Indiana Electricity Projections and Environmental Regulations Study

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Purdue University

Presented to:
Hoosier Energy Board of Directors
French Lick, IN

August 13, 2012
Indiana Electricity Requirements

- Retail sales by investor owned and not-for-profit utilities
- Includes estimated transmission and distribution losses
- Growth rates
  - 2011 forecast: 1.30%
  - 2009 forecast: 1.55%
  - 2007 forecast: 2.46%
Indiana Peak Demand Requirements

- Peak demand is net of DSM and interruptible loads
- Growth rates
  - 2011 forecast: 1.28%
  - 2009 forecast: 1.61%
  - 2007 forecast: 2.46%
Indiana Resource Requirements

- Resources may be provided by conservation measures, contractual purchases, purchases of existing assets, or new construction.
- Existing resources are adjusted into the future for retirements, contract expirations, and IURC approved new resources.
<table>
<thead>
<tr>
<th>Year</th>
<th>Uncontrolled Peak Demand(^1)</th>
<th>Interruptible</th>
<th>Net Peak Demand(^2)</th>
<th>Existing/Approved Capacity(^3)</th>
<th>Incremental Change in Capacity(^4)</th>
<th>Projected Additional Resource Requirements(^5)</th>
<th>Total Resources(^6)</th>
<th>Reserve Margin(^7)</th>
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</table>

1 Uncontrolled peak demand is the peak demand without any interruptible loads being called upon.
2 Net peak demand is the peak demand after interruptible loads are taken into account.
3 Existing/approved capacity includes installed capacity plus approved new capacity plus firm purchases minus firm sales.
4 Incremental change in capacity is the change in existing/approved capacity from the previous year. The change is due to new, approved capacity becoming operational, retirements of existing capacity, and changes in firm purchases and sales.
5 Projected additional resource requirements is the cumulative amount of additional resources needed to meet future requirements.
6 Total resource requirements are the total statewide resources required including existing/approved capacity and projected additional resource requirements.
7 Resources may be required by individual utilities even if the state as a whole meets or exceeds the statewide reserve margin. Individual utility reserve margins are not allowed to fall below 6 percent.
Indiana Real Price Projections (2009 $)

- Effect of inflation removed
- Average across sectors for IOUs
- Includes the cost of new resources
- Does not include cost of expected EPA regulations
  - unless utility has already taken steps or included costs in data request
Environmental Regulations

• SUFG performed a follow up study of the expected impacts of recent, proposed, and expected EPA regulations
  – Cross-State Air Pollution Rule
  – Mercury and Air Toxics Standards
  – Greenhouse gases
  – Cooling water
  – Coal ash
Cross-State Air Pollution Rule

- Final rule issued in July 2011
- Appealed & currently stayed by federal court
- Reduces emissions caps for sulfur dioxide (SO$_2$) and nitrogen oxides (NO$_x$) in 2012
- Further reductions in 2014
Mercury and Air Toxics Standards

• Final rule issued in December 2011
• Replaces court vacated Clean Air Mercury Rule
• Reduces emissions from mercury, acid gases, and other pollutants
• Prevents release of 91% of mercury
• Expected to go into effect in 2015-16
Greenhouse Gases

• Final rule issued in March 2012
  – after SUFG study released
• Establishes carbon dioxide (CO$_2$) emissions standards for new sources
Cooling Water Intake Structures

• Proposed rule issued in April 2011
• Final rule expected in June 2013
• Intended to reduce damage to aquatic life
  – impingement – trapping against inlet screen
  – entrainment – drawn into cooling system
• Compliance actions include enhanced screening, reducing water flow rate, and installing cooling towers
• Uncertainty over timing
Coal Combustion Residuals

- Proposed rule issued in June 2010
- No date has been released for final rule
- In response to concerns over the potential failure of coal ash facilities
- Two options
  - classify as special hazardous waste (~2020)
  - regulate as non-hazardous waste (~2018)
SUFG Study Inputs

- Model inclusion of SO$_2$ scrubbers (wet FGD), NO$_x$ control (SCR), and mercury control (activated charcoal injection with bag house)
- Conversion of cooling water systems to recirculating
- Conversion of ash disposal from wet to dry
Retire vs. Retrofit

- For each unit, if the cost of retrofitting was greater than the cost of replacing it with a natural gas combined cycle facility, the unit was considered retired for the study.
- If not, the retrofit costs were included.
- Approximately 2,280 MW modeled as retired.
Results

EPA Rules vs 2011 Base

History vs Forecast

Year

Cents/kWh (2009$)
Comparison to Base Forecast (2009 cents/kWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>2011 Base</th>
<th>EPA Rules</th>
<th>Change</th>
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<tr>
<td>2015</td>
<td>7.80</td>
<td>8.14</td>
<td>4.4%</td>
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<td>2020</td>
<td>8.74</td>
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<td>13.9%</td>
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<td>2025</td>
<td>8.67</td>
<td>9.76</td>
<td>12.5%</td>
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Caveats

- Uncertainty in EPA rules
- Impact on transmission investment
- Fuel switching option
- Accuracy of price elasticity modeled
- Macroeconomic effects
- Technological innovations
- Compliance strategies
- Engineering considerations
- Materials and labor premiums
- Efficiency and outage impacts
Further Information

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