Electric Transmission:
Meeting the Needs of the 21st Century

Michael Heyeck
Senior VP Transmission
2007 Pennsylvania Planning Association Conference
October 29, 2007
Agenda

- American Electric Power
- Energy Policy Act of 2005
  - Drivers of the Act
  - EPAct05: Striking a Balance
- National Interest Electric Transmission Corridors
- Building an Interstate Transmission System
  - Changing our expectations of transmission
  - Wind Integration
- AEP Advocacy Initiatives
- Siting Transmission
American Electric Power

Strength & Scale in Assets & Operations

- 5.1 million customers in 11 states
- Industry-leading size and scale of assets:
  - Domestic Generation: 38,400 MW #2
  - Transmission: 39,000 miles #1
  - Distribution: 208,000 miles #1
- Coal & transportation assets:
  - Control over 8,000 railcars
  - Own/lease and operate over 2,600 barges & 51 towboats
  - Coal handling terminal with 20 million tons of capacity

AEP enjoys significant presence throughout the energy value chain.
Drivers of EPAct05

Reliability & Congestion

- Transmission problems can impact more than a state or an entire region.

- Similarly, transmission improvements can benefit multiple states.

Source: 2006 DOE National Electric Transmission Congestion Study
Drivers of EPAct05

- **August 13, 2003 Blackout**
- **August 15, 2003** President Bush and Prime Minister Chrétien directed formation of a joint U.S.-Canada Power System Outage Task Force to investigate the causes
- **DOE Issues Recommendations**
  - Imposition of “Mandatory and Enforceable” Reliability Standards with penalties for non-compliance.
  - Develop a regulator approved mechanism for funding NERC and the Regional Reliability Councils, to ensure independence.
  - Strengthen the institutional framework for reliability management in North America.
- **EPAct05 Passes Promoting**
  - System modernization and incentives for new technologies
  - Clean fuel technology and efficiency
  - Recognition of state interests
  - Strengthening Nation’s power grid improving system reliability and fair wholesale competition
National Interest Electric Transmission Corridors

- EPAct05 requires the Secretary of Energy to conduct a nationwide study of electric transmission congestion (within one year from the date of enactment and every three years thereafter). Federal law requires:
  - DOE to consult with “affected States.”
  - Provides “interested parties” with an opportunity to offer “alternatives and recommendations.”
  - DOE designated two NIETC corridors, one in the Mid-Atlantic Region and one in the Southwest U.S.
Building an Interstate Transmission System: Regulatory Support Needed

- Advancing a Vision Takes Leadership and Action
  - Federal jurisdiction over interstate transmission is needed to ensure efficient interstate commerce:
    - Oversight of cost allocation and siting for interstate transmission assets, defined as existing and new transmission at voltages above 300 kV
    - Elimination of hurdles to inter-regional projects caused by the application of different planning and cost allocation policies.
  - States must act to ensure their constituents benefit with better access and market efficiency enabled by the interstate grid:
    - Pass-through of costs at the retail level.
    - Collaborative regional planning and expedited siting.

As the electric grid evolves, so must our polices for planning, siting, allocating, and recovering transmission investments.
“We need a true nationwide transmission version of our interstate highway system; a grid of extra-high voltage backbone transmission lines reaching out to remote resources and overlaying, reinforcing, and tying together the existing grid in each interconnection to an extent never before seen.”

Suedeen Kelly-Commissioner FERC
July 23, 2007 ERO006-18-007/008 (FERC’s denial of rehearing on MISO’s current cost allocation method.)
Existing 765 kV
New 765 kV
AC-DC-AC Link

Composite Wind Resource Map

Wind Power Classification

<table>
<thead>
<tr>
<th>Wind Power Potential</th>
<th>Wind Power Density at 50 m W/m²</th>
<th>Wind Speed at 50 m m/s</th>
<th>Wind Speed at 50 m mph</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Marginal</td>
<td>200 - 300</td>
<td>5.6 - 6.4</td>
<td>12.5 - 14.3</td>
</tr>
<tr>
<td>3 Fair</td>
<td>300 - 400</td>
<td>6.4 - 7.0</td>
<td>14.3 - 15.7</td>
</tr>
<tr>
<td>4 Good</td>
<td>400 - 500</td>
<td>7.0 - 7.5</td>
<td>15.7 - 16.8</td>
</tr>
<tr>
<td>5 Excellent</td>
<td>500 - 600</td>
<td>7.5 - 8.0</td>
<td>16.6 - 17.9</td>
</tr>
<tr>
<td>6 Outstanding</td>
<td>600 - 800</td>
<td>8.0 - 8.8</td>
<td>17.9 - 19.7</td>
</tr>
<tr>
<td>7 Superb</td>
<td>800 - 1600</td>
<td>8.8 - 11.1</td>
<td>19.7 - 24.8</td>
</tr>
</tbody>
</table>

Wind speeds are based on a Weibull k value of 2.0

Source: POWERmap, powermap.platts.com ©2007 Platts, a division of the McGraw-Hill Companies

U.S. Department of Energy
National Renewable Energy Laboratory
Key Advantages of 765-kV

- Advanced six-conductor bundles for higher capacity, lower line losses and reduced noise
- Fiber-optic shield wires for better protection and control
- Wide-area monitoring, control, and remote diagnostics
- Independent-phase operation for improved line performance
- Line design and right-of-way usage for least environmental impact

765-kV maximizes land use thus providing more capacity in less right-of-way.
AEP Advocacy Initiatives

AEP Advancing the Development of a National Interstate Grid Today

AEP will continue to:

- Support the development of a federally regulated (FERC) extra-high voltage, interstate transmission grid, which will:
  - Improve reliability and efficiency of interstate transmission.
  - Enhance market competition, and optimal economic dispatch.
  - Reduce the need for additional generation across an expanded market area.

- Work with partners to advance the building of the I-765™, the next interstate, with the most advanced technological solutions.

- Engage regulators to ensure benefits of access and market efficiency of the next interstate, and to ensure proper planning, siting, allocation and recovery.
Typical Siting Process

Then, an additional 1-3 years are needed for right-of-way acquisition and construction depending on length and complexity of the transmission line.
Siting Transmission

AEP Siting Principles

AEP is dedicated to:

- Providing reliable energy to our customers

- Incorporating new concepts and ideas to address aesthetic and land use issues

- Maintaining strong environmental principles
  - Identifying powerline routes that minimize the overall impact to local residences and the surrounding environment
Example: Protecting Cultural Resources

Project: Wyoming-Jacksons Ferry
- Location: Kimball, WV
- Designated historic district
- Topography used to route project and reduce views
- Demonstrates flexibility
Example: Protecting Cultural Resources
Example: Protecting Natural Resources

Endangered Species

Construction Techniques
Example: Protecting Visual Resources

Use of Darkened Materials

Select Cut Right-of-way