Grid Resilience in Regional Transmission Organizations and Independent System Operators
AD18-7-000

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FERC Order – January 8, 2018

- Unanimous decision with three concurrences (Chatterjee, LaFleur & Glick)
- Terminated the DOE NOPR proceeding initiated in Docket No. RM18-1-000 to address the Proposed Rule on Grid Reliability and Resilience Pricing.
- Initiated a new proceeding in Docket No. AD18-7-000 to evaluate the resilience of the bulk power system: Grid Reliability in Regional Transmission Organization and Independent System Operator

A Common Understanding of Resilience

FERC's Proposed Definition: The ability to withstand and reduce the magnitude and/or duration of disruptive events, which includes the capability to anticipate, absorb, adapt to, and/or rapidly recover from such an event.
(January 8 Order at P23)

PJM Definition: The ability of the system to withstand or quickly recover from events that pose operational risks.

Prepare + Operate + Recover = Resilience

A Common Understanding of Resilience

FERC Risks: Resilience could encompass a range of attributes, characteristics, and services that allow the grid to withstand, adapt to, and recover from both naturally occurring and man-made disruptive events.

At the most basic level, ensuring resilience requires that we both (1) determine which risks to the grid we are going to protect against, and (2) identify the steps, if any, needed to ensure those risks are addressed. (January 8 Order at P24)

PJM Risks: Such high-impact, low frequency threats include extreme weather, electromagnetic pulses, geomagnetic disturbances, earthquakes, cyber and physical attacks, and fuel security.

Next Steps

The RTOs/ISOs are hereby directed to provide responses to the Commission, as discussed in the body of this order, within 60 days of the date of this order. Interested entities may submit reply comments within 30 days of the due date of the RTO/ISO submissions.

- Stakeholder input, particularly regarding red highlighted sections of the FERC-posed questions in the appendix to this presentation:
  - Stakeholder written input appreciated by February 9th
  - February 13th Liaison Committee Meeting topic
  - Special MRC on February 23rd at 1:00 – 3:00 pm to receive verbal input
- March 9, 2018 – PJM's responses due to FERC

Appendix – Questions Posed by FERC on Grid Resilience in Regional Transmission Organizations and Independent System Operators

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How RTOs/ISOs *Assess* Threats to Resilience

a) What are the primary risks to resilience in your region from both naturally occurring and man-made threats? How do you identify them? Are they short-, mid-, or long-term challenges?

b) How do you assess the impact and likelihood of resilience risks?

c) Please explain how you identify and plan for risks associated with high-impact, low-frequency events (e.g., physical and cyber attacks, accidents, extended fuel supply disruptions, or extreme weather events). Please discuss the challenges you face in trying to assess the impact and likelihood of high-impact, low-frequency risks. In addition, please describe what additional information, if any, would be helpful in assessing the impact and likelihood of such risks.

How RTOs/ISOs *Assess* Threats to Resilience

d) Should each RTO/ISO be required to identify resilience needs by assessing its portfolio of resources against contingencies that could result in the loss or unavailability of key infrastructure and systems? For example, should RTOs/ISOs identify as a resilience threat the potential for multiple outages that are correlated with each other, such as if a group of generators share a common mode of failure (e.g., , a correlated generator outage event, such as a wide-scale disruption to fuel supply that could result in outages of a greater number of generating facilities)? The RTOs/ISOs should also discuss resilience threats other than through a correlated outage approach. Do RTOs/ISOs currently consider these types of possibilities, and if so, how is this information used?

How RTOs/ISOs *Assess* Threats to Resilience

e) Identify any studies that have been conducted, are currently in progress, or are planned to be performed in the future to identify the ability of the bulk power system to withstand a high-impact, low-frequency event (e.g., physical and cyber-attacks, accidents, extended fuel supply disruptions, or extreme weather events). Please describe whether any such studies are conducted as part of a periodic review process or conducted on an as-needed basis.

f) In these studies, what specific events and contingencies are selected, modeled, and assessed? How are these events and contingencies selected?

g) What criteria (e.g., load loss (MW)), duration of load loss, vulnerability of generator outages, duration of generator outages, etc.) are used in these studies to determine if the bulk power system will reasonably be able to withstand a high-impact, low-frequency event? Are the studies based on probabilistic analyses or deterministic analyses?

How RTOs/ISOs *Assess* Threats to Resilience

h) Do any studies that you have conducted indicate whether the bulk power system is able to reasonably withstand a high-impact, low frequency event? If so, please describe any actions you have taken or are planning as mitigation, and whether additional actions are needed.

i) How do you determine whether the threats from severe disturbances, such as those from low probability, high impact events require mitigation? Please describe any approaches or criteria you currently use or otherwise believe are useful in determining whether certain threats require mitigation.

j) How do you evaluate whether further steps are needed to ensure that the system is capable of withstanding or reducing the magnitude of these high-impact, low frequency events?

k) What attributes of the bulk power system contribute to resilience? How do you evaluate whether specific components of the bulk power system contribute to system resilience? What component-level characteristic, such as useful life or emergency ratings, support resilience at the system level?

How RTOs/ISOs *Assess* Threats to Resilience

l) If applicable, how do you determine the quantity and type of bulk power system physical asset attributes needed to support resilience? Please include, if applicable, what engineering and design requirements, and equipment standards you currently have in place to support resilience? Are those engineering and design requirements designed to address high-impact, low-frequency events? Do these requirements change by location or other factors?

m) To what extent do you consider whether specific challenges to resilience, such as extreme weather, drought, and physical or cyber threats, affect various generation technologies differently? If applicable, please explain how the different generation technologies used in your system perform in the face of these challenges.

n) To what extent are the challenges to the resilience of the bulk power system associated with the transmission system or distribution systems, rather than electric generation, and what could be done to further protect the transmission system from these challenges?

How RTOs/ISOs *Assess* Threats to Resilience

p) Over what time horizon should the resilience assessments discussed above be conducted, and how frequently should RTOs/ISOs conduct such an analysis? How could these studies inform planning or operations?

q) How do you coordinate with other RTOs/ISOs, Planning Coordinators, and other relevant stakeholders to identify potential resilience threats and mitigation needs?

r) Are there obstacles to obtaining the information necessary to assess threats to resilience? Is there a role for the Commission in addressing those obstacles?

s) Have you performed after-the-fact analyses of any high-impact, low-frequency events experienced in the past on your system? If so, please describe any recommendations in your analyses and whether they have or have not been implemented.

t) Please provide any other information that you believe the Commission would find helpful in its evaluation of the resilience of the RTO/ISO systems.

How RTOs/ISOs *Mitigate* Threats to Resilience

a) Describe any existing operational policies or procedures you have in place to address specific identified threats to bulk power system resilience within your region. Identify each resilience threat (e.g., the potential for correlated generator outage events) and any operational policies and procedures to address the threat. Describe how these policies or procedures were developed in order to ensure their effectiveness in mitigating the identified risks and also describe any historical circumstances where you implemented these policies or procedures.

b) How do existing market-based mechanisms (e.g., capacity markets, scarcity pricing, or ancillary services) currently address these risks and support resilience?

c) Are there other generation or transmission services that support resilience? If yes, please describe the service, how it supports resilience, and how it is procured.

How RTOs/ISOs *Mitigate* Threats to Resilience

d) How do existing operating procedures, reliability standards (e.g., N-1 NERC TPL contingencies), and RTO/ISO planning processes (e.g., resource adequacy programs or regional transmission planning) currently consider and address resilience?

e) Are there any market-based constructs, operating procedures, NERC reliability standards, or planning processes that should be modified to better address resilience? If so, please describe the potential modifications.