Agenda

- Review changes between current TPL standards and new TPL-001-4
- Discuss plans for TPL-001-4 implementation, milestones
- Future meetings
TPL-001-4: Major Changes

- **Base Models**
  - More detailed description of system conditions to model
  - Modeling of known maintenance outages*

- **Sensitivity Analysis**
  - Study of sensitivity cases for varying assumptions
  - Spare equipment strategy for long lead equipment

- **Annual Short-circuit Assessment**

- **New Method and Restrictions on Limited Use of Load Shedding related to Footnote 12**

* FERC directed NERC to modify this requirement in the Final Rule
TPL-001-4: Major Changes (cont.)

- **Stability Analysis**
  - Dynamic load models
  - Transient voltage criteria
  - Use of relay models in analysis to simulate tripping and OOS blocking
  - Simulation of generator ride-through capability

- **Contingencies**
  - Loss of a shunt device (capacitors, reactors, SVCs, etc.)
  - Loss of generator plus loss of another facility (G-1, N-1)
  - Several events no longer allow interruption of firm service or non-consequential load loss for >300 kV events
  - Separated and clarified stuck breaker versus relay failure contingencies

- **Planning Coordinator/Transmission Planner division of responsibilities**

- **Documentation of criteria for monitoring limits, system deviations, identification of system instability**
System Models (R1)

- Responsible entities will maintain models necessary for performing studies to complete its Planning Assessment
  - Modeling data used will be consistent with MOD-010 and 012
- System models represent projected system conditions for Category P0 (normal system condition) and may include the following:
  - Known generation or transmission outages with duration of 6 months or greater
  - New and modified facilities
  - Real and reactive load forecasts
  - Known commitments for Firm Transmission Service and Interchange
  - Items represented in the Corrective Action Plan
Steady-State Analysis (R2.1, R2,2 & R3)

• **Study models scenarios:** Near and Long Term Planning
  – Year 1 or 2, 5 and a year between 6 and 10
  – System peak and off-peak models
  – Sensitivity models

• **Contingency Analysis**
  – P1 events (single contingent events)
  – Selected events expected to produce more severe system impacts (based on P2-P7 events)
  – Extreme events

• **Corrective Action Plans (R2.7)**
  – List system deficiencies, and actions necessary to resolve them
  – If necessary, documentation of use of Non-Consequential Load Loss and curtailment of Firm Transmission Service
Stability Analysis (R2.4, R2.5 & R4)

- **Study models scenarios: Near and Long Term Planning**
  - System peak load for a year between 1 and 5
  - System off-peak load for a year between 1 and 5
  - Long term stability assessment (between year 6 and year 10)
  - Sensitivity models

- **Contingency Analysis**
  - P1 – P7 events simulated
  - Extreme events
  - Detailed requirements for generator and system behavior post contingency detailed in R4.1-R4.3

- **Corrective Action Plans (R2.7)**
  - List system deficiencies, and actions necessary to resolve them
  - If necessary, documentation of use of Non-Consequential Load Loss and curtailment of Firm Transmission Service
Short-Circuit Analysis (R2.3 & R2.8)

• **Study models scenarios: Near Term Planning**
  – Be conducted annually, using System short circuit models
  – Models will include any planned generation and Transmission Facilities which could impact the study area

• **Contingency Analysis**
  – Determine whether circuit breakers have sufficient interrupting capability for Faults they are expected to interrupt

• **Corrective Action Plans**
  – List system deficiencies, and actions necessary to resolve them
  – Review any identified deficiencies in subsequent Planning Assessments
Sensitivity Analysis (R2.1.4, R2.1.5 and R2.4.3)

- Sensitivity analysis will be used to stress the system, demonstrating the impact of changes to the base modeling assumptions
- One or more of the following will be adjusted for the sensitivity analysis (applies to both Steady state and Stability analysis, unless noted):
  - Real and reactive forecasted Load (steady state only)
  - Load level, load forecast, or dynamic Load model assumptions (stability only)
  - Expected transfers
  - Expected in service dates of new or modified Transmission Facilities
  - Reactive resource capability
  - Generation additions, retirements, or other dispatch scenarios
  - Controllable Loads and Demand Side Management (steady state only)
  - Duration or timing of known Transmission outages (steady state only)

- **Spare Equipment Strategy**
  - System impact assessment of unavailability of long lead time (greater than or equal to one year) Transmission equipment
  - Perform studies for P0, P1 and P2 events
Additional Requirements

- **R5**: Responsible Entities shall have criteria for acceptable System steady state voltage limits, post-Contingency voltage deviations and transient voltage response for its System.
- **R6**: Responsible Entities shall define and document the criteria or methodology used to identify system instability.
- **R7**: Planning Coordinator, in conjunction with its Transmission Planners, shall identify each entity’s individual and joint responsibilities for performing the required Planning Assessment.
- **R8**: Responsible Entities shall distribute its assessment to adjacent Planning Coordinators and Transmission Planners.
TPL-001-4 Game Plan

• Latest revision of the NERC Transmission Planning standards, will replace currently active TPL-001 through TPL-004.
• Enforcement dates require all new standard requirements to become effective with MTEP15 cycle.
  – Two requirements need to be completed in 2014
• TPL-001-4 applies to both the Planning Coordinator (MISO) and the Transmission Planner (Transmission Owners)
• MISO is reviewing the standard internally and will discuss the changes, impact, BPM updates and the compliance plan in detail in the Planning Subcommittee
• MISO as the Planning Coordinator will work directly with the Transmission Planners (i.e., Transmission Owners) to develop a plan and strategy to comply with TPL-001-4 including the division and/or delegation of responsibilities per R7.
Milestones

• Compliant with R1, R7 of TPL-001-4 by January 1, 2015
  – Necessary work to be completed between December 2013 and December 2014
    • R1 Updates related to modeling needed prior to start of model building process for MTEP15
    • R7 Agreement on division of responsibilities needs between the Planning Coordinator and Transmission Planner by end of 2014
Milestones (cont.)

• Compliant with remaining TPL-001-4 requirements by January 1, 2016
  – Identify new tasks to be completed
  – Some questions to consider include:
    • How to address new requirements?
    • What new information is needed to meet the new requirement?
    • Is someone (PC or TP) already doing this?
    • Who is best suited to perform the required study? PC or TP or both?
    • Is a process change/new process necessary in order to meet this requirement?
    • Is a BPM update necessary to document changes resulting from this requirement?
Upcoming Meeting Schedule

• December 17, 2013: PSC meeting TPL overview
• December 17, 2013: Post-PSC TPL-001-4 meeting
  – Discuss R7 delegation of responsibilities between PC and TP
• February 2014: Next scheduled PSC meeting
Questions / Contacts

• **TPL-001-4 implementation contacts**
  – Expansion Planning
    • Mike Dantzler, mdantzler@misoenergy.org
    • Matt Tackett, mtackett@misoenergy.org
  – Transmission Access Planning
    • Ling Hua, lhua@misoenergy.org
  – System Modeling
    • Cody Doll, cdoll@misoenergy.org
Appendix: Contingent Events Table

<table>
<thead>
<tr>
<th>New Category</th>
<th>Old Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>Cat A</td>
<td>System intact</td>
</tr>
<tr>
<td>P1</td>
<td>Cat B</td>
<td>Single contingency (Fault of a shunt device- fixed, switched or SVC/STATCOM is new)</td>
</tr>
<tr>
<td>P2</td>
<td>Cat C1, C2</td>
<td>Single event which may result in multiple element outage. Open line w/o fault, bus section fault, internal breaker fault</td>
</tr>
<tr>
<td>P3</td>
<td>Cat C3</td>
<td>Loss of generator unit followed by system adjustments + P1. No load shed is allowed</td>
</tr>
<tr>
<td>P4</td>
<td>Cat C</td>
<td>Fault + stuck breaker events</td>
</tr>
<tr>
<td>P5</td>
<td>n/a</td>
<td>Fault + relay failure to operate (new)</td>
</tr>
<tr>
<td>P6</td>
<td>Cat C3</td>
<td>Two overlapping singles (not generator)</td>
</tr>
<tr>
<td>P7</td>
<td>Cat C5, C4</td>
<td>Common tower outages; loss of bipolar DC</td>
</tr>
</tbody>
</table>