Natural Gas Supply/Demand Outlook

Presentation to:
The Fertilizer Outlook and Technology Conference
Jacksonville, Florida

By:
John Harpole

November 14, 2018
Fertilizer Industry vs. Natural Gas Industry

Source: http://www.search.com/reference/Lucy_van_Pelt
*Forecast from my 2010 speech: BENTEK Expects The Forward Curve To Fall Further
What will impact natural gas prices during the next 5 years?

- Shale gas/productivity gains (We aren’t exploring, we are manufacturing gas.)
- Lower EPA Air Standards (demand increase)
- Renewable Portfolio Standards (in an inexpensive gas environment?)
- Coal to gas conversion (demand increase)
- Demand in Mexico (potential demand increase)
- LNG exports from North America (China is waiting)
Natural Gas Outlook

Presentation to:
2013 Fertilizer Outlook
& Technology Conference
Tampa, Florida

By:
John Harpole

November 20, 2013
Conclusions from November 20, 2013

• U.S. continues to produce more gas, shale gas revolution was too successful, end-users will benefit
• During the next 3 years, supply will likely exceed demand
• Prices will remain in the $3.50 to $4.75 range, with short period above and below that band during adjustments
• Long term prices depend on demand growth. Without demand growth, supply will continue to be long and prices relatively low.
• A significant demand response can’t occur for at least 3-5 years
Circa 2015

The Big Three Issues to Watch

1. Global Oil Price Recovery
2. Marcellus and Utica Shale Production
3. U.S. LNG Exports
Marcellus wellhead production is expected to increase by 28.1 Bcf/d between 2014 and 2024.
Supply growth in the Northeast combined with pipeline capacity constraints drove pricing dynamics in that region in 2014. By 2019, capacity additions should ease the constraints, but continued supply growth puts pressure on prices again by 2024.

Source: ICF International, KM analysis

Source: Kinder Morgan, 2015 Business Meeting: West Region Gas Pipelines, November 2, 2015
NYMEX Historical and Future Forecast

It is not a scarce resource anymore

Rig Increases Dry Gas Focused Areas
Rig Increases Liquids-Rich/Oil Focused Areas
Rig Declines

Source: S&P Global, Aug 2018


Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
U.S. Dry Shale Gas Production

billion cubic feet per day

- Permian (TX NM)
- Utica (OH PA WV)
- Rest of US
- Marcellus (PA WV OH NY)
- Haynesville (LA TX)
- Eagle Ford (TX)
- Fayetteville (AR)
- Barnett (TX)
- Woodford (OK)
- Bakken (ND)
- Antrim (MI IN OH)

Source: EIA Natural Gas Weekly Update, 03 May 2018  ©LNG Allies, 2018

Permian, Marcellus, Utica Shale Gas Production

billion cubic feet per day

2006  2010  2014  2018

- Utica (OH PA WV)
- Marcellus (PA WV OH NY)
- Permian (TX NM)

Source: EIA Natural Gas Weekly Update, 03 May 2018
©LNG Allies, 2018
US supply growing again; largest year-over-year gain in history

Source: S&P Global Platts Analytics

Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
U.S. Natural Gas Production, Consumption, Imports

Production
Consumption
Imports

Source: EIA Annual Energy Outlook - 2018
©LNG Allies, 2018

Source: U.S. Energy Information Administration

Source: www.eia.gov/dnav/ng/hist/n9132mx2m.thm accessed 08/20/2018
Major delays on Mexico’s interior gas pipelines

**4.7 Bcf/d delayed downstream of West Texas**

**4.9 Bcf/d delayed downstream of South Texas**

**Average delay over 400 days**

**Most new capacity delayed past 2018**

**US pipeline exports will remain capacity constrained until 2019**

---

**Mexican Pipeline Construction Tracker**

<table>
<thead>
<tr>
<th>Pipeline</th>
<th>Import Corridor</th>
<th>Capacity MMcf/d</th>
<th>Original ISD</th>
<th>Estimated Start 6/1/2018</th>
<th>Days Delayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Encino - La Laguna</td>
<td>West Texas</td>
<td>1,500</td>
<td>Apr-17</td>
<td>Mar-18</td>
<td>334</td>
</tr>
<tr>
<td>El Encino - Topolobampo</td>
<td>West Texas</td>
<td>670</td>
<td>Oct-16</td>
<td>Jun-18</td>
<td>608</td>
</tr>
<tr>
<td>Nueva Era</td>
<td>South Texas</td>
<td>504</td>
<td>Jun-17</td>
<td>Dec-18</td>
<td>548</td>
</tr>
<tr>
<td>Tula - Villa de Reyes</td>
<td>South Texas</td>
<td>886</td>
<td>Dec-17</td>
<td>Jul-18</td>
<td>212</td>
</tr>
<tr>
<td>La Laguna - Aguascalientes</td>
<td>West Texas</td>
<td>1,189</td>
<td>Dec-17</td>
<td>Nov-18</td>
<td>335</td>
</tr>
<tr>
<td>Villa de Reyes - Agua. - Guadalajara</td>
<td>West Texas</td>
<td>886</td>
<td>Dec-17</td>
<td>Nov-18</td>
<td>335</td>
</tr>
<tr>
<td>Samalayuca - Sasabe</td>
<td>West Texas</td>
<td>472</td>
<td>Jun-17</td>
<td>Nov-18</td>
<td>518</td>
</tr>
<tr>
<td>Sur de Texas - Tuxpan</td>
<td>South Texas</td>
<td>2,600</td>
<td>Jun-18</td>
<td>Oct-18</td>
<td>122</td>
</tr>
<tr>
<td>Tuxpan - Tula</td>
<td>South Texas</td>
<td>886</td>
<td>Mar-17</td>
<td>Dec-19</td>
<td>1,005</td>
</tr>
</tbody>
</table>

**Average Delay** 460
Downstream constraints alleviated in 2019

Imports peak at ~4.9 Bcf/d in Oct-18

Imports peak at ~6.2 Bcf/d in Jul-19

Source: S&P Global Platts Analytics

# Permitting Status of U.S. LNG Export Projects

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Projects</th>
<th>MTPA</th>
<th>Bcm/yr</th>
<th>Bcf/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating / Under Construction</td>
<td>6</td>
<td>70.9</td>
<td>97.7</td>
<td>10.0</td>
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<tr>
<td>Fully Permitted (Major Projects)</td>
<td>4</td>
<td>68.9</td>
<td>95.0</td>
<td>9.7</td>
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<tr>
<td>Fully Permitted (Small Projects)</td>
<td>N/A</td>
<td>9.0</td>
<td>12.4</td>
<td>1.3</td>
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<tr>
<td>Formal FERC Review</td>
<td>11</td>
<td>146.9</td>
<td>202.6</td>
<td>20.9</td>
</tr>
<tr>
<td>FERC Pre-Filing</td>
<td>2</td>
<td>24.0</td>
<td>33.1</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
<td><strong>310.7</strong></td>
<td><strong>428.5</strong></td>
<td><strong>44.0</strong></td>
</tr>
</tbody>
</table>

Notes: (1) Projects = individual projects. (2) Additional trains for existing projects not included in the project count, but in the MTPA, Bcm/year, and Bcf/day totals (Sabine Pass #6, Corpus Christi #3, Cameron #4 #5, Freeport #4).

Source: Federal Energy Regulatory Commission & LNG Allies (17 April 2018)  ©LNG Allies, 2018
Major U.S. LNG Export Projects - Existing & Proposed

Includes Train 4 - Pending at FERC (5.1 MTPA)
Includes Trains 4-5 FERC Pre-Filing (10.0 MTPA)

Sources: LNG Allies, EIA, DOE (Dec. 2017)

©LNG Allies, 2017

U.S. LNG Liquefaction Capacity Growth

Source: LNG Allies (Based on Trade Press & Company Data) ©LNG Allies, 2018

High Utilization of US LNG Expected to Persist

Source: S&P Global Platts Analytics

Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
Latin America and Asia main markets US LNG

1,240 BCF US LNG exports shipped to 27 countries

37% to Americas
36% to Asia
17% to India and Middle-East
10% to Europe

Source: S&P Global Platts Analytics

*Numbers may not add up to 100% due to rounding

Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
Asia Clearly Driving LNG Demand

LNG Demand in Asia expected to account for roughly 50% of the total LNG demand growth 2023 v 2018

Source: S&P Global Platts Analytics


Source: S&P Global Platts Analytics
China almost 30% of growth in global LNG demand (2018 to 2023)

Source: S&P Global Platts Analytics

Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
North America LNG Outlook

- North America LNG supply competitive with rest of world for delivery to Asia
- Deliveries to Europe are competitive but margins are thinner
- Cost competitiveness is not the only factor in determining market share

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**Asian Landed Cost by Export Location**

<table>
<thead>
<tr>
<th>Location</th>
<th>Hub Price</th>
<th>Pipeline Costs</th>
<th>Liquefaction Costs</th>
<th>Liquefaction Fuel</th>
<th>Shipping Costs</th>
<th>Estimate</th>
<th>JCC 2023 Proxy</th>
<th>JKM (Jul, 2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gulf Coast LNG</td>
<td>$2.00</td>
<td>$0.52</td>
<td>$2.50</td>
<td>$0.15</td>
<td>$3.34</td>
<td>$0.50</td>
<td>$10.36</td>
<td>$8.76</td>
</tr>
<tr>
<td>Costa Azul</td>
<td>$1.10</td>
<td>$2.00</td>
<td>$1.68</td>
<td>$2.87</td>
<td>$8.83</td>
<td>$0.84</td>
<td>$8.36</td>
<td>$8.76</td>
</tr>
<tr>
<td>Jordan Cove</td>
<td>$0.96</td>
<td>$2.88</td>
<td>$1.62</td>
<td>$2.40</td>
<td>$9.14</td>
<td>$0.78</td>
<td>$10.02</td>
<td>$9.26</td>
</tr>
<tr>
<td>BC LNG</td>
<td>$0.84</td>
<td>$2.40</td>
<td>$3.00</td>
<td>$0.68</td>
<td>$9.83</td>
<td>$0.62</td>
<td>$10.60</td>
<td>$9.83</td>
</tr>
<tr>
<td>Alaska LNG</td>
<td>$0.62</td>
<td>$4.75</td>
<td>$3.65</td>
<td>$0.78</td>
<td>$10.36</td>
<td>$0.84</td>
<td>$11.00</td>
<td>$10.36</td>
</tr>
<tr>
<td>Russia</td>
<td>$8.76</td>
<td>$8.76</td>
<td>$8.76</td>
<td>$0.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Africa</td>
<td>$9.26</td>
<td>$9.26</td>
<td>$9.26</td>
<td>$0.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Landed cost components are based on projected average 2023 prices.

Source: Platts Gas/LNG Daily, KM Analysis

Source: Greg Ruben, KinderMorgan, Colorado Oil and Gas Association Trade presentation, August 21, 2018
Projected Net North America LNG Exports

Source: Greg Ruben, KinderMorgan, Colorado Oil and Gas Association Trade presentation, August 21, 2018
Global Supply Concentrate to Three Players

US follows ramp in Australian volumes; +60% of total liquefaction capacity increase 2023 v 2018

Source: S&P Global Platts Analytics

Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
World LNG Estimated Landed Prices: May-18

Note: Includes information and data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved. Prices are the monthly average of the weekly landed prices for the listed month. Landed prices are based on a netback calculation.
U.S. Natural Gas Production and Consumption

Dry Gas Production
Domestic Consumption

trillion cubic feet per year

Source: EIA Annual Energy Outlook 2018 (Reference Case)

Difference between production and consumption = volume available for export by LNG and pipeline.
U.S. Natural Gas Production and Consumption

dry gas production

domestic consumption

Difference between production and consumption = volume available for export by LNG and pipeline.

Source: EIA Annual Energy Outlook 2018 (High Oil & Gas Case) ©LNG Allies, 2018
# The Size and Scale to Capitalize on the Resource

## Antero Resources Profile

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Cap.</td>
<td>$5.0B</td>
</tr>
<tr>
<td>Enterprise Value</td>
<td>$9.0B</td>
</tr>
<tr>
<td>Corporate Debt Ratings</td>
<td>Ba2 / BB+ / BBB-</td>
</tr>
<tr>
<td>Stand-Alone Debt/Adj. EBITDAX</td>
<td>2.5x</td>
</tr>
<tr>
<td>Net Production (2018E)</td>
<td>2.7 Bcfe/d</td>
</tr>
<tr>
<td>Liquids</td>
<td>130,000 Bbl/d</td>
</tr>
<tr>
<td>3P Reserves</td>
<td>54.6 Tcfe</td>
</tr>
<tr>
<td>C2+ NGLs(^{(1)})</td>
<td>2,131 MMBbls</td>
</tr>
<tr>
<td>Condensate</td>
<td>131 MMBbls</td>
</tr>
<tr>
<td>Net Acres</td>
<td>620,000</td>
</tr>
<tr>
<td>Core Drilling Locations</td>
<td>3,295</td>
</tr>
<tr>
<td>Hedge Mark to Market</td>
<td>$1.2B</td>
</tr>
<tr>
<td>AR Midstream Ownership (53%)</td>
<td>$2.9B</td>
</tr>
</tbody>
</table>

\(^{(1)}\) C2+ 3P Reserves contain 1,318 MMBbls of C3+ NGLs and 812 MMBbls of ethane. Assumes approximately 31% ethane recovery leaving 1,808 MMBbls of ethane in the natural gas stream.

Source: Antero Resources Company Presentation, November 2018
Largest Liquids-rich Drilling Inventory in Appalachia

Largest Undrilled Core Liquids-Rich Inventory

Largest core undeveloped liquids-rich inventory
Over 2.5X the closest competitor

Holds **40%** of Core Undrilled Liquids-Rich Locations

<table>
<thead>
<tr>
<th>Rich Gas Locations</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Undrilled Liquids-Rich Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,234</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AR</th>
<th>Peer 1</th>
<th>Peer 2</th>
<th>Peer 3</th>
<th>Peer 4</th>
<th>Peer 5</th>
<th>Peer 6</th>
<th>Peer 7</th>
<th>Peer 8</th>
<th>Peer 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,475'</td>
<td>8,723'</td>
<td>8,548'</td>
<td>8,912'</td>
<td>8,279'</td>
<td>8,231'</td>
<td>7,999'</td>
<td>7,140'</td>
<td>7,656'</td>
<td>9,028'</td>
</tr>
</tbody>
</table>

Source: Antero Resources Company Presentation, November 2018
Leader in Leverage to NGL Prices

Top NGL Producers in the U.S.

- **2018 Consensus C2+ NGL Production**
- **Pre-hedged Realized NGL Price ($/Bbl)**
- **Pre-Hedge NGL % of Total Product Revenues**

NGLs Generate 37% of AR Revenue (1) 3Q 2018

**Antero Delivers Highest Exposure to Rising NGL Prices**

Source: Bloomberg consensus, SEC filings and company press releases.
Note: Volumes represent consensus as of 10/31/2018. 3Q 2018 realized prices are weighted average including ethane (C2) where applicable. DVN, MRO, OXY and PXD percent revenue and realized prices represent 2Q 2018 actuals.
(1) 3Q 2018 actual NGL revenue percentage based on unhedged product revenue.
* Denotes consensus inclusive of international NGL production.
**Permian, Rockies, Mid-Continent & Bakken**
- Transport Y-grade for out-of-basin fractionation at Mont Belvieu and Conway
- Severely constrained fractionation, Y-grade transportation and NGL storage capacity
- Rapidly rising spot fractionation fees
- Midstream controls product destination and captures pricing uplift

**Appalachia**
- In-basin fractionation
- Transport marketable purity products out-of-basin
- Sufficient fractionation capacity
- Fixed fractionation fees
- Producer controls product destination and captures pricing uplift

Source: Antero Resources Company Presentation, November 2018
Antero’s Ethane Exposure: All Upside

Antero’s ethane has a natural gas pricing “floor” and purity ethane “ceiling”; increases in ethane purity prices are all upside. Antero’s balanced approach to ethane sales results in 50% of contracts tied to purity ethane prices vs. natural gas value.

Ethane Revenue Uplift ($MM)

Incremental Revenue

+$90 - $130MM

+$0.10/Gal C2 price change = $40MM incremental revenue

Ethane sensitivity: +$0.10/gallon x 2019 production target x ~50% exposure to Mt. Belvieu = ~$40MM incremental 2019 ethane revenue

Source: Antero Resources Company Presentation, November 2018
Antero’s NGL Pricing Uplift from Mariner East 2

Mariner East 2 will allow AR to access international LPG markets and realize a ~$5.88/Bbl uplift on its exported barrels.

50,000 Bbl/d Mariner East 2 commitment equates to over $107 MM of incremental annual cash flow.

Domestic Markets

Mariner East 2 ("ME2")
- Initial Capacity (4Q18): Committed volumes
  - Full Capacity (3Q19): 275 Mbbbl/d
  - AR Commitments: 35 Mbbbl/d C3
  - AR Expansion Rights: 15 Mbbbl/d C4

International Markets

Europe Netback 2019
- NWE Price ($/Gal): $1.15
- Pipeline, Terminal & Shipping Cost (1): $(0.24)
- NWE Netback: $0.91
- Blended Conway / MB Netback: $0.77
- Uplift vs. YTD 2018 Average Differential: +$0.14

Asia Netback 2019
- FEI Price ($/Gal): $1.24
- Pipeline, Terminal & Shipping Cost (1): $(0.33)
- Asia Netback: $0.91
- Blended Conway / MB Netback: $0.77
- Uplift vs. YTD 2018 Average Differential: +$0.14

Source: Antero Resources Company Presentation, November 2018
Declining Well Costs → Longer Laterals the Next Step

41% | 43% Lower Costs
Marcellus | Utica reduction in well costs from 2014 to 2017 for a 9,000' lateral
- 54% from efficiencies
- 45% from service costs

9% | 10% Cost Benefit
Marcellus | Utica reduction in well cost per 1,000' lateral going from 9,000' to 12,000' laterals

Note: Well costs reflect 2,000 pound per foot completions. See Appendix for further assumptions.

Source: Antero Resources Company Presentation, November 2018
Well Hedged at High Prices Relative to Strip

Commodity Hedge Position

~100% of 2018 and 2019 Target Gas Production Hedged at ~$3.50/MMBtu

$4.0B of realized gains on hedges since 2008

2.2 Tcfe hedged through 2023 at $3.32/MMBtu

$1.2B Mark-to-Market

~$1.2B Mark-To-Market Unrealized Gains Based On 9/30/2018 Prices

Source: Antero Resources Company Presentation, November 2018
A Paired Trade – Hedges Support Firm Commitments

Hedge Portfolio Supports Firm Commitments

5-Year Cumulative:
- Hedge Gains: $1,350
- Marketing Expense: ($461)
- Net Uplift: $889

Firm Transportation Portfolio
Allows Antero to achieve:

- Premium Price Certainty
  Less volatility and greater surety in realized prices
- Effectively Hedge NYMEX Index
  A key advantage as our product is delivered to NYMEX-related markets

Hedge Gains More than Offset Marketing Expense – Hedges Support FT Commitments

Source: Antero Resources Company Presentation, November 2018
Dramatically Lower F&D Cost

F&D Cost per Mcfe\(^{(1)(2)}\)

- Marcellus
- Utica

52% | 42%
Lower F&D
in Marcellus | Utica
(2014 – 2017)

Dramatic Improvement in Operating Efficiencies, Lower Service Costs and Higher Well Recoveries Have Driven F&D Costs Materially Lower

\(^{(1)}\) Ethane rejection assumed.
\(^{(2)}\) F&D cost is defined as current D&C cost per 1,000' lateral divided by net EUR per 1,000' lateral assuming 85% NRI in Marcellus and 81% NRI in Utica. Please see "Antero Definitions" and "Antero Non-GAAP Measures" in the Appendix.

Source: Antero Resources Company Presentation, November 2018
Drilling and Completion Efficiencies

Drilling Days

Marcellus Down 59%

Completion Stages per Day

72% Increase

Average Lateral Length per Well

28% Increase

Average Lateral Feet per Day

228% Increase

Note: Utica 3Q 2018 results reflect YTD results, as Antero is not operating any rigs in the Utica during 2H18. Note: Percentage increase and decrease arrows represent change in Marcellus data from 2014 to 3Q 2016.

Source: Antero Resources Company Presentation, November 2018
Oil and Gas Production Added Per Rig

Key Takeaways from 2010

- Shale gas/productivity gains (We aren’t exploring, we are manufacturing gas.)
- Demand in Mexico (potential demand increase)
- LNG exports from North America (China is waiting)

Key Takeaways from 2015

The Big Three Issues to Watch:
- Global Oil Price
- Marcellus and Utica Shale Production
- U.S. LNG Exports
Key Takeaways

• Forecasted NorAm production growth is highly dependent on global export markets; more exports to Mexico and LNG (10.3 Bcf/d) than organic demand growth in Canada and US (5.7 Bcf/d); reductions in exports forecasted are balanced by reductions in production growth.

• Global demand for LNG continues growing; expect a “second wave” of LNG liquefaction capacity.

• Gas infrastructure development is required to connect supply centers with emerging demand.

• You have heard “it’s about location, location, location.” Production is about efficiency, efficiency, efficiency.

Source: Rick Allen, S&P Global Platts, The Energy Summit – COGA 2018 presentation, August 22, 2018
Contact Information

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(303) 825-1100 (work)
(303) 478-3233 (cell)
NYMEX Historical and Future Forecast

Natural Gas Basis Map
(differential to Henry Hub)
October '18 FOM Indices
*Circa 2014: Saudis have staying power; $750 billion in foreign country reserves
<table>
<thead>
<tr>
<th>Nation</th>
<th>Oil price per barrel required to break even or balance budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>US producers</td>
<td>$38-$77</td>
</tr>
<tr>
<td>Qatar</td>
<td>$58</td>
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<tr>
<td>Kuwait</td>
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<td>Nigeria</td>
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<tr>
<td>Iran</td>
<td>$136</td>
</tr>
</tbody>
</table>

According to data compiled by Bloomberg, “prices have dropped below the level needed by at least 9 OPEC member states to balance their budgets.”


*Survival of fittest as oil tumbles below $65*, Bloomberg News, December 1, 2014