THE FUTURE OF MERCHANT POWER PLANTS

Presented by:
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MAJOR CONCLUSIONS

• There is growing concern over the developing shortage of Indiana utility-controlled generation capacity. SUFG expects the statewide reserve margin to fall below 15 percent this year when the generation deficit (including 15 percent reserves) is expected to be 400 MW, or about 2 percent of Indiana’s current generating capacity.

• If, as the forecast predicts, electricity sales and peak demand grow at 1.8 percent per year (down from 2 percent in the 1996 forecast), SUFG projects the need for 2250 MW of new capacity by 2005, and an additional 5400 MW by 2016, the end of the forecast horizon.
MAJOR CONCLUSIONS (Continued)

• If the current regulatory framework is unchanged over the forecast horizon, SUFG predicts real (inflation adjusted) prices to fall at a rate of slightly less than 1 percent per year until 2003, when prices level out until the end of the forecast horizon when they are expected to increase slightly.

• If, on the other hand, Indiana chose to allow competition among generators and competition works perfectly, SUFG would initially expect market clearing prices to drop below the level of prices that would prevail if regulation were to continue. SUFG would then expect competitive prices to rise quite rapidly as demand growth increases until such prices reach a point where new units are added at the long-run cost of electricity, which is slightly above the mid-term price under continued regulation.
MAJOR CONCLUSIONS (Continued)

• However, SUFG is doubtful that electricity markets will work perfectly; hence, the competitive price forecast should be considered as a lower limit on likely prices if competition is introduced. If market power is exercised by sellers, actual prices are not likely to be lower and could very likely be higher than those expected with perfect competition.

• In the long run, after the transition from regulation to competition is complete, SUFG would expect prices with competition to be lower than prices with continued regulation, as electricity generators are provided with greater incentives to reduce costs.
INDIANA ELECTRICITY REQUIREMENTS IN GWh
(HISTORICAL, CURRENT AND PREVIOUS FORECASTS)
## FORECAST ELECTRICITY CONSUMPTION (% GROWTH RATES)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Utilization/Unit (%)</th>
<th># Units (%)</th>
<th>Total Growth Rates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1.01</td>
<td>0.66 (Customers)</td>
<td>1.67</td>
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<tr>
<td>Commercial</td>
<td>0.36</td>
<td>1.89 (Energy-Weighted Floorspace)</td>
<td>2.25</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.23</td>
<td>1.44 (Outputs)</td>
<td>1.67</td>
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</tbody>
</table>

- Total residential growth primarily from increase in intensity (gadgets, AC).
- Commercial/industrial growth primarily from expansion of sector output.
INDIANA ENERGY REQUIREMENTS
BY SCENARIO IN GWh

The graph shows the energy requirements for Indiana by scenario, with the years 1980 to 2015 on the x-axis and GWh on the y-axis. The scenarios include History, Base, Low, and High. The graph indicates a steady increase in energy requirements over the years, with the high scenario showing the most significant increase.
INDIANA PEAK DEMAND REQUIREMENTS IN MW (HISTORY, CURRENT AND PREVIOUS SUFG BASE FORECASTS)
DEMAND AND SUPPLY IN MW (SUFG BASE) (INCLUDES 15 PERCENT RESERVES)

[Graph showing demand and supply走势 from 1980 to 2016, with labels for existing resources, supply additions SUFG planned, and projected demand.]
## INDIANA RESOURCE PLAN (SUFG BASE)

<table>
<thead>
<tr>
<th>Year</th>
<th>Dem and Capacity*</th>
<th>Additions (in MW)</th>
<th>Retired Penalty</th>
<th>Reserve Margin (%)</th>
<th>Comments</th>
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<tbody>
<tr>
<td></td>
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<td>Peaking</td>
<td>Cycling</td>
<td>Base Load</td>
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<td>17514</td>
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<td>2004</td>
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<td>21290</td>
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<td>675</td>
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<tr>
<td>2016</td>
<td>22789</td>
<td>26287</td>
<td>100</td>
<td>0</td>
<td>500</td>
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</tbody>
</table>

*Includes installed capacity plus firm purchases minus firm sales.
Source: SUFG Modeling System and Utility IRP filings for retirements.
INDIANA REAL PRICE PROJECTIONS
(1996 DOLLARS) (HISTORICAL, CURRENT AND
PREVIOUS FORECASTS)

Cents/kWh

Year


1 2 3 4 5 6 7 8 9 10

History

1994

1999

(1996)

(CURRENT FORECAST)

1996
DSM

• 150 MW; large decrease from 1996.

• Interruptible: 540 MW; slight increase.

• Previously:
  – 1995: 250 MW
  – 2000: 569 MW
  – 2005: 792 MW
  – 2010: 908 MW

• Source: Utility IRP data.
THE INDIANA ELECTRICITY INDUSTRY:
TRADE AND PRICES UNDER RESTRUCTURING

• Two major assumptions:
  – **Perfect competition**: marginal cost pricing scheme.
  – **Imperfect competition**: market price departs from marginal cost.
PERFECT COMPETITION

- Assumptions:
  - Power exchange for ECAR/MAIN.
  - Producers bid their marginal costs.
  - Consumers bid their reservation prices.
- Hourly prices are set at the marginal cost of the most expensive unit that is dispatched.
- No stranded cost recovery.
SUFG’s 1999 COMPETITIVE MODEL

Exogenous imports and exports assumed for MAPP, SPP, TVA, VP, PJM and Ontario Hydro
SCENARIO A -- BASE CASE

• Net export is 376 MW from ECAR/MAIN to surrounding utilities. (Source: NERC 1998 Summer Assessment Study)

• Yearly Forecast = energy-weighted average of hourly marginal costs + average T&D cost + average cost of ancillary services.
SCENARIO B -- CASE WITH 5500 MW NET ECAR/MAIN EXPORT TO OTHER REGIONS

• Assumed the higher ECAR/MAIN export is about 45 percent of the maximum transmission capacity limit.

• Yearly price calculated the same way as Case A.
INDIANA YEARLY ENERGY-WEIGHTED AVERAGE PRICES--COMPETITION VS. REGULATION (1996 REAL DOLLARS)

Scenario B: 5500 MW

Scenario A: 376 MW

Continued Regulation
IMPERFECT COMPETITION

• Key Assumptions:
  – Not enough producers to ensure competitive pricing.
PJM DATA: ENERGY-WEIGHTED AVERAGE MARKET CLEARING PRICE AND MARGINAL COST

Market Clearing Price
(August 1998)

Market Clearing Price
(September 1998)

Marginal Cost
(August 1998)

Marginal Cost
(September 1998)
THE PROJECTED ENERGY-WEIGHTED AVERAGE RETAIL PRICES FOR INDIANA

Year

$/MWh

Scenario 1: Low Intensity Gaming
Scenario 2: Moderate Intensity Gaming
Scenario 3: High Intensity Gaming
Scenario 4: Perfect Competition
CONCLUSIONS

- The perfect competition model has practical value because the results could be used as a benchmark to measure the degree of competitiveness.

- During low demand periods, pool market prices were close to marginal costs.

- The imperfect competition model is tailored for real world situations when demands are high and the capacity margin is tight. It captures the deviations from a perfect world and would give better forecasting.

- More studies are needed.
**1999 TOTAL DEMAND AND SUPPLY (MW) FOR INDIANA - 1999 to 2004**

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand</th>
<th>Capacity</th>
<th>Additions</th>
<th>Reserve Margin (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>0</td>
</tr>
</tbody>
</table>

**Conclusion:** The 1680 MW installed would be sufficient IF all the MW stayed in Indiana. BUT, they are independent power producer plants, whose output will be purchased by the highest bidder, which may not be an Indiana utility.
INDIANA PROPOSED MERCHANT PLANTS
## ECAR/MAIN PROPOSED MERCHANT PLANTS (MW)

### ECAR
- **Indiana**: 10,960 MW
- **Michigan**: 8,623 MW
- **Ohio**: 9,941 MW
- **Pennsylvania**: 1,170 MW
- **West Virginia**: 2,768 MW
  
  **Subtotal**: 33,462 MW

### MAIN
- **Illinois**: 21,052 MW
- **Missouri**: 2,022 MW
- **Wisconsin**: 3,528 MW
  
  **Subtotal**: 26,602 MW

### TOTAL ECAR/MAIN
**60,064 MW**
THE COAL OUTLOOK

• Still true that 98% of Indiana power is generated from coal (EIA data).

• New construction mostly CTs for peaking.

• \( \text{SO}_2 \) and \( \text{NO}_x \) emissions standards work against coal.

• High gas fuel costs work against gas. (If all ECAR/MAIN plants come on as planned, 25% increase in gas fuel use by U.S. utilities.)
**GENERATION COSTS -- PULVERIZED COAL VS. COMBINED CYCLE (CENTS/KWh)**

<table>
<thead>
<tr>
<th></th>
<th>PC</th>
<th>CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Recovery</td>
<td>1.969</td>
<td>0.839</td>
</tr>
<tr>
<td>Fixed O&amp;M</td>
<td>0.485</td>
<td>0.519</td>
</tr>
<tr>
<td>Variable O&amp;M</td>
<td>0.210</td>
<td>0.055</td>
</tr>
<tr>
<td>Fuel</td>
<td>0.98</td>
<td>0.734 * Gas Price/10^6 Btu</td>
</tr>
<tr>
<td></td>
<td>3.644</td>
<td>?</td>
</tr>
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</table>

- Break even gas price is $3.04/10^6 Btu; current price volatile, but well above that.

- PC capital cost based on 0.10 lbs./ 10^6 Btu NO\textsubscript{x} emissions, within the proposed NO\textsubscript{x} standards.