Resilience in System Planning

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Resilience - Planning

• Resilience Criteria – Range of Possibilities
  – Do “no harm” (i.e. don’t make an existing problem worse)
  – Opportunistic – incorporate resilience as a factor in RTEP proposal selections
  – Standalone - address resilience as a stand-alone driver

• Resilience Criteria would require new analytical procedures and tools
  – Assess Vulnerabilities
  – Develop Resilience Indices
• Do No Harm approach when considering network changes
  – Consider upstream and downstream impact of local upgrades
  – Shift of power flow, voltage impact, etc.
  – Potential examples
• Metrics & Criteria

• What’s the difference?
  – **Metrics:** a standard for measuring or evaluating something, especially one that uses figures or statistics
  – **Criterion:** a rule or principle for evaluating or testing something
Resilience - Planning

• Event (and associated contingency definitions) Evaluation
  – All NERC TPL “P0 through P7” already included in RTEP infrastructure planning
  – Consider “Table 1 – Steady State & Stability Performance Extreme Events” and similar events

• Tools
  – Utilize existing commercially available power flow software combined with PJM developed automation
  – Use to simulate, produce metrics, summarize results, etc.
Simulation Result

- No cascading
- Bounded
- Collapse
Development of Metrics

• Cascade Analysis

  • Percentage improvement or degradation

  • Transmission facilities involved in triggering events (i.e. the contingencies)

  • Transmission facilities involved in resulting cascade events
    – Identify “repeat” and “worst” offenders

• Bounded vs. Collapse
Development of Metrics

- Development of Simulation Data Metrics
  - Collapse likelihood (%)
  - Load at risk (MW)
  - Generation at risk (MW)
  - Headroom increase (i.e. reduction in loading on other facilities)
  - Others
• Resilience Challenges
  – RTEP Approval and Inclusion
    • Transparency & Stakeholder Communication
  – Siting given States historic preferences
  – Cost and cost allocation