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APPLIED PHYSICS LABORATORY

Securing the Zero Carbon Grid

PRESENTATION FOR PJM

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Bottom Line Up Front

- Our current approach to decarbonization is creating additional, and potentially catastrophic, cyber vulnerabilities

- But: done right, the transition to a zero carbon grid can *strengthen* grid resilience, by:
  - Identifying and mitigating emerging risks
  - Leveraging the changes in grid architecture currently underway to build resilience in novel ways
  - PUCs and other stakeholders will be critical for such progress

Emerging Risks

- New technologies will be critical to compensate for the loss of inertia, spinning reserves, etc. vital for reliability of today's grid
  - Every one of these technologies could create new attack surfaces
- Additional problems: booming DERs, rise of energy aggregators/operators, and two-way power flows between distribution and BPS systems
  - Issues for grid reliability/resilience for RTOs
  - Challenges for regulatory oversight and cyber standards

Emerging Risks (continued)

- Market adaptations needed to incorporate solar and wind – FERC Order 2222 is just the start
  - Real time energy markets and associated changes (generation attribute tracking systems, automated dispatch, etc.)
  - Risk: adversaries will seek to deny/corrupt expanded data flows and new market operations to create grid instabilities
- Exacerbating all such problems: massive (and potentially manipulable) internet-connected loads

Potential Solutions: Pre-Attack

- New *risk-based* regulatory initiatives for the distribution level and for “seams” with the BPS
  - Prime example: require improved RTO/ISO visibility over distribution-level metering and telemetry
- Supply chain risk management initiatives
  - China has a strategy for our zero carbon grid
  - We need one too!
- Buildout of a *secure* high voltage transmission system

Solutions For When the You–Know-What Hits the Fan

- Fallback market mechanisms
- Strategic power islanding
- Additional need: account for the *transition* from today's legacy, fossil-based system to the zero carbon grid
  - We may be entering a period of increased vulnerability for reliability and cyber resilience
  - Specialized initiatives essential to meet these transition challenges

Thank you!

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