West Virginia Oil and Natural Gas Association

West Virginia Energy Summit
October 18, 2017
Tremendous Industry Investment

• Mid-Stream Processing
  o MarkWest Mobley, Sherwood & Majorsville Expansions
  o Williams Ohio Valley Midstream $4.5 billion investment
    – Oak Grove Gas Processing Plant
    – Fort Beeler Processing Plant
    – Moundsville Fractionalization Plant

• Antero Resources
  o Doddridge Co. Wastewater Facility $275mm
  o Ohio River Water Pipeline Project $525mm

• Natural Gas Power Generation
  o ESC Harrison Power $600+mm
  o ESC Brooke County Power $800+mm
  o Quantum Utility Generation’s Moundsville Power $600+mm
Energizing West Virginia’s Jobs and Economy

PricewaterhouseCoopers reports that West Virginia’s oil and natural gas industry supported:

- **70,900** Direct/Indirect West Virginia Jobs
- **RANKED 8th in U.S.** Number of industry workers as a percentage of total employment
- **$8 BILLION** Impact to State Economy

The oil and gas industry’s ripple effect is becoming more like a tidal wave, and we’re proud to play a part in moving West Virginia forward.

energizeWV
wv oil & natural gas association

ENERGIZEWV.COM
How Do We Maximize the Opportunities Provided by Natural Gas?

• Move supply to where it’s needed
• Enact pro-development policies to grow the industry
• Create additional end uses:
  • Petrochemical industry
  • Natural gas fired power plants
Interstate Pipelines Proposed

Major Proposed Pipeline Projects in West Virginia

Proposed Pipeline Projects
- Atlantic Coast
- Atlantic Coast Previous Route
- Header Supply Project
- Leach Xpress
- Mariner East 2
- Mountain Valley
- Mountain Valley Alternative Route
- Mountaineer Xpress
- Rover
- Stonewall Gas Pipeline Project
- Tennessee Gas Expansion
- Western Marcellus
Largest Private Sector Infrastructure Investment in WV History

• Construction related impact in West Virginia: $5.7 billion
• Combined jobs during construction: 18,000+ jobs
• Estimated capital investment property taxes: $61.1 million
Downstream Opportunities
Natural Gas to Petrochemicals

Production Wells
- Gas
- Oil & Gas
- Oil

Gathering

Field Separation & Treating

Production Wells

Gas

Production Wells

Oil & Gas

Oil

Gathering

Production Wells

Gas

Production Wells

Oil & Gas

Oil

Gathering

Production Wells

Gas

Production Wells

Oil & Gas

Oil

Gathering

Production Wells

Gas

Production Wells

Oil & Gas

Oil

Gathering

Pipeline

Natural Gas (Heating)

Mixed NGL's (Y-Grade)

Fractionation Plant

Butanes and natural gasoline

Crude oil and condensate

Gas Processing Plant

Off gas

Propane

Normal Butane

Refinery

Ethane (C2) (Petrochemicals)
Propane (C3)
(Heating & petrochemicals)
Iso-Butane (iC4)
(Motor fuel)
Normal Butane (nC4)
(Motor fuel & petrochemicals)
Natural Gasoline (C5+)
(Motor fuel, petrochemicals, & diluent)

LPGs
Chemicals & LPGs: The Basics

- All chemicals and LPGs start with Oil, Coal or Natural Gas
  - BLACK DOT
- Most refineries only produce some base petrochemicals
  - RED DOTS
- Chemical plants use base petrochemicals to make derivatives
  - YELLOW DOTS
- Derivatives are then further developed into consumable items
  - GRAY PRODUCT TYPES
<table>
<thead>
<tr>
<th>Product</th>
<th>Normal Use</th>
<th>Consumer Items</th>
<th>Refinery Alternative to Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethane, Off Gas</td>
<td>Refinery fuel, further split for petrochemicals processing (ethylene)</td>
<td>PVC pipes, bottles (PE), Ziploc bags, films, solar panel components</td>
<td>Refinery fuel</td>
</tr>
<tr>
<td>Propane</td>
<td>Home heating, industrial fuel, petrochemical processing (propylene)</td>
<td>Home heat, grills, auto/truck fuel, forklifts, agricultural weed control, plastics, packaging, windmill blades</td>
<td>Refinery fuel</td>
</tr>
<tr>
<td>Propylene</td>
<td>Polypropylene, cumene, acrylonitrile</td>
<td>Plastic storage totes, toys, disposable bottles (PP), packaging, see cumene above</td>
<td>Alkylate, fuel, cumene</td>
</tr>
<tr>
<td>Benzene</td>
<td>Cumene, styrene</td>
<td>Styrofoam, nylon, polymers, elasticizers (asphalt SBS), rubber, fiberglass, see cumene above</td>
<td>Cumene to gasoline blending</td>
</tr>
<tr>
<td>Toluene</td>
<td>Xylene, gasoline blending, solvents</td>
<td>Detergents, paint, paint thinner, insecticides, adhesives, see xylene below</td>
<td>Blend to gasoline</td>
</tr>
<tr>
<td>Xylene</td>
<td>Polyester, plastics, gasoline blending</td>
<td>Plastic bottles (PET), clothing, dyes, paint, paint thinner, adhesives</td>
<td>Blend to gasoline</td>
</tr>
<tr>
<td>Cumene</td>
<td>Phenol</td>
<td>Polycarbonate lenses, street light covers, headlights, sauder furniture, pressboard construction materials, reusable bottles, electronics, CDs, appliances</td>
<td>Decreased rates; blend to gasoline</td>
</tr>
<tr>
<td>Sulfur</td>
<td>Sulfuric acid; fertilizers</td>
<td>Fertilizer, paper, water treatment, tires, batteries, detergents</td>
<td>Prill &amp; export; landfill</td>
</tr>
</tbody>
</table>
Other Products from Shale You Use Every Day

- Electronics
- Window frames
- Toiletries
- Medicine
- Toothbrush
- Kitchen utensils
- Siding
- Appliances
- Fertilizer
- Shoes
- Clothing
- Carpet
- Paint
- Automobile

In your daily life, you use products made from shale in various aspects of your home and personal care.
So how do we get there?

- US jobs related to plastics manufacturing alone are expected to grow by 462,000 (>20%) over next decade due to shale gas boom
- Marcellus and Utica Shales driving US natural gas production
- Ethane storage key to developing chemical manufacturing industry
- A storage facility tied into overall play via massive piping infrastructure
- Appalachian basin provides:
  - Access to markets
  - Competitive pricing advantage of valuable hydrocarbons
- WV has a long history in using natural gas to make chemicals
  - Clendenin, WV is site of world's first commercial ethylene plant
  - Union Carbide 10,000 lb/day ethylene plant in 1921
Conclusion

• West Virginia is primed for resurgence of manufacturing industry
  – Natural gas resources
  – Appalachian basin produces 33% of US natural gas
    • 25-30% of NGL’s
  – Lowest cost NGL’s and natural gas are here for next century
  – Appalachian manufacturers of base and derivative products have a significant price advantage
  – Infrastructure opportunities
Help Us Grow Opportunity in WV

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• [www.EnergizeWV.com](http://www.EnergizeWV.com)
Thank You!