Economic Development Organization Conference

April 6, 2016
Hilton Garden Inn, Erie, PA
Agenda

• Appalachian oil and gas development
  – Production, prices and performance
• Midstream and downstream development
• Impacts of resource development on regional economic prospects

In other words ...

1. What are we producing and
2. What are we going to do with it
Geographic Context
Value Proposition for our Region

- Extraction of gas and other products
- Gas gathering and processing
- Lower energy costs for homes and businesses
- Ethane processing
- Manufacturing of products from methane and petrochemical products

Cumulative regional economic benefit
Dynamic Oil and Gas Rig Count

According to Baker Hughes, lowest U.S. natural gas rig count on record in late March 2016!

Data Source: Energy Information Administration
Despite fewer new wells, production surges, especially in OH, PA.

Source: EIA, Drilling Productivity Report, March 2016
Increases in Productivity per Well

Source: EIA, Drilling Productivity Report, March 2016
Natural Gas Price Declining - to a New Normal?

Weekly Henry Hub Natural Gas Spot Prices
Last two years

Data Source: Energy Information Administration
Natural Gas Prices Over Time

Weekly Henry Hub Natural Gas Spot Prices
1997-2015

Data Source: Energy Information Administration
# Natural Gas Cash Prices

## Regional Variability

<table>
<thead>
<tr>
<th>Natural Gas, Source</th>
<th>10.30.15</th>
<th>Previous</th>
<th>Year Ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas, Henry Hub-I</td>
<td>1.94</td>
<td>2.1</td>
<td>3.8</td>
</tr>
<tr>
<td>Natural Gas, Transco Zone 3, $ per Mmbtu-I</td>
<td>1.93</td>
<td>2.1</td>
<td>3.73</td>
</tr>
<tr>
<td>Natural Gas, Transco Zone 6 NY, $ per MMBtu-I</td>
<td>1.48</td>
<td>2.03</td>
<td>2.76</td>
</tr>
<tr>
<td>Natural Gas, Panhandle East, $ per MMBtu-I</td>
<td>1.7</td>
<td>2.07</td>
<td>3.37</td>
</tr>
<tr>
<td>Natural Gas, Opal, $ per MMBtu-I</td>
<td>1.93</td>
<td>2.09</td>
<td>3.57</td>
</tr>
<tr>
<td>Natural Gas, Marcellus NE PA, $ per MMBtu-I</td>
<td>0.69</td>
<td>1</td>
<td>2.09</td>
</tr>
<tr>
<td>Natural Gas, Haynesville N. LA, $ per MMBtu-I</td>
<td>1.9</td>
<td>2.06</td>
<td>3.59</td>
</tr>
</tbody>
</table>

Source: Wall Street Journal, 10.30.15
Performance varies by Company

Financial performance:
- One energy company excelled
- Many in dead last
- Most working to make it through price trough

Source: WSJ Market Data Group
Pipeline Development
Marcellus and Utica Expansion Projects

MarkWest alone had 22 Major projects under construction in 2013

**KEYSTONE COMPLEX**
- Bluestone I & Sarsen I – 90 MMcf/d – Complete
- Bluestone II – 120 MMcf/d – 2Q14
- Bluestone III – 200 MMcf/d – TBD
- De-ethanization – 10,000 Bbl/d – 1Q14
- C3+ Fractionation – 10,000 Bbl/d – 1Q14

**HOUSTON COMPLEX**
- Houston I, II & III – 355 MMcf/d – Complete
- Houston IV – 200 MMcf/d – 2015
- C3+ Fractionation – 60,000 Bbl/d – Complete
- De-ethanization – 38,000 Bbl/d – Complete

**HOPEDALE FRACTIONATOR**
- C3+ Fractionation – 60,000 Bbl/d – 1Q14

**CADIZ COMPLEX**
- Cadiz I & Refrig – 185 MMcf/d – Complete
  - Cadiz II – 200 MMcf/d – 3Q14
  - De-ethanization – 40,000 Bbl/d – 1Q14

**SENeca COMPLEX**
- Seneca I – 200 MMcf/d – 4Q13
- Seneca II – 200 MMcf/d – 4Q13
- Seneca III – 200 MMcf/d – 2Q14
- De-ethanization – 38,000 Bbl/d – 4Q14

**Majorsville Complex**
- Majorsville I-III – 470 MMcf/d – Complete
  - Majorsville IV – 200 MMcf/d – 1Q14
  - Majorsville V – 200 MMcf/d – 4Q13
  - De-ethanization I – 38,000 Bbl/d – 4Q13
  - De-ethanization II – 38,000 Bbl/d – TBD

**MOBLEY COMPLEX**
- Mobley I & II – 320 MMcf/d – Complete
  - Mobley III – 200 MMcf/d – 4Q13
  - Mobley IV – 200 MMcf/d – 1Q15

**Sherwood Complex**
- Sherwood I & II – 400 MMcf/d – Complete
  - Sherwood III – 200 MMcf/d – 4Q13
  - Sherwood IV – 200 MMcf/d – 2Q14
  - De-ethanization – 38,000 Bbl/d – 1Q15

- MWE Gathering Area
- MWE Utica Counties
- MWE Marcellus Counties
- MWE Plants
- ATEX Express Pipeline
- TEPPCO Product Pipeline
- Mariner Projects
- MWE NGL Pipelines

[Map Image]

**THE KLABER GROUP**

ENERGY, ENVIRONMENTAL AND ECONOMIC STRATEGIES FOR BUSINESS
Value Proposition for our Region

- Extraction of gas and other products
- Gas gathering and processing
- Lower energy costs for homes and businesses
- Ethane processing
- Manufacturing of products from methane and petrochemical products

Cumulative regional economic benefit
We can continue to provide for our regional electricity needs.

Source: U.S. Energy Information Administration, Electric Power Monthly, *Short-Term Energy Outlook*
Cost Savings to Manufacturers

Total US manufacturers estimated annual natural gas expenses under high and low shale gas recovery/price scenarios ($ billion)

- 2012: $15.74 at $2.75 mil Btu
- 2030: $24.33 at $4.25 mil Btu
- 2040: $26.22 at $4.58 mil Btu

High recovery/low price
Low recovery/high price
*Avg. wellhead price

$34.06 bil. est. annual savings
$22.33 bil. est. annual savings

Source: EIA, PWC Analysis
Industrial sector energy consumption is expected to grow faster than all other sectors.
Shale Development = Manufacturing

Cumulative Manufacturing Impact
Projects: 117  Investment: $80 billion  Jobs: 515,000

- Northern Plains Nitrogen (new fertilizer plant): $1.5 billion, 2,000 jobs
- Emery Refining LLC (new refinery): $225 million, 125 jobs
- OCI Fertilizer (new fertilizer plant): $1.4 billion, 2,500 jobs
- Formosa Plastics (new ethane cracker): $1.7 billion, 2,000 jobs
- Dow Chemical (new ethane cracker): $1.7 billion, 2,000 jobs
- Methanex (new methanol plant): $1.1 billion, 1,500 jobs
- Sasol (new ethane cracker): $14 billion, 7,000 jobs
- U.S. Steel (plant expansion): $1.6 billion, 300 jobs
- V&M Star (new steel mill): $650 million, 350 jobs
- Eastman Chemical (plant expansion): $1.6 billion, 300 jobs
- Siemens (gas turbine facility): $350 million, 700 jobs

SOURCE: IHS-CERA; American Chemistry Council

ENERGY, ENVIRONMENTAL AND ECONOMIC STRATEGIES FOR BUSINESS
Balancing benefits of high and low natural gas prices for manufacturers

![Graph showing the optimal range for both industry suppliers and downstream users. The graph plots natural gas price ($/Mmbtu) on the y-axis and manufacturer's profit on the x-axis. The graph illustrates the optimal range where both oil & gas industry suppliers and energy users benefit.](image-url)
Regional Ethane Story

Source: www.rangeresources.com
# Ethane => Ethylene Production \( (C_2H_4) \)

## Product categories

<table>
<thead>
<tr>
<th>Product categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesives</td>
</tr>
<tr>
<td>Alkyd resins</td>
</tr>
<tr>
<td>Solvents</td>
</tr>
<tr>
<td>Corrosion inhibitors</td>
</tr>
<tr>
<td>Textiles</td>
</tr>
<tr>
<td>Inks</td>
</tr>
<tr>
<td>Shampoos, detergents, soaps</td>
</tr>
<tr>
<td>Paints and paint remover</td>
</tr>
<tr>
<td>Coatings</td>
</tr>
<tr>
<td>Pipes, hoses, wire coating</td>
</tr>
<tr>
<td>Coolant, antifreeze</td>
</tr>
<tr>
<td>Films, packaging, bottles</td>
</tr>
<tr>
<td>Plastics</td>
</tr>
<tr>
<td>Tire and rubber</td>
</tr>
<tr>
<td>Lubricant additives</td>
</tr>
<tr>
<td>Solvent, industrial cleaners</td>
</tr>
</tbody>
</table>

## Manufacturing Sectors

<table>
<thead>
<tr>
<th>Manufacturing Sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparel and accessories</td>
</tr>
<tr>
<td>Beverage and tobacco products</td>
</tr>
<tr>
<td>Chemicals</td>
</tr>
<tr>
<td>Computers and electronics</td>
</tr>
<tr>
<td>Fabricated metal products</td>
</tr>
<tr>
<td>Food and kindred products</td>
</tr>
<tr>
<td>Leather and allied products</td>
</tr>
<tr>
<td>Nonmetallic mineral products</td>
</tr>
<tr>
<td>Paper</td>
</tr>
<tr>
<td>Petroleum and coal products</td>
</tr>
<tr>
<td>Pharmaceutical</td>
</tr>
<tr>
<td>Plastics and rubber products</td>
</tr>
<tr>
<td>Primary metal manufacturing</td>
</tr>
<tr>
<td>Printed matter</td>
</tr>
<tr>
<td>Textiles, fabrics and mill products</td>
</tr>
<tr>
<td>Transportation equipment</td>
</tr>
</tbody>
</table>

Source: PWC, Shale Gas: Reshaping the US Chemicals Industry, October 2012
Shale gas through ethane chain into manufactured products

Product categories:
- Adhesives
- Alkyl resins
- Solvents
- Corrosion inhibitors
- Textiles
- Inks, adhesives
- Shampoos, detergents, soaps
- Paints
- Coatings
- Pipes, hoses, wire coating
- Coolant, antifreeze
- Films, packaging, bottles
- Paint remover
- Plastics
- Tire and rubber
- Lubricant additives
- Solvent, industrial cleaners

Manufacturing sectors:
- Apparel and accessories
- Beverages and tobacco products
- Chemicals
- Computers and electronics
- Fabricated metal products
- Food and kindred products
- Leather and allied products
- Machinery, except electrical
- Nonmetallic mineral products
- Paper
- Petroleum and coal products
- Pharmaceutical
- Plastics and rubber products
- Primary metal manufacturing
- Printed matter and related
- Textiles and fabrics
- Textiles and mill products
- Transportation equipment
- Wood products

Source: PWC and Top Line Analytics
Manufacturing Jobs in PA (2014)

Source: Bureau of Labor Statistics and ACC
Announced Plastics Processor Projects by State

Announcements since June 2012
Source: Plastics News, ACC analysis

NOTE: The data is based on publicly available information, which is believed to be accurate, but have not been independently verified by ACC.

Updated -1/7/16
Population Dynamics Will Bring Challenges and Opportunities

Of the 169 Combined Statistical Areas nationwide, more than 30% of the regions with the largest population losses are from the tri-state region.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>131</td>
<td>Johnstown-Somerset, PA</td>
<td>217,019</td>
<td>221,421</td>
<td>−1.99%</td>
</tr>
<tr>
<td>6</td>
<td>74</td>
<td>Youngstown-Warren, OH-PA</td>
<td>661,399</td>
<td>673,614</td>
<td>−1.81%</td>
</tr>
<tr>
<td>7</td>
<td>130</td>
<td>Mansfield-Ashland-Bucyrus, OH</td>
<td>217,624</td>
<td>221,398</td>
<td>−1.70%</td>
</tr>
<tr>
<td>13</td>
<td>67</td>
<td>Charleston-Huntington-Ashland, WV-OH-KY</td>
<td>702,984</td>
<td>708,228</td>
<td>−0.74%</td>
</tr>
<tr>
<td>17</td>
<td>102</td>
<td>Erie-Meadville, PA</td>
<td>367,670</td>
<td>369,331</td>
<td>−0.45%</td>
</tr>
<tr>
<td>18</td>
<td>145</td>
<td>Parkersburg-Marietta-Vienna, WV-OH</td>
<td>153,780</td>
<td>154,451</td>
<td>−0.43%</td>
</tr>
<tr>
<td>19</td>
<td>15</td>
<td>Cleveland-Akron-Canton, OH</td>
<td>3,501,538</td>
<td>3,515,646</td>
<td>−0.40%</td>
</tr>
<tr>
<td>22</td>
<td>75</td>
<td>Toledo-Port Clinton, OH</td>
<td>649,298</td>
<td>651,429</td>
<td>−0.33%</td>
</tr>
<tr>
<td>29</td>
<td>20</td>
<td>Pittsburgh-New Castle-Weirton, PA-OH-WV</td>
<td>2,659,937</td>
<td>2,660,727</td>
<td>−0.03%</td>
</tr>
</tbody>
</table>

Data Source: US Census
Manufacturing Revolution?
Critical Elements for Success

- Workforce
- Infrastructure
- Ready Sites
- Customer Base
- Competitive Business Climate

“If you build it, they will come.”
Where should we focus?

Skills in which manufacturing employees are most deficient:

- 70% technology/computer skills
- 69% problem solving skills
- 67% basic technical training
- 60% math skills

Skills shortage in different workforce categories:

<table>
<thead>
<tr>
<th>Workforce Category</th>
<th>Percentage of Executives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled production workers</td>
<td>54%</td>
</tr>
<tr>
<td>Engineers</td>
<td>33%</td>
</tr>
<tr>
<td>Researchers/scientists</td>
<td>28%</td>
</tr>
<tr>
<td>Skilled production workers</td>
<td>63% (+9%)</td>
</tr>
<tr>
<td>Engineers</td>
<td>48% (+15%)</td>
</tr>
<tr>
<td>Researchers/scientists</td>
<td>37% (+9%)</td>
</tr>
</tbody>
</table>

Techniques to Mitigate Effects of Skill Shortages for Production Workforce

Techniques to Mitigate Effects of Skill Shortages for Engineers, Scientists

University Research

- University of Pittsburgh,
  - Energy-Intensive manufacturing
  - Utilization for New Products
  - Applications of Additive and Advanced Manufacturing
- West Virginia University
  - Gas to liquids
  - Direct-use natural gas fuel cells
  - Natural gas combustion
  - Gas to chemicals
    - Alkanes
    - Aromatics

Source: Tri-State SHALE Summit, Research and Innovation Panel, October 13, 2015
Value Proposition for our Region

Extraction of gas and other products → Gas gathering and processing → Lower energy costs for homes and businesses → Ethane processing → Manufacturing of products from methane and petrochemical products

Cumulative regional economic benefit

Lower energy costs for homes and businesses

Manufacturing of products from methane and petrochemical products
Questions and Answers
Northwest Pennsylvania and the National Economy with Thoughts on the Shale Play

Jim Robey, PhD
W.E. Upjohn Institute for Employment Research
April 6th, 2016
W.E. Upjohn Institute for Employment Research

• The Institute is an activity of the W.E. Upjohn Unemployment Trustee Corporation, which was established in 1932 to administer a fund set aside by Dr. W.E. Upjohn, founder of the Upjohn Company.

• MISSION:
  – The W.E. Upjohn Institute for Employment Research is a private, nonprofit, nonpartisan, independent research organization devoted to investigating the causes and effects of unemployment, to identifying feasible methods of insuring against unemployment, and to devising ways and means of alleviating the distress and hardship caused by unemployment.
Regional and Economic Planning Services

• Data Dissemination & Analysis
• Economic Impact Studies
• Economic & Workforce Development Strategy
• Talent Assessment
• Urban & Regional Planning
Defining the Region
## University of Michigan RSQE Forecast

<table>
<thead>
<tr>
<th></th>
<th>2015 (Actual)</th>
<th>2016 (Forecast)</th>
<th>2017 (Forecast)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP (Percent)</td>
<td>2.4</td>
<td>2.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Light Vehicle Sales ($Millions)</td>
<td>17.3</td>
<td>17.8</td>
<td>18.0</td>
</tr>
<tr>
<td>Unemployment Rate (Percent)</td>
<td>5.3</td>
<td>4.7</td>
<td>4.5</td>
</tr>
<tr>
<td>Housing Starts (Millions)</td>
<td>1.106</td>
<td>1.218</td>
<td>1.388</td>
</tr>
<tr>
<td>CPI/Inflation (Percent)</td>
<td>0.1</td>
<td>1.1</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Northwest PA hasn’t recovered from the recession, at least based on employment.

![Labor Force Index (2006 = 100)](image)

But from an value-added perspective, Northwest PA has recovered

Gross Domestic, State, and Regional Product

Source: Moody’s Analytics, and Upjohn Institute
The labor market here is “tight”

Unemployment Rate

Unemployment Rate

Source: Bureau of Labor Statistics Local Area Unemployment Statistics
Lower labor force participation limits growth potential

![Graph showing labor force participation](image-url)

Labor Force Participation Rate

Relatively low weekly wages: good on one hand and not so good on another
Average Weekly Wage

Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages
## Basic Demographics

<table>
<thead>
<tr>
<th>Population</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>734,274</td>
</tr>
<tr>
<td>2010</td>
<td>721,580</td>
</tr>
<tr>
<td>2016 (estimated)</td>
<td>705,081</td>
</tr>
<tr>
<td>2021 (projected)</td>
<td>696,358</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000–2010</td>
<td>−1.7</td>
</tr>
<tr>
<td>2010–2016</td>
<td>−2.3</td>
</tr>
<tr>
<td>2016–2021</td>
<td>−1.2</td>
</tr>
</tbody>
</table>

Source: Claritas
## Household Income NW Pennsylvania

<table>
<thead>
<tr>
<th>HH INCOME</th>
<th>HOUSEHOLDS</th>
<th>SHARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;$15,000</td>
<td>38,705</td>
<td>13.6</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>36,801</td>
<td>12.9</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>34,402</td>
<td>12.1</td>
</tr>
<tr>
<td>$35,000 - $49,999</td>
<td>45,048</td>
<td>15.8</td>
</tr>
<tr>
<td>$50,000 - $74,999</td>
<td>54,465</td>
<td>19.1</td>
</tr>
<tr>
<td>$75,000 - $99,999</td>
<td>32,772</td>
<td>11.5</td>
</tr>
<tr>
<td>$100,000 - $124,999</td>
<td>19,892</td>
<td>7.0</td>
</tr>
<tr>
<td>$125,000 - $149,999</td>
<td>9,635</td>
<td>3.4</td>
</tr>
<tr>
<td>$150,000 - $199,999</td>
<td>7,066</td>
<td>2.5</td>
</tr>
<tr>
<td>$200,000 - $249,999</td>
<td>2,666</td>
<td>0.9</td>
</tr>
<tr>
<td>$250,000 - $499,999</td>
<td>2,746</td>
<td>1.0</td>
</tr>
<tr>
<td>$500,000+</td>
<td>814</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Source: Claritas
Shares of household income: skew to the lower levels
## Age Cohort

<table>
<thead>
<tr>
<th>Age</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 0–4</td>
<td>37,444</td>
<td>5.3</td>
</tr>
<tr>
<td>Age 5–9</td>
<td>38,742</td>
<td>5.5</td>
</tr>
<tr>
<td>Age 10–14</td>
<td>41,244</td>
<td>5.9</td>
</tr>
<tr>
<td>Age 15–17</td>
<td>27,131</td>
<td>3.9</td>
</tr>
<tr>
<td>Age 18–20</td>
<td>33,404</td>
<td>4.7</td>
</tr>
<tr>
<td>Age 21–24</td>
<td>38,773</td>
<td>5.5</td>
</tr>
<tr>
<td>Age 25–34</td>
<td>81,324</td>
<td>11.5</td>
</tr>
<tr>
<td>Age 35–44</td>
<td>77,114</td>
<td>10.9</td>
</tr>
<tr>
<td>Age 45–54</td>
<td>93,353</td>
<td>13.2</td>
</tr>
<tr>
<td>Age 55–64</td>
<td>104,172</td>
<td>14.8</td>
</tr>
<tr>
<td>Age 65–74</td>
<td>72,872</td>
<td>10.3</td>
</tr>
<tr>
<td>Age 75–84</td>
<td>39,629</td>
<td>5.6</td>
</tr>
<tr>
<td>Over 85</td>
<td>19,879</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Source: Claritas
Age cohort: skewed to be a little older

Source: Claritas
Downstream Industries

• Based on NAICS codes
• 3241 Petroleum and Coal: Refineries, paving and shingle products, lubricating and grease
• 3251 Basic Chemicals: Petrochemicals, industrial gas, dye and pigments, and inorganics
• 3252 Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments
Downstream Industries

- 3253 Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
- 3255 Paint, Coating, and Adhesive Manufacturing
- 3259 Other Chemical Product and Preparation: Ink, explosives, and other miscellaneous chemicals
- 3261 Plastics Product Manufacturing: Packaging, pipe, sheeting, urethane and foam, polystyrene, and formed products

-10 0 10 20 30 40

-10 0 10 20 30 40

Employment Change (%)

Gross Product Change (%)

-10 0 10 20 30 40

-10 0 10 20 30 40

Source: Moody’s Analytics
National Downstream, 2016–2021

- Plastics product manufacturing (3261)
- Petroleum and coal products manufacturing (3241)
- Basic chemical manufacturing (3251)
- Resin; synthetic rubber; and artificial synthetic fibers and filaments manufacturing (3252)
- Pesticide; fertilizer; and other agricultural chemical manufacturing (3253)
- Paint; coating; and adhesive manufacturing (3255)
- Other chemical product and preparation manufacturing (3259)

Source: Moody’s Analytics
Regional Downstream, 2011–2016

- Plastics product manufacturing (3261)
- Petroleum and coal products manufacturing (3241)
- Basic chemical manufacturing (3251)
- Resin; synthetic rubber; and artificial synthetic fibers and filaments manufacturing (3252)
- Pesticide; fertilizer; and other agricultural chemical manufacturing (3253)
- Paint; coating; and adhesive manufacturing (3255)
- Other chemical product and preparation manufacturing (3259)

Source: Moody’s Analytics
Regional Downstream, 2016–2021

-15 -10 -5 0 5 10
Employment Change (%)

-10 0 10 20 30 40
Gross Product Change (%)

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

-15 -10 -5 0 5 10

Source: Moody’s Analytics
Petroleum and Coal Products Manufacturing

Total Employment in Firms in 3241 NAICS - 2,878

NAICS Business Density Boundary
- County
- Businesses in Zip Code
  - 1
  - 2
  - 3

Source: Avention and Juniper CRE
Basic Chemical Manufacturing

Source: Avention and Juniper CRE
Resin, Synthetic Rubber, and Artificial Synthetic Fibers & Filaments Manufacturing

Source: Avention and Juniper CRE
Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing
Paint, Coating, and Adhesive Manufacturing

Source: Avention and Juniper CRE
Other Chemical Products and Preparation Manufacturing
Plastics Product Manufacturing
Total Downstream Employment
Estimating Impacts from Investment

• Use Input/Output (I/O) model
• The following are done using REMI
  – Regional Economic Models, Inc.
  – www.remi.com
• Output effects for Employment
  – Direct: the direct jobs or capital investment
  – Indirect: regional/local suppliers
  – Induced: households supplying goods and services
  – Government
REMI: Adding 100 jobs in petroleum and coal products

- Employment Outcomes
  - Direct: 100
  - Indirect: 94
  - Induced: 231
  - Government: 3

- Value added: 93 Million
- Personal income: $29 Million
- Disposable personal income: $24 Million
- Average wage/comp: $62,160/112,220
REMI: Adding 100 jobs in chemical manufacturing

• Employment Outcomes
  – Direct: 100
  – Indirect: 54
  – Induced: 95
  – Government: 2

• Value added: $45 Million
• Personal income: $18 Million
• Disposable personal income: $15 Million
• Average wage/comp: $30,295/42,954
REMI: Adding 100 jobs in plastics and rubber manufacturing

• Employment Outcomes
  – Direct: 100
  – Indirect: 31
  – Induced: 54
  – Government: 1
• Value added: $20 Million
• Personal income: $10 Million
• Disposable personal income: $9 Million
• Average wage/comp: $15,920/20,355
Questions/Comments?

- Jim Robey, Ph.D.,
  - W.E. Upjohn Institute for Employment Research
  - 269.343.5541
  - jim.robey@upjohn.org
National and Northwest Pennsylvania

INDUSTRIAL MARKET OVERVIEW

Sponsored by FirstEnergy

Dennis Burnside | Juniper CRE Solutions

April 6, 2016
AGENDA

1. National Industrial Market
2. Northwest Pennsylvania Market
3. Site Selection Process
National Industrial Market
National Industrial Snapshot Year End 2015

U.S. overall vacancy rate ↓ to 6.4%

- Warehouse – 8.6%
- Flex space – 6.1%

U.S. overall net absorption was positive 97,177,108 square feet

- Warehouse – positive 82,712,512 sq ft
- Flex space – positive 14,464,596 sq ft
U.S. VACANCY RATES 2000-2015

FLEX
WAREHOUSE
TOTAL MARKET

VACANCY RATES

2015 U.S. Industrial Space Average Quoted Rental Rates

- **Industrial quoted rental rate ▶ 1.2% (Q3 to Q4)**
  - Q3: $5.69 /sqft
  - Q4: $5.76 /sqft

- **Flex sector quoted rate ▶ 0.5% (Q3 to Q4)**
  - Q3: $11.43 /sqft
  - Q4: $11.49 /sqft

- **Warehouse quoted rate ▶ 1.4% (Q3 to Q4)**
  - Q3: $4.97 /sqft
  - Q4: $5.04 /sqft
## INDUSTRIAL LEASES

### SELECT TOP 15

<table>
<thead>
<tr>
<th></th>
<th>BUILDING</th>
<th>MARKET</th>
<th>SF</th>
<th>TENANT</th>
<th>LANDLORD</th>
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<tbody>
<tr>
<td>1</td>
<td>Amazon</td>
<td>Boston</td>
<td>1,000,000</td>
<td>Amazon.com</td>
<td>NAI Hunneman Commercial Company</td>
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<td>2</td>
<td>Union Station Business Center</td>
<td>Atlanta</td>
<td>987,840</td>
<td>Exel Logistics</td>
<td>Colliers International</td>
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<tr>
<td>3</td>
<td>ProLogis Park I-210 – Bldg 1</td>
<td>Inland Empire (California)</td>
<td>882,230</td>
<td>Amazon</td>
<td>Lee &amp; Associates</td>
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<td>4</td>
<td>Duke Perris Logistics Center – Bldg II</td>
<td>Inland Empire (California)</td>
<td>783,407</td>
<td>Wayfair.com</td>
<td>Duke Realty Corp.; Colliers Int.</td>
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<td>5</td>
<td>5635 NE 14th St</td>
<td>Des Moines</td>
<td>600,000</td>
<td>Monsanto</td>
<td>The Graham Group Inc.</td>
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<td>6</td>
<td>Monsanto Expansion - Phase 1</td>
<td>St. Louis</td>
<td>590,000</td>
<td>Monsanto</td>
<td>Monsanto Company</td>
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<td>7</td>
<td>75 Mill Rd</td>
<td>Northern New Jersey</td>
<td>571,000</td>
<td>List Logistics</td>
<td>JLL</td>
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<tr>
<td>#</td>
<td>Address</td>
<td>City</td>
<td>Size</td>
<td>Tenant</td>
<td>Ownership</td>
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<td>---------------------------------------</td>
<td>--------------------</td>
<td>----------</td>
<td>-------------------------</td>
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<td>8</td>
<td>5220 Robert J Mathews Pkwy</td>
<td>Sacramento</td>
<td>555,219</td>
<td>DST Output</td>
<td>N/A</td>
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<td>9</td>
<td>Whirlpool Bldg</td>
<td>Nashville</td>
<td>505,000</td>
<td>Sinomax</td>
<td>NorthStar Real Estate Advisors</td>
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<td>10</td>
<td>Hermosa II</td>
<td>Inland Empire (California)</td>
<td>468,682</td>
<td>Amaxi Nutrition</td>
<td>JLL</td>
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<td>11</td>
<td>Buford Logistics Center II - Building B</td>
<td>Atlanta</td>
<td>461,700</td>
<td>Best Buy</td>
<td>CBRE</td>
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<td>12</td>
<td>Boice Pond Rd</td>
<td>Orlando</td>
<td>451,823</td>
<td>Freeman Expositions, Inc.</td>
<td>Cite Partners, LLC</td>
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<td>13</td>
<td>8369 Milliken Ave</td>
<td>Inland Empire (California)</td>
<td>441,970</td>
<td>Custom Goods LLC</td>
<td>Prologis</td>
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<tr>
<td>14</td>
<td>301 Broadway</td>
<td>Northern New Jersey</td>
<td>439,015</td>
<td>National Retail Systems</td>
<td>Hartz Mountain Industries, Inc.</td>
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<tr>
<td>15</td>
<td>Trammell Crow at 35 Eagle - Building D</td>
<td>Dallas/Ft Worth</td>
<td>391,744</td>
<td>Exel</td>
<td>CBRE</td>
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</tbody>
</table>
Northwest Pennsylvania Industrial Market
Overview | Northwest Pennsylvania Industrial Real Estate Market
Age of Existing Industrial Product

- Total existing square footage: 28,619,000
- Built since 1990: 5,670,000
- Built before 1990: 22,949,000
- Built since 2000: 1,826,000
## Industrial Shifts

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>AGRARIAN REVOLUTION</th>
<th>INDUSTRIAL REVOLUTION</th>
<th>LOGISTICS REVOLUTION</th>
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<tbody>
<tr>
<td>Typical Building Size</td>
<td>100,000-300,000 SF</td>
<td>500,000-750,000 SF</td>
<td>&gt;1,000,000 SF</td>
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<tr>
<td>Docks</td>
<td>Single Dock</td>
<td>Cross Dock</td>
<td>Cross Dock/U-Shape</td>
</tr>
<tr>
<td>Building/Land Ratios</td>
<td>50%-52%</td>
<td>48%-50%</td>
<td>40%-45%</td>
</tr>
<tr>
<td>Leases</td>
<td>&gt;15 Years</td>
<td>10-15 Years</td>
<td>&lt;10 Years</td>
</tr>
<tr>
<td>Typical Ceiling Height</td>
<td>22 Feet</td>
<td>32-36 Feet</td>
<td>36-60 Feet</td>
</tr>
<tr>
<td>SF/Dock Ratios</td>
<td>1/10,000</td>
<td>1/5,000</td>
<td>1/3,000</td>
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<tr>
<td>Trailer Storage</td>
<td>N/A</td>
<td>1/10,000</td>
<td>1/5,000</td>
</tr>
<tr>
<td>Stacking</td>
<td>Manual</td>
<td>Forklifts</td>
<td>Robotics</td>
</tr>
<tr>
<td>Building Owners</td>
<td>Local/Regional</td>
<td>Regional/National</td>
<td>National/Global</td>
</tr>
<tr>
<td>Design</td>
<td>Outside-In Developer-Driven</td>
<td>→</td>
<td>Inside-Out Tenant-Driven</td>
</tr>
</tbody>
</table>
VACANCY RATE  NORTHWEST PENNSYLVANIA INDUSTRIAL

Source: CoStar Group, Inc.
ASKING RENTAL RATES  NORTHWEST PENNSYLVANIA INDUSTRIAL

Source: CoStar Group, Inc.
AS OF 12/31/2015

Light Manufacturing
LIND - < 1990 & 25k + SF
LIND - 25k + SF
LIND - 1990+ & 25k + SF
TOTAL
ASKING RENT LEVELS AND ANNUAL GROWTH

AS OF 12/31/2015

RENT PER SF

$8.31

$7.04

$5.76

$4.49

$3.22


RENT GROWTH

-4% -2% 0% 2% 4%

ANNUAL RENT GROWTH

Asking Rent
National Asking Rent
Rent Growth Y/Y
Site Selection Process
HOW CAN COMMUNITIES BE READY WHEN OPPORTUNITY KNOCKS?

Can somebody get that please?
A systematic, time-tested approach to helping companies resolve business location challenges.
Has the Site Selection Process/Industry Changed?
Site Selection Process

**PHASE 1** Define the Objectives – Foundations of Search

- Preparation of baseline information questionnaire
- Client completes questionnaire
  - Profile of any existing locations
  - Operational needs of the new facility
- Location criteria defined/weighted
- Finalization of information/criteria
- Establish expectations
Site Selection Process

**PHASE 2: Location Filtering**

- Desktop research and outreach to EDO agencies
- Systematic elimination of areas within the defined search region
- Basic criteria (e.g., minimum population size) introduced early on
- Longlist (7-8) of promising contenders emerges
- Additional research conducted on each area’s operational fit
- Longlist ranked/scored
- Shortlist (often three areas) recommended
Site Selection Process

PHASE 3 Location Selection

• Field-based evaluation, including:
  – Employer interviews, site/building tours, GIS mapping, and other empirical research
  – Seeking a match, then ranked/scored, among:
    – Demand/supply
    – Quality/ stability
    – Cost
    – Unionization

• Best submarkets targeted
• Several sites/buildings shortlisted
• Recommendations tendered
  – Best location
  – Shortlist sites/buildings
  – Most viable alternatives
    ▪ Locations
    ▪ Sites/buildings
Site Selection Process

PHASE 4  Site Selection

- Assist client’s real estate team to assess shortlisted sites on:
  - Access
  - Taxes
  - Utilities

- Under final incentives negotiations
  - Working closely with client’s real estate team and other internal players (e.g., tax, legal, corporate affairs)
  - Best/final offers received
  - Multi-year savings refined
  - Finalization and documentation of details

- Recommend and support
SITE SELECTION

THE PROCESS IN ACTION
What’s Important to Site Selectors (and, therefore, their clients)?

• Access to accurate data
• Clarity
• Efficiency and timeliness
• Updated website that is ED leaning
• Single point of contact, who has the answers or can get them quickly
• Facts vs. sales pitch

“All Hands on Deck”

– Schools
– Fire and safety
– Parks and recreation
– Finance
– Human resources from other companies
– Labor (if on board)
– Elected officials
– Real estate developers and owners

“Just the facts, ma’am.”
Everyone on the Same Page

• Share data
• Communicate with each other
• Rehearse story

Examples of where things went wrong ...
Economic Development Committee

• Example: Highland Heights, Ohio
  – Citizens
  – Business leaders
  – Finance
  – Eight to 10 members
## Features and Benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workforce</td>
<td>?</td>
</tr>
<tr>
<td>Employer base</td>
<td>?</td>
</tr>
<tr>
<td>Location</td>
<td>?</td>
</tr>
<tr>
<td>Training program</td>
<td>?</td>
</tr>
<tr>
<td>Bricks and mortar/sites</td>
<td>?</td>
</tr>
<tr>
<td>Transportation</td>
<td>?</td>
</tr>
<tr>
<td>Quality of life</td>
<td>?</td>
</tr>
</tbody>
</table>
Current Challenges Facing Companies

How can you help?

- Attracting workforce
- Bricks and mortar
- Reduce costs
- Speed to market
Learn from Other Communities

- Observe
- Visit
- Engage
- Collaborate
- Regional perspective
QUESTIONS

Thank you.
Regional Partnerships
Electricity 101

Lisa Nentwick
Manager, Economic Development

Economic Development Conference
April 6, 2016
Transmission Service

(Typical) Application for Retail Load Serving Entities
Requesting a Delivery Point to the FE System

APPLICANT INFORMATION
Company/Customer Name: ____________________________
Facility Owner’s Name: ______________________________
Mailing Address: __________________________________
City: __________ County: __________ State: _______ Zip Code: _______
Contact Representative: ___________________ Title: __________
Phone: ___________________ Fax: _______________ email: __________________

Project Design/Engineering Information
Company: _______________________________________
Mailing Address: __________________________________
City: __________ County: __________ State: _______ Zip Code: _______
Contact Representative: ___________________ Phone: _______________ email: __________________
Phone: ___________________ Fax: _______________ email: __________________

GENERAL FACILITY INFORMATION
Address/Location of Facility: __________________________
Proposed In-Service Date. ___/___/_______ Proposed voltage level for point of connection. ______ kV
Proposed substation configuration. _______________________
Initial peak load and corresponding power factor. _______ MVA @ ___ % PF
Estimated peak load and corresponding power factor in five years. ______ MVA @ ___ % PF
Estimated peak load and corresponding power factor in ten years. ___ MVA @ ___ %PF

Your application should include the following additional information:
1. Detailed map of the project area with the project location clearly identified.
2. One line schematic diagram of the proposed facility.
3. Details of any non-conforming load that may significantly impact the FirstEnergy system. For example:
   Harmonic producing loads (ASD’s, SCR’s, etc). Flicker producing loads (large motors, arc furnaces, etc),
   and Backup requirements (loop feed versus tap, etc)
4. Details on any proposed power factor correction equipment.
5. Description of any generation that is to be operated in parallel with the FE power system.

All information contained in this application will be considered confidential until completion of the Detailed Load Study.
Cost to Serve Requests for Large Loads

General (*minimum*)
- In-Service Date
- Location
- Initial peak load
- Estimated peak load in 5 years
- Estimated peak load in 10 years
- Also need non-conforming loads that impact our system (large motors, arc furnaces)

Why we Need It?
- Determine Available Capacity
- Measure Impact on System
- Load Study includes other projects in area
- Planning for Growth

MOST OF ALL …

TIME！！
Transmission Line Extension Example

Original Krendale-Maple 138kV Line

Relocated Krendale-Maple 138kV Line

Mark West Bluestone 2 Substation
Transmission Line Extension Example

Mark West Bluestone 3 Substation

Mark West Bluestone 2 Substation
Pennsylvania Shale Projects

- **Pipeline Projects**— multiple compressor stations in three PA operating companies to support the Mariner East 1 & 2 pipeline project to deliver propane and ethane from the liquid-rich Marcellus Shale areas in Western Pennsylvania to the Marcus Hook facility, where it will be processed, stored, and distributed to various domestic and waterborne markets.

- **Midstream Projects**— new and expansion projects
  - Cyrogenic processing plants
  - Fractionation Plants
  - Compressor stations

200 MW of new load is expected in Pennsylvania within the next three years with more prospective projects in the pipeline.
Economic Development Tools - Location One (LOIS)
Introduction to LOIS

Functionality is Around the Map

FirstEnergy’s Footprint
Economic Development Tools

■ **IMPACTfactor+** – computer simulation program for economic development

■ Identifies *measurable* effects associated with a specific activity in a specific location

■ **Typical economic development activities include:**
  - New business attraction
  - Retention or expansion
  - Value of existing business base
  - Creation of a new business
  - An increase in “export” activity will result in spin-off spending in the local economy
ImpactFactor+

- Provides data on the economic base of each county in the model including jobs, wages and output by industry (*this determines in part what purchases can occur locally*)

- Provides data on inter-industry purchasing patterns nationally and within the local area (*this determines supplier impacts*)

- Provides data on household purchasing patterns at different income levels

- This data is used to create the multipliers
  - **Impact Components**
    - Economic
    - Real Estate
    - Revenue
Promotion to Site Selectors

Shovel-Ready Site in Pennsylvania

Westgate Business Park
Big Beaver PA
115 Available Acres
beavercoutrycad.org

For Sale: $35,000 per acre

FirstEnergy Economic Development
76 South Main St.
Aliquippa, PA 45673

For more information, please contact:
Lisa Nenettic
701 West New Castle St
Zelienople, PA 16063
724-453-3438
nenettic@firstenergycorp.com

FirstEnergy Economic Development Services

FirstEnergy’s Economic Development team can provide the assistance you need when you’re looking to move to or expand your business in Ohio, Pennsylvania, New Jersey, West Virginia and Maryland.

Website: http://www.firstenergycorp.com
Industry: Utilities

Followers in your network

Bright Spot.

FirstEnergy Economic Development

FirstEnergy Overview

ENewsletters

Ohio Shale development will yield abundant opportunity for manufacturers, shows new shale study

The energy-rich Marcellus and Utica shale fields in the Ohio River Valley are already proving to be assets for oil and gas drillers. They also represent a dynamic new opportunity for refineries and manufacturers located downstream from the derricks, according to “Mapping the Opportunities for Shale Development in Ohio,” a study released by Cleveland State University in 2013.

The 2013 study follows up on a 2012 study jointly conducted by Cleveland State, The Ohio State University and Muscatine College that examined the economic value of the region’s oil and gas development. The authors make five key points about the potential of Ohio shale to impact the state’s downstream job and industry development:
Moody’s Analytics – Available for your Region

Moody’s Analytics – Available for your Region
Moody’s Analytics (Continued)
Thank You