The New Vision for Coal
Virginia Coal & Energy Alliance
Southern States Energy Board
Virginia Center for Coal & Energy Research

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### American Electric Power

- **Regulated & Competitive Customers:** 5.8 million
- **Territory:** 200,000 sq. miles
- **Transmission:** 40,000 miles
- **Distribution:** 224,000 miles
- **Generation Capacity:** 26,000 MW
- **Total Assets:** $63,468 (millions)
Appalachian Power

<table>
<thead>
<tr>
<th>Customers</th>
<th>1 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generation</td>
<td>8,146.5 MW</td>
</tr>
<tr>
<td>Employees</td>
<td>2,000</td>
</tr>
<tr>
<td>Revenue</td>
<td>$3 billion</td>
</tr>
<tr>
<td>Net Income</td>
<td>$369 million</td>
</tr>
</tbody>
</table>

Residents in West Virginia, Virginia, and Tennessee
The power sources available for use

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>Gas</th>
<th>Hydro</th>
<th>Wind</th>
<th>EE/DR</th>
<th>Solar</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>60%</td>
<td>19%</td>
<td>11%</td>
<td>7%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>2032</td>
<td>55%</td>
<td>12%</td>
<td>9%</td>
<td>7%</td>
<td>1%</td>
<td>13%</td>
</tr>
</tbody>
</table>
Fuel energy mix

The power sources actually used to provide energy

2018
- Coal: 83%
- Gas: 9%
- Hydro: 3%
- Wind: 4%

2032
- Coal: 74%
- Gas: 11%
- Solar: 7%
- Wind: 5%
- Hydro: 2%
Coal use in AEP

<table>
<thead>
<tr>
<th>Coal Purchases</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEP</td>
<td>29.4 M tons</td>
</tr>
<tr>
<td>Appalachian Power</td>
<td>8.4 M tons</td>
</tr>
</tbody>
</table>

Coal Cost in WV/VA/TN
$475 million
The future of the industry

- Innovations in technology
- Changes in cost structure
- Expectations of society
The changing grid

Past/Present State

• Mature technologies
• Unidirectional flow
• Positive load growth

Future State

• Developing technology
• Bi-direction flow
• Uncertain load growth
Integrating the grid

- Renewable Energy Integration
- Microgrid integration
- Electric Vehicle Charging Platforms
- Distributed Generation Integration
- Automated Demand Side Management (ADSM)
- Storage and Grid Power Balancing
Small modular coal plants

- Could they change the “no new coal” picture?
- Significant improvements will be needed in
  - Efficiency
  - Emissions
  - Flexibility
Levelized cost of electricity

- Universal Solar: $50, 29%
- Wind: $48, 41%
- Natural Gas Advanced CC w/CCS: $75, 87%
- Natural Gas Advanced CC: $49, 87%
- Advanced Coal w/CCS: $130, 85%
- Conventional Coal: $95, 85%

% shows plant availability or “capacity factor”

Evolving generation mix

<table>
<thead>
<tr>
<th>Year</th>
<th>Coal</th>
<th>Natural Gas</th>
<th>Nuclear</th>
<th>Hydro, Wind, Solar &amp; Pumped Storage</th>
<th>Energy Efficiency &amp; Demand Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>66%</td>
<td>22%</td>
<td>7%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>2005</td>
<td>70%</td>
<td>19%</td>
<td>6%</td>
<td>4%</td>
<td>1%</td>
</tr>
<tr>
<td>2017</td>
<td>47%</td>
<td>27%</td>
<td>7%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>2030</td>
<td>33%</td>
<td>24%</td>
<td>6%</td>
<td>30%</td>
<td>7%</td>
</tr>
</tbody>
</table>

*2030 estimates include integrated resource plans forecasted additions and retirements through that year.*
The future

AEP System Planned Generation Resource Additions
Regulated and AEP Ohio Purchase Power Agreement

<table>
<thead>
<tr>
<th>Year</th>
<th>Wind Capacity</th>
<th>Total Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>185 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2019</td>
<td>390 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2020</td>
<td>160 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2021</td>
<td>120 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2022</td>
<td>130 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2023</td>
<td>120 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2024</td>
<td>180 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2025</td>
<td>170 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2026</td>
<td>220 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2027</td>
<td>210 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2028</td>
<td>230 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2029</td>
<td>290 MW</td>
<td>2,405 MW</td>
</tr>
<tr>
<td>2030</td>
<td>4,895 MW</td>
<td>2,130 MW</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,130 MW</td>
</tr>
</tbody>
</table>

Source: Current Internal Integrated Resource Plans.
Wind and solar represents nameplate MW capacity.
Investing to reduce
Dramatic reductions

Total AEP System NOx & SO2 Emissions

SO2
94%

NOx
90%

Hg
93%

1990-2016
ACTUAL

2001-2016
ACTUAL
Dramatic reductions

Actual CO₂ Reductions 2000-2016
- 44%
<table>
<thead>
<tr>
<th>CO₂ emissions goal</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce 60% from 2000 levels</td>
<td>2030</td>
</tr>
<tr>
<td>Reduce 80% from 2000 levels</td>
<td>2050</td>
</tr>
</tbody>
</table>
Key takeaways

• AEP depending on coal for decades to come
• Dramatically reducing emissions
• Responding to changing needs of society
Discussion