WV 2010 Energy Summit

Infrastructure Investment Opportunities in WV

Stonewall Resort

James Crews
Director, Appalachian Supply
December 7, 2010
Extent of the Marcellus in WV
Infrastructure Requirements- M&R, Pipelines, Compression, and Processing
WV Scorecard
Water Treatment
Value Added Petro Chemical Products from NGL’s?
Marcellus Shale including Fairway and Rich Gas Boundary
From Caimen Energy
Marcellus Interconnect Program

74 New Taps (tap capacity) 5.6 Bcf/d

- Current Max Marcellus Flow: 150 MMcf/d
- 15 In-Service (tap capacity): 605 MMcf/d
- 23 In Progress – 2012: 2640 MMcf/d
<table>
<thead>
<tr>
<th>Company</th>
<th>Project (s)</th>
<th>Location</th>
<th>Capex-$MM</th>
<th>Year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caimen</td>
<td>Fort Beeler</td>
<td>Marshall Co.</td>
<td>80</td>
<td>2010-2011</td>
<td>$400 MM long term</td>
</tr>
<tr>
<td>ETP</td>
<td>Bobcat Gathering</td>
<td>Harrison, Wetzel</td>
<td>46.8</td>
<td>2010/2011</td>
<td>$218 MM for Marcellus</td>
</tr>
<tr>
<td>Eureka Hunter</td>
<td>Eureka Gathering</td>
<td>Wetzel, Doddridge, Tyler</td>
<td>31</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td>EQT</td>
<td>Marcellus Expansion</td>
<td>Wetzel, Marion, Monongalia, Dodridge, Harrison, Lewis</td>
<td>850*</td>
<td>2010, 2011, 2012</td>
<td>*Derived</td>
</tr>
<tr>
<td>MarkWest</td>
<td>Majorsville I and II + Y-Grade</td>
<td>Marshall</td>
<td>150</td>
<td>2011, 2012</td>
<td></td>
</tr>
<tr>
<td>NiSource</td>
<td>Majorsville I, Smithfield I and II, Cobb, WB Expansion</td>
<td>Marshall, Wetzel, Gilmer, Kanawha, Upshur</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spectra-TETCo</td>
<td>Taps</td>
<td>Marshall</td>
<td>0</td>
<td>2010-2012</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>2208</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Water Treatment/Disposal

- Hydraulic Fracturing will require 5 MM gallons/well
- On-site Treatment and Re-use is promising.
- Total Dissolved Solids, and Chloride limit disposal at Sewerage Treatment Plants
- May result in on-site treatment or central plant treatment with pipeline and storage infrastructure.
Value Added Petro Chemical Products

“The Polyethylene Renaissance?”
Sub $4.00 Breakevens Drive Resource Plays

Note: Breakevens computed at 12:1 Crude Ratio and 1:1 NGL Ratio (green 1:3 NGL Ratio)
Total Ethane Volume

Total Ethane From High BTU Marcellus Gas

<table>
<thead>
<tr>
<th>Ethane Extracted (bpd)</th>
<th>Four Cases (2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>40,000</td>
<td>1,300,000</td>
</tr>
<tr>
<td>60,000</td>
<td>1,600,000</td>
</tr>
<tr>
<td>80,000</td>
<td>1,900,000</td>
</tr>
<tr>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>120,000</td>
<td></td>
</tr>
<tr>
<td>140,000</td>
<td></td>
</tr>
<tr>
<td>160,000</td>
<td></td>
</tr>
<tr>
<td>180,000</td>
<td></td>
</tr>
</tbody>
</table>

GPM of Natural Gas

5.0 5.5 6.0 6.5 7.0 7.5
Must Recover Ethane Volume

Must Recover Ethane From High BTU Marcellus Gas

- Ethane Extracted (bpd)
- GPM of Natural Gas

Four Cases (2014)
- 1,000,000
- 1,300,000
- 1,600,000
- 1,900,000

BENTEKENERGY.COM
Gulf Coast Ethylene Market

- Plaquemine, Louisiana
  - 58,000 bpd of maximum ethane cracking capacity
  - Purity ethane storage
  - Proprietary dock for offloading

- Lake Charles, Louisiana
  - 85,000 bpd of maximum ethane cracking capacity
  - Purity ethane storage
  - Proprietary LNG dock for offloading ethane

- Nederland, Texas
  - 200,000+ bpd of ethane cracking capacity
  - Purity ethane storage at Mt. Belvieu through displacement and flow reversal
  - Potential additional ethane storage development
  - Market growth potential of up to an additional 40,000 bpd of ethane
  - SXL proprietary dock currently in crude oil and refined products use
What About the Ethane

- Western Marcellus contains 15% Ethane
- Could result in up to 12 Billion pounds/year of Ethane
- 3 Billion pounds/year supports Steam Cracker for Ethylene Production
- Blending with GOM Supply will be an interim solution
- Pipelines/Barge to GOM-Midwest may be a solution
- Every $1/MM Btu (Dth) advantage in gas costs results in 6 cents/gallon advantage in Ethane.
- Costs to transport Ethane to GOM are 15 cents/gal to 40 cents/gal.
- High Oil and Naptha prices will force cracking of Ethane/Propane
- Frac Spread Futures for Ethane are Negative after 2010 (DTI vs. Mont. Belvieu)
- Ethylene Oxide (XO) Manufacture in NE will be economically advantaged.
- 50+ Chemical Manufacturing Processes use XO as feedstock.
Thank You

Jim Crews-304-357-2897