Industrial team preliminary results for AEO2015

Macro Industrial Working Group (MIWG)
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WORKING GROUP PRESENTATION FOR DISCUSSION PURPOSES
DO NOT QUOTE OR CITE AS RESULTS ARE SUBJECT TO CHANGE
Overview AEO2015

• AEO2015 is a “Lite” year
  – New ethane/propane pricing model only major update
  – Major side cases released with Reference case in late 2014: price, resource and macro

• Macro model results have changed since first MIWG; growth not as robust for some industries, especially after 2025

• What you’ll see today
  – Shipments
  – Industrial energy use (total and excluding both refining and lease & plant fuel)
    • AEO2015 Reference and selected side cases
    • AEO2015 v. AEO2014
  – New ethane/propane price model results
Side case definitions

• Price cases relative to Reference case
  – High Oil Price case: technology and policy half as effective in reducing demand in non-OECD countries, increasing demand; OPEC restricts production, reducing market share; higher production of tight oil; higher production of other liquid fuels as a result of technology development and increased development of previously uneconomic resources
  – Low Oil Price case: technology and policy twice as effective in reducing demand in non-OECD countries, decreasing demand substantially; OPEC maintains market share; lower production of tight oil and other liquid fuels
  – Economic growth the same in Reference, High and Low Price Cases

• High Resource case: substantially higher Estimated Ultimate Recovery of tight oil, tight gas, and shale gas, more resources
Macro model revision means lower growth for manufacturing 2013-2040

Manufacturing shipments in 2009 billion U.S. dollars

AEO2015 Reference case before revision

AEO2015 Reference case

Growth rates of selected industries 2013-2040

<table>
<thead>
<tr>
<th>Industry</th>
<th>Revised</th>
<th>Original</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>0.1%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Bulk Chemicals</td>
<td>1.8%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Primary Metals (Fe, Al)</td>
<td>1.1%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Metal Based Durables</td>
<td>2.3%</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

Source: ref2015.0922a, ref2015.0909a
Full Industrial sector results
Total Industrial delivered energy consumption AEO2015 Reference case and AEO2014 Reference case

Energy consumption in quadrillion Btu

Source: AEO2015.0922a and AEO2014 Reference case – includes total industrial sector
Total industrial natural gas consumption AEO2015 Reference case and AEO2014 Reference case

Energy consumption in quadrillion Btu

Source: AEO2015.0922a and AEO2014 Reference case – includes total industrial sector
IDM Results – excluding refining and lease and plant fuel
Industrial delivered energy consumption, Reference case and selected side cases for AEO2015

Energy consumption in quadrillion Btu

- **Reference case**
- **High Price**
- **Low Price**
- **High Resource**

Source: AEO2015.0922a excludes refining and lease & plant fuel
Industrial delivered energy consumption AEO2015 Reference case and AEO2014 Reference case

Energy consumption in quadrillion Btu

Source: AEO2015.0922a and AEO2014 Reference case excludes refining and lease & plant fuel
Industrial natural gas consumption, Reference case and selected side cases for AEO2015

Energy consumption in quadrillion Btu

Source: AEO2015.0922a excludes refining and least and plant fuel
More feedstock use, optimistic short run mean higher short run industrial natural gas consumption in AEO2015 than AEO2014

Consumption in quadrillion Btu

Source: AEO2015.0922a and AEO2014 Reference case excludes refining and lease and plant fuel
More domestic methanol and fertilizer production boosts proportion of natural gas feedstock consumption in AEO2015

Natgas feedstock as % of industrial natgas consumption

Source: AEO2015.0922a and AEO2014 Reference case excludes refining and lease and plant fuel

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Industrial purchased electricity consumption, Reference case and selected side cases for AEO2015

Consumption in quadrillion Btu

Source: AEO2015.0922a

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Industrial purchased electricity: Lower relative MBD shipments, less short term use lead to AEO2015 consumption

Consumption in quadrillion Btu

Source: AEO2015.0922a and AEO2014 Reference case excludes refining
Industrial CHP generation: lower long term growth in energy intensive industries lowers AEO2015 generation

Generation in billion kwh

Source: AEO2015.0922a and AEO2014 Reference case excludes refining
Industrial liquids consumption: Higher AEO2015 HGL consumption offsets lower liquids consumption in other categories

Consumption in quadrillion Btu

Source: AEO2015.0922a and AEO2014 Reference case excludes refining

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Ethane/Propane Price Modeling for 2015

• Dynamic Linear Model (DLM) joint pricing model of ethane and propane
  – Dependence of ethane and propane prices on oil and natural gas prices can vary over time
  – Historically high wet gas discoveries increase the role of natural gas prices from very little to a larger amount

• Automated updating of parameters with new data as it arrives

• Drivers will also include exports, chemical shipments, and “total” ethane supply
Liquid feedstock prices – ethane and propane HGL and petrochemicals - in bulk chemicals industry, AEO2015 v AEO2014

Price in 2013 $/MMBtu

Source: AEO2015.0922a and AEO2014 Reference case
Liquid feedstock consumption – HGL and petrochemicals - in bulk chemicals industry, AEO2015 v AEO2014

Source: AEO2015.0922a and AEO2014 Reference case
Memo on this meeting and presentation can be found here in about a month:

http://www.eia.gov/forecasts/aeo/workinggroup/macroindustrial/
Thank you for your attention!

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Bonus slides
More domestic methanol and fertilizer production boosts natural gas feedstock consumption in AEO2015

Source: AEO2015.0922a and AEO2014 Reference case excludes refining and lease and plant fuel