/d</td>
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<td>Trunkline LNG Export LLC</td>
<td>2.0 Bcf/d</td>
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<tr>
<td>Freeport-McMoRan Energy LLC</td>
<td>3.22 Bcf/d</td>
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<td>Venture Global LNG, LLC</td>
<td>0.67 Bcf/d</td>
<td>Pending Approval</td>
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<tr>
<td><strong>Total of all Applications Received</strong></td>
<td><strong>30.60 Bcf/d</strong></td>
<td><strong>29.21 Bcf/d</strong></td>
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Global LNG Demand and Capacity

- The current largest LNG exporting country is Qatar near 10 Bcf/d.
- The next largest countries are Malaysia, Indonesia and Australia all near 3 Bcf/d.

Global LNG Demand

- Proposed US export capacity is over 90% of existing global demand

<table>
<thead>
<tr>
<th>Year</th>
<th>Bcf/d</th>
</tr>
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<tbody>
<tr>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>2015 Expected Demand</td>
<td>30</td>
</tr>
<tr>
<td>2020 Expected Demand</td>
<td>60</td>
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</table>
The U.S. domestic price is only one component of the total cost to export LNG from the U.S. Additional costs include liquefaction costs, shipping, and regasification costs.

Depending on destination, these additional costs can be 2 to 3 times the current U.S. domestic price.
# LNG Export Study Comparison

<table>
<thead>
<tr>
<th>Modeler</th>
<th>Sponsor</th>
<th>Release Date</th>
<th>Price Timeline, Location</th>
<th>U.S. Natural Gas Supply Assumption*</th>
<th>LNG Export Levels Assumed or Solved For?</th>
<th>LNG Exports Volume Range (Bcf/d)</th>
<th>Price Change from Reference Case</th>
<th>% Price Change from Reference Case</th>
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<tbody>
<tr>
<td>ICF</td>
<td>API</td>
<td>May, 2013</td>
<td>2016-2030 Avg, Henry Hub</td>
<td>High</td>
<td>Assumed</td>
<td>4.0 - 16.0</td>
<td>$0.32 - $1.02</td>
<td>7% - 21%</td>
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<tr>
<td>CRA</td>
<td>Dow</td>
<td>February, 2013</td>
<td>2030, Henry Hub</td>
<td>Low</td>
<td>Assumed</td>
<td>20.0 - 35.0</td>
<td>$1.60 - $3.10</td>
<td>22% - 43%</td>
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<tr>
<td>NERA</td>
<td>DOE</td>
<td>December, 2012</td>
<td>2035, Well-head</td>
<td>Reference</td>
<td>Solved (w/ &amp; w/o constraints)</td>
<td>0.0 - 15.8</td>
<td>$0.00 - $1.09</td>
<td>0% - 17%</td>
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<tr>
<td>NERA</td>
<td>DOE</td>
<td>December, 2012</td>
<td>2035, Well-head</td>
<td>High</td>
<td>Solved (w/ &amp; w/o constraints)</td>
<td>6.0 - 23.0</td>
<td>$0.28 - $1.09</td>
<td>6% - 22%</td>
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<tr>
<td>NERA</td>
<td>DOE</td>
<td>December, 2012</td>
<td>2035, Well-head</td>
<td>Low</td>
<td>Solved (w/ &amp; w/o constraints)</td>
<td>0.0 - 1.4</td>
<td>$0.00 - $0.16</td>
<td>0% - 2%</td>
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<td>Navigant</td>
<td>Jordan Cove</td>
<td>January, 2012</td>
<td>2035, Henry Hub</td>
<td>Reference</td>
<td>Solved (w/ constraints)</td>
<td>0.9 - 6.6</td>
<td>$0.04 - $0.41</td>
<td>1% - 7%</td>
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<tr>
<td>Deloitte</td>
<td></td>
<td>2011</td>
<td>2035, U.S. Average</td>
<td>Reference</td>
<td>Assumed</td>
<td>6.0</td>
<td>$0.22</td>
<td>3%</td>
</tr>
</tbody>
</table>

* Relative to EIA supply assumptions
Paul Smith
Senior Director, Infrastructure
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Appendix
The transportation of natural gas is one of the safest ways of transporting energy, and pipelines are the safest method of transporting natural gas.

Pipeline companies routinely inspect their pipelines for corrosion and defects using sophisticated equipment known as “Smart Pigs”, intelligent robotic devices that evaluate the interior of the pipeline.

Smart pigs can test pipeline thickness and roundness, check for signs of corrosion, detect leaks and any other defects along the interior of the pipeline that may impede the flow of gas or pose a potential safety risk.

Many other safety precautions and procedures are in place to minimize the risk of pipeline accidents, including:

- Aerial Patrols
- Leak Detection
- Pipeline Markers
- Gas Sampling
- Preventative Maintenance
- Emergency Response
- One Call Program – Call “811”
Industry Progress

- Interstate transmission pipelines have demonstrated commitment and made significant progress toward improving pipeline integrity, focused on three areas:
  - Making their systems capable of accommodating inline inspection tools
  - Performing assessments
  - Making necessary repairs and replacements
- In-line inspections are now viable on almost all transmission pipelines.

Source: INGAA