ADVANCED TRANSMISSION TECHNOLOGIES

The Future of American Electricity Policy Academy
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Council of State Governments

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AEP is transitioning to become the next premium utility.

We are focused on providing our customers with much more zero and low CO2 emission generated energy including wind and solar and more efficient energy resources.

We are also focused on improving reliability/resiliency through deployment of advanced technologies throughout our transmission and distribution grids, as well as offering our customers customized energy solutions to improve their efficient use of energy.

This transformation has already begun as shown by AEP operating company integrated resources plan filings adding 3108 MW of solar, 6300 MW of wind, and 3400 MW natural gas through 2033, and energy storage.

Reference: DOC 1.

Supporting documents in the TOOLKIT handout are indexed by number at the end of these slides. Please contact Paul Loeffelman (phloeffelman@aep.com) for copies.
AEP has pioneered or adapted generation, transmission, and distribution technology innovations to cost-effectively increase reliability, efficiency, and environmental performance for its customers.

Transmission technologies are being focused on grid flexibility, data acquisition and analytics, improving system performance and efficiency, and maximizing use of right-of-way.

Policymakers may be interested in the report AEP and 10 other international electricity companies wrote to share their technology and public policy experiences for 50 low and zero carbon emitting energy technologies that could help country signatories to the Paris Agreement meet their CO2 reduction pledges, and achieve other public policy goals. Together the 11 companies annually produce and deliver 33% of the world’s electricity, 60% being carbon free.

Reference: DOC 2.
Example Technology: Asset Health Center

- **Purpose of the Asset Health Center (AHC)**
  - Prevent failures
  - Optimize maintenance effectiveness
  - Support asset renewal prioritization
- **Aging assets need increasing attention**
  - 33% of transformers > 50yrs; 18% > 60yrs old
  - Aging assets drive increasing outages, cost
- **Analytics platform**
  - Algorithms evaluate condition & trends
  - Develop risk of failure, condition severity
- **Monitors on major substation equipment**
  - Standard on new EHV equipment
  - Retrofit EHV transformers, circuit breakers
  - Lower voltage equipment to follow
The Breakthrough Overhead Line Design (BOLD™) is a new transmission line design that maximizes capacity and efficiency while minimizing environmental impacts.

AEP is deploying the BOLD technology within the 11 states of our traditional service territory, and now working with domestic and international utilities for use on future projects.

BOLD™ can help states achieve many of their public policy goals, such as economic growth, decreasing carbon emissions, adding more clean energy generation, increasing grid reliability and resiliency, etc.

Each state has many miles of high-voltage lines that are at least 50-75 years old. BOLD is well suited to replace and upgrade these aging circuits and maximize use of right-of-way while limiting impacts to the environment.

Reference: DOCs 3, 4, 5.
Comparison of BOLD vs. Conventional Design Benefits

BOLD can be used for new or replacement transmission circuits up to 500 kV.

BOLD is a cost-effective design, and results in a net savings when benefits are considered.

<table>
<thead>
<tr>
<th>BENEFITS</th>
<th>BOLD 345 kV</th>
<th>BOLD 230 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Capacity*</td>
<td>10-60%</td>
<td>15-75%</td>
</tr>
<tr>
<td>Lower Tower Height</td>
<td>(25-35%)</td>
<td>(20-30%)</td>
</tr>
<tr>
<td>Lower Magnetic Field Levels</td>
<td>(45-50%)</td>
<td>(45-50%)</td>
</tr>
<tr>
<td>Lower Energy Losses*</td>
<td>Up to (33%)</td>
<td>Up to (15%)</td>
</tr>
</tbody>
</table>

*Comparisons dependent on conductor selection.

- Costs for BOLD differ depending on design standards, but current estimates put BOLD on par with conventional designs before considering any benefits.
- BOLD is up to 33% less expensive than conventional on a cost per MW basis. This also means fewer lines are required to achieve the same level of capacity.
- Savings associated with reduced line losses further offset up-front material cost.

State legislators, utility regulators, regional planning organizations, and other policymakers are interested in new advanced technologies like BOLD™ being quickly deployed to benefit citizens and businesses. But project developers can be reluctant to propose these new technologies if they believe that policymakers will favor older, more familiar technologies.

Policymakers can reassure project developers that their new technologies will be fairly compared through development of supportive policies in the form of legislation, resolutions, regulations and other expressions of encouragement.

Reference: DOC 5 (especially slides 13, 14 and the Appendix).

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Encourage Advanced Transmission Technology Deployment Through Policymaker Associations & State Policies

- There are a few regional and national policymaker association resolutions and policies that have supported deployment of new transmission technologies like BOLD:

- Policymaker Resolutions: NARUC, CSG Southern Legislative Conference, CSG Midwest Legislative Conference, CSG West,

- Additionally, only a few states (Arkansas, Kansas, and New York are examples) have established policies that encourage the deployment of these types of new technologies.

- Additional statehouse-level policies can help to further accelerate this technology deployment, extending the benefits to residents of other states.

- Reference: DOCs 5, 6, 7.

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Q&A – Thank You

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