Transmission, Risk and EPA Air Regulations

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Headquartered in Columbus, Ohio, AEP is one of the largest electric utilities in the U.S., serving over 5 million customers in 11 states. AEP covers over 200,000 square miles and operates in three RTOs. They own:

- Nearly 38,000 megawatts of generating capacity
- More than 40,000 miles of electricity transmission network, the largest in the nation
- More 765-kilovolt extra-high-voltage transmission lines than all other U.S. transmission systems combined

![AEP Transmission Network Map](image-url)
Resiliency vs Reliability

- Resiliency and Reliability are different things
- Reliability is a measure of service
  - High probability, low consequence
  - Not risk based
  - Deterministic – yes/no
  - Focuses on impact to grid
- Resiliency relates to risks & consequences
  - Low probability, high consequence
  - Risk based (resilient to something)
  - Confidence is specified (not yes/no)
  - Focuses on impact beyond grid
Resiliency – Definition?

• Resiliency encompasses many things

• Presidential Policy Directive 21:
  – Prepare for/adapt to changing conditions
  – Withstand/rapidly recover from disruption: deliberate attack, accident, or naturally occurring threats or incidents

• Resilience, in context of critical infrastructure
  – The ability of a facility/asset to anticipate, resist, absorb, respond to, adapt to, and recover from a disturbance (Resilience: Theory and Applications, ANL, 2013)

No consensus yet on appropriate measures or metrics for grid resiliency
• Vulnerabilities vary
  – System characteristics
  – Geographic & economic variations
• Threats vary by location
  – Natural disaster/severe weather, e.g., hurricane, tornado, derecho, ice, flood, wildfire, earthquake, pandemic
  – Space weather: geomagnetic storms
  – Human threats, e.g. cyber/physical attacks, electromagnetic pulse
• Consequences vary
  – Requires comprehensive analysis
  – Probability of consequence is a function of vulnerabilities & threats
AEP’s Resiliency Strategy

Transmission Grid Resiliency

- Incident Command Structure
- Situational Awareness & Decision Support
- Asset Renewal with Selective Hardening
- Equipment & Materials Spare Strategy
- Asset Health Center
- Cyber/Physical Security
- Maintenance Programs
Transmission Reliability

- Keeping the lights on is job #1
  - Grid operation in violation of thermal, voltage, and stability limits places the system at risk for cascading outages and ultimately blackouts
- Transmission planning standards are in place to ensure we stay within the limits
  - NERC TPL standards
  - RTO criteria
  - TO criteria
- Potential violation of the standards and criteria drives grid enhancements
CPP’s Four “Building Blocks”

1. Heat rate improvement for coal plants
2. Increase renewables and preserve nuclear
3. Increase use of natural gas plants to displace coal
4. Increase energy efficiency
Transmission Reliability Impacts

- AEP modeled the retirement scenario as proposed by the EPA in the CPP
- AEP’s preliminary analysis identified severe, widespread reliability concerns across the PJM region
- Retirement of base-load coal units at key locations can cause:
  - Changes in power flow magnitude and direction compared with historical operation, leading to thermal overloads
  - Reactive power deficiencies that lead to voltage collapse
  - Loss of spinning reserves, dynamic voltage regulation and frequency control
  - Loss of black start capabilities
Concerns with the CPP

• The interim targets need to be addressed and provide additional time to get infrastructure enhancements in place
  – The industry is being pushed to take on too much too fast
• Timing is critical
  – We need to ensure that the timing and framework of new regulations are aligned with operational realities of the grid
• Reliability will be the collateral damage
  – Maintaining grid reliability must be a critical part of decisions and the transition
What is Being Done?

• AEP supports the Reliability Assurance Mechanism and Reliability Safety Valve
  - Assurances that reliability can be sustained during the implementation period
  - Ensures that the wide range of factors that could impact conformance with the state’s implementation plan would be addressed
  - Provides protection or relief to states, regions, and industry entities as reliability challenges occur in CPP development or during implementation
  - The principal elements of an effective reliability assurance mechanism should include alignment of reliability, implementation plans, regulation, and overall certainty

• A reliability assurance mechanism, along with sufficient timelines to accommodate infrastructure development, can facilitate a reliable transition and ensure BPS reliability
The Value of Transmission

- A robust transmission system is the key to ensuring we can achieve our long-term policy objectives
- Long-lived transmission facilities provide adaptability and optionality
  - Enables consumer choices
  - Supports markets
  - Enables deployment of new technologies
  - Provides access to a range of available energy resources
- Transmission is fundamental hedge against uncertainties surrounding the nature and timing of new technology development and shifting patterns of supply and demand
What Can Policymakers Do?

- From a resiliency perspective, understand the risks from both a likelihood and grid vulnerability perspective.
- Ensure that utilities are aware of the risks we face and are taking appropriate steps to mitigate.
  - Be wary of those pedaling quick fixes.
  - There is no one size fits all approach.
- Understand that new regulations like the CPP will bring about dramatic changes for the electric industry.
- Be open to creative new proposals.
- Recognize transmission infrastructure as an enabler of public policy.