Shale and Energy Development In Ohio

October 2015
Shale Development: Foundation in Place, Long-Term Future

- Approaching 1600 wells drilled (As of 8/3/2015)
- Over 1000 wells in production
- Over $12 billion of midstream investment committed

Less than 10% of the drillable acreage has been developed...
The Energy to Drive Prosperity

- Marcellus & Utica provide 85% of U.S. shale gas production growth since 2012

- Ohio offers a significant natural gas cost advantage vs. the Gulf Coast

- Ohio is in close proximity to key markets

- Ohio’s strong business climate stems from a competitive tax structure and a streamlined, predictable regulatory system

Source: US Energy Information Administration, August 12, 2014
Massive Midstream Investment

- Approx. $15-20 Billion invested in the last five years
- New Feedstocks
- New Pipelines
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Pipeline</th>
<th>Sponsor</th>
<th>Delivery Area</th>
<th>Total Capacity (MMBtu/day)</th>
<th>Start-Up Date</th>
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<tbody>
<tr>
<td>Lebanon Lateral Reversal</td>
<td>ANR Pipeline</td>
<td>TransCanada</td>
<td>Midwest</td>
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<td>SWLA Station 219 to Zone 1 S/L</td>
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<td>Lebanon East - Phase 1</td>
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<td>Team South</td>
<td>Texas Eastern Transmission</td>
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<td>Team 2014 (M2 to Lebanon)</td>
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Total: 20,127
Natural Gas Price Comparisons

Dominion South Gas Price Curve

Source: Morningstar September 2015
Example Natural Gas Price Comparisons

Dominion South vs. Demand Market Prices

Summer to date 2015
- Dominion South: $1.38
- Henry Hub: $2.75
- Texas Eastern M-3: $2.76
- Transco Zone 5: $1.50

Peak Winter (Dec-Feb) 2015-16
- Dominion South: $2.04
- Henry Hub: $2.97
- Texas Eastern M-3: $3.24
- Transco Zone 5: $5.08
- Chicago Citygate: $5.51

Source: Morningstar Sept 2015
Global Natural Gas Price Advantage

Source: World Bank
## Recent Liquids World Commodity Prices

<table>
<thead>
<tr>
<th></th>
<th>U.S. Gulf of Mexico</th>
<th>Europe</th>
<th>Asia</th>
<th>Appalachia</th>
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<tr>
<td>Natural Gas</td>
<td>$2.50</td>
<td>$6.30</td>
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<td>Ethane</td>
<td>$0.19</td>
<td>$0.49</td>
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<td>Propane</td>
<td>$0.41</td>
<td>$0.72</td>
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<td>Iso-Butane</td>
<td>$0.66</td>
<td>$0.64</td>
<td>$0.93</td>
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<tr>
<td>Normal Butane</td>
<td>$0.66</td>
<td>$0.64</td>
<td>$0.93</td>
<td>$0.25</td>
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<tr>
<td>Condensate</td>
<td>$1.06</td>
<td>$1.25</td>
<td>—</td>
<td>$0.90</td>
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</table>

Source: MarkWest Oct 2015
Effects of A Low Price Environment

- Rig reductions
- Continue to drive down E&P costs
- Some delaying of well completions
- Focus on dry gas and high producing regions/leases
- Some hedged when prices were higher
- Takeaway pipelines to chase higher priced markets (Gulf, Mid continent, and Northeast)
- Securing firm transport on pipes to higher price markets
Rig Counts is only part of the story

Source: Baker Hughes and EIA
Production Per Rig Has Drastically Improved

U.S. Major Shale Natural Gas Production Per Rigs

Source: Baker Hughes and EIA
Effects of Shale Cost Advantage

- Helping to justify expansions of some Ohio facilities
- Attracting energy intensive industries
- Attracting industries where energy is a feedstock
- Merchant power generation with gas
- Distributed/onsite power generation
Where Do Things Go From Here

- Pricing will determine speed of new drilling
- Midstream and Pipelines should continue to grow
- Gas consumptions should continue to grow (industrial, power generation)
Producer Actions (Antero Resources)

North American Breakeven Oil Prices ($/Bbl)\(^{(1)}\)

- **2015 WTI Strip:** $56.26/Bbl\(^{(2)}\)
- Assumes $3.66/MMBtu NYMEX Gas\(^{(1)}\)

Antero 2015 Drilling Plan:
- Utica - Wet Gas: $39
- Marcellus - Super Rich: $42
- Niobrara XL: $51
- Wolfcamp (Permian): $53
- Bone Springs (Permian): $54
- Utica - Condensate: $60
- Mississippian: $64
- Bakken Shale: $65
- Wolfberry: $68
- Uinta - Green River: $69
- Tuscaloosa Marine Shale: $72
- Granite Wash: $83

North American Gas Resource Play Breakeven Natural Gas Prices ($/MMBtu)\(^{(3)}\)

- **2015 NYMEX Strip:** $3.01/MMBtu\(^{(2)}\)
- Assumes $65/Bbl WTI Oil\(^{(3)}\)

Antero 2015 Drilling Plan:
- Marcellus - Super Rich: $1.94
- Eagle Ford - Liquids Rich: $2.20
- Utica - SW Liquids Rich: $2.20
- Marcellus - NE: $2.37
- Utica Dry Gas: $2.96
- Barnett Shale - Core: $3.13
- Fayetteville Shale - SW: $3.13
- Haynesville Shale - Core: $3.48
- Cotton Valley Horizontal: $3.50
- Pineville: $3.63
- Horn River Basin: $3.77
- Tyler Shale: $3.85
- Bossier Shale: $3.88
- McRose - Elsberry: $3.98
- Winkler: $4.33
- Haynesville: $4.38
- Bossier Shale - Liquids Rich - NE TX: $5.56
- Marcellus Shale - SW: $5.62
- Lamont: $5.69
- Mississippi; Horizon: $5.71
- Winkler: $5.74

2. 2015 one-year WTI crude oil strip price as of 12/31/2014; NYMEX one-year natural gas strip price as of 12/31/2014.
3. Source: Credit Suisse report dated December 2014 – Break-even NYMEX gas price to generate 15% after-tax rate of return. Assumes WTI oil price of $64.74/Bbl for 2015-2019; $70.50/Bbl thereafter; NGLs at 35% of WTI vs. Antero guidance of 30%-35% of WTI for 2015-2016 and 50% of WTI for 2017 and thereafter, driven by completion of Mariner East II project expected by year-end 2016.
Hedging Example (Antero Resources)

Quarterly Realized Hedge Gains / (Losses)\(^{(1)}\)

- Realized $1.5 Billion in Hedge Gains Since 2009
- $3.1 Billion in Projected Hedge Gains Through 2021\(^{(1)}\)
- 3.1 Tcfe Hedged at average index price of $3.93/Mcfe through 2021

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1. 4Q 2015 – 4Q 2021 hedge gains based on current mark-to-market hedge gains.
2. Based on NYMEX strip as of 9/30/2015.

Source: Antero Resources Oct 2015 Investor Report
Firm Transport Example to Higher Priced Markets

Antero Long Term Firm Processing & Takeaway Position (YE 2018) – Accessing Favorable Markets

YE 2018 Gas Market Mix
AR 4.85 Bcf/d FT

<table>
<thead>
<tr>
<th>Market</th>
<th>Quantity</th>
<th>Price ($/MMBtu)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwest</td>
<td>1,400 Mmcf/d</td>
<td>$0.22 / $0.04</td>
</tr>
<tr>
<td>Domestic South</td>
<td>625 Mmcf/d</td>
<td>$1.55 / $1.05</td>
</tr>
<tr>
<td>Gulf Coast</td>
<td>800 Mmcf/d</td>
<td>$0.04</td>
</tr>
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<td>TCO Pool</td>
<td>689 Mmcf/d</td>
<td>$0.18 / $0.22</td>
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<tr>
<td>Atlantic Seaboard</td>
<td>630 Mmcf/d</td>
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<tr>
<td>Midwest</td>
<td>1,503 Mmcf/d</td>
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<tr>
<td>Gulf Coast</td>
<td>600 Mmcf/d</td>
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<tr>
<td>4.85 Bcf/d Firm Gas Takeaway By YE 2018</td>
<td>$0.09 / $0.08</td>
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</tbody>
</table>

CGTLA (1) $0.09 / $0.08
Sabine Pass (Trains 1-4) 50 Mmcf/d per Train
Freeport LNG 70 Mmcf/d

Source: Antero Resources Oct 2015 Investor Report
Coal generation has driven industrial growth until today but natural gas will take over with some help from clean coal, remaining nuclear, and renewables.
New Generation Under Development – Mostly Natural Gas and Some Renewables

Why maintaining a diverse generation portfolio is important in a global economy? Opportunity to attract new generating and infrastructure to your region.
Competitor nations continue to ramp up use of cheap coal.

- Coal
- Oil
- Natural Gas
- Nuclear
- Hydro
- Renewables

Global Electricity Production (TWh)

2000 2015P 2035P

Largely led by China and India.
Transition away from centralized bulk generation

- Fully Regulated
- Allowed for large scale, long-term ROI investments
- Focus on reliability more than price
- Limited customer engagement
- Limited ability to customize solutions
Over 50% of the power bill is provide by third parties other than the local utility. Like telecom, cellular, cable, and internet, customers can shop for best price and service.
Opportunities to develop controls, valves, microelectronics, software, services...
Example of a JobsOhio Sector Supply Chain Strategy
Energy & Petrochemicals Industry

OHIO’S RANK IN THE U.S.

#1 Ohio’s polymer output
#1 Ohio’s rubber output
#1 Regional polyolefin demand
#2 Ohio’s plastics output

Ohio’s Polymer & Chemical segment grew 20% since 2010 (vs. 11% in the U.S. overall)

Key Sector Players

- Government and resources
  - OEPA, Ohio Department of Commerce, Ohio Department of Natural Resources, Ohio Department of Transportation, Polymer Ohio, Edison Center for Advance Materials and Polymers, University of Akron, National Polymer Innovation Center.

- Midstream Players

- Industrial Chemical/Polymers
  - PolyOne
  - Momentive
  - Lubrizol
  - Saint-Gobain

- Infrastructure Providers
  - AEP
  - FirstEnergy
  - CSX
  - NS
  - NiSource
Example of a JobsOhio Sector Supply Chain Strategy
Energy & Petrochemicals Industry

- Identified High Growth Opportunities for Ohio

Upstream Extractors

- CONSOL ENERGY
- Chesapeake Energy
- ENERVEST
- Gulfport Energy
- HESS
- MAGNUM HUNTER RESOURCES CORPORATION
- TOTAL

Pipelines

- BLUEracer Midstream
- Columbia Pipeline Group
- Enterprise Products
- Enterprise
- Spectra Energy
- TALLGRASS ENERGY

Fractionators/Processors

- Momentum
- MARKWEST
- Williams
- NiSource

Methanol Plants

- On-Purpose Propylene Plants

Power Generators

- advanced power
- clean energy works oregon
- NTE ENERGY

Ammonia Plants

- PotashCorp

Refineries

- bp
- Husky Energy

Industrial Chemicals & Polymer Companies

- A. Schulman
- AkzoNobel
- Lubrizol
- Momentive
- PolyOne
- Sherwin-Williams
Recent Win – Proposed Ethane Cracker

PTT Global Chemical -
• Thailand’s biggest chemical company (Operates 18 Plants in Thailand)
• Operates in 7 countries
• Current presence in Ohio with equity interest in Emery Oleochemicals

The Project -
• Belmont County, Ohio on retired coal power plant located on Ohio River
• Potential project investment - $5.7 billion
• One-million-ton world scale olefin cracker
• May spend about $150 million over the next 18-24 months to determine final investment viability of the project
Petrochem and Downstream Manufacturing within 400 miles - 17,477 Companies
JobsOhio

Dana Saucier
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614-361-0608 | jobs-ohio.com
Created in 2011, JobsOhio (JO) is a private economic development organization that helps businesses relocate, expand, and prosper in Ohio.

JO is governed by business & civic leaders, has a significant recurring funding source (~$150mm+ per year) and is led by 7 Managing Directors who generally possess over 20 years of relevant industry experience.

In addition to providing industry expertise, JO operates loan & grant programs and facilitate state tax credits.

Evaluation criteria include job creation, additional payroll, fixed-asset investment, ROI & location.

JO Regional Network is comprised of 6 partners:
- APEG
- Columbus 2020
- DDC
- REDI Cincinnati
- RGP
- Team NEO/Cleveland+

Sectors of Focus:
- Advanced Manufacturing
- Aerospace & Aviation
- Automotive
- BioHealth
- Information Technology
- Shale Energy & Petrochemical
- Financial Services
- Food Processing
- Distribution & Logistics

Ohio is one of the few states that has all five Game Changers, identified by McKinsey Global Institute: Shale Energy, Big Data Analytics, Advanced Manufacturing, Infrastructure, and Talent.

Illustrative Recent Announcements:
- Commitment to develop facilities in Ohio for AWS cloud & two fulfillment centers, resulting in over 2,100 jobs (May 2015)
- Site finalist for a world-scale petrochemical complex (ethane cracker); PTTGC & Marubeni expected to make final investment decision in 2016 (Apr. 2015)
- Fuyao Glass announced $130mm investment; 1,550 total jobs and $360mm total capital investment (Jan. 2015)
- GE chose Cincinnati for a new U.S. Global Operations Center; project is expected to create 1,400 new jobs (Apr. 2014)
Economic Development Toolbox

- Growth Fund Loan
- Workforce Grant
- Economic Development Grant
- Revitalization Loan and Grant

- Job Creation Tax Credit
- Data Center Sales Tax Exemption
- Direct 166 Loan
- Ohio Enterprise Bond Fund
- Innovation Ohio Loans
- R&D Loan
- Roadwork Grants
JobsOhio 2014 Performance by Company Size

Note: Ohio’s Shale investments not counted
JobsOhio Project Pipeline

ACTIVE PROJECTS BY STAGE

19,037 JOBS
$5.3 BILLION CAPITAL INVESTMENT

13,242 JOBS
$3.4 BILLION CAPITAL INVESTMENT

22,416 JOBS
$9.0 BILLION CAPITAL INVESTMENT

25,865 JOBS
$1.4 BILLION CAPITAL INVESTMENT

LEADS 242
NEGOTIATIONS 145
OFFERS 57
APPLICATIONS 88

Data as of March 31, 2015

1Potential results if all projects are realized
Includes new and retained jobs