

Mapping Document

Project 2015-10 Single Points of Failure TPL-001

Standard: TPL-001-5		
Requirement in Approved Standard	Translation to New Standard or Other Action	Description and Change Justification
<p>TPL-001-4, Requirement R1</p> <p>R1. Each Transmission Planner and Planning Coordinator shall maintain System models within its respective area for performing the studies needed to complete its Planning Assessment. The models shall use data consistent with that provided in accordance with the MOD-010 and MOD-012 standards, supplemented by other sources as needed, including items represented in the Corrective Action Plan, and shall represent projected System conditions. This establishes Category P0 as the normal System condition in Table 1.</p> <p>1.1 System models shall represent: 1.1.1. Existing Facilities</p>	<p>TPL-001-5, Requirement R1</p> <p>R1. Each Transmission Planner and Planning Coordinator shall maintain System models within its respective area for performing the studies needed to complete its Planning Assessment. The models shall use data consistent with that provided in accordance with the MOD-032 standard, supplemented by other sources as needed, including items represented in the Corrective Action Plan, and shall represent projected System conditions. This establishes Category P0 as the normal System condition in Table 1. <i>[Violation Risk Factor: High] [Time Horizon: Long-term Planning]</i></p> <p>1.1. System models shall represent:</p>	<p>Requirement R1 body has been updated to reference MOD-032 standard number in body of requirement.</p> <p>Requirement R1, Part 1.1.2 and subparts have been deleted. Selection of known outages will be addressed in Requirement R2, Parts 2.1.4 and 2.4.4.</p>

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<p>1.1.2. Known outage(s) of generation or Transmission Facility(ies) with a duration of at least six months.</p> <p>1.1.3. New planned Facilities and changes to existing Facilities</p> <p>1.1.4. Real and reactive Load forecasts</p> <p>1.1.5. Known commitments for Firm Transmission Service and Interchange</p> <p>1.1.6. Resources (supply or demand side) required for Load</p>	<p>1.1.1. Existing Facilities.</p> <p>1.1.2. Known outage(s) of generation or Transmission Facility(ies) scheduled in the Near-Term Transmission Planning Horizon selected for analyses pursuant to Requirement R2, Parts 2.1.3 and 2.4.3 only. Known outage(s) shall be selected according to an established procedure or technical rationale that, at a minimum:</p> <p>1.1.2.1. Includes known outage(s) that are expected to result in Non-Consequential Load Loss for</p>	

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	<p>P1 events in Table 1 when concurrent with the selected known outage(s); and</p> <p>1.1.2.2. Does not exclude known outage(s) solely based upon the outage duration.</p> <p><u>1.1.3.1.1.2.</u> New planned Facilities and changes to existing Facilities.</p> <p><u>1.1.4.1.1.3.</u> Real and reactive Load forecasts.</p> <p><u>1.1.5.1.1.4.</u> Known commitments for Firm</p>	

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	<p>Transmission Service and Interchange.</p> <p>1.1.6.1.1.5. Resources (supply or demand side) required for Load.</p>	
<p>TPL-001-4, Requirement R2</p> <p>Parts 2.1, 2.1.1, 2.1.2, and 2.1.5</p> <p>Parts 2.2, 2.2.1</p> <p>Part 2.3</p> <p>Parts 2.4, 2.4.1, 2.4.2</p> <p>Part 2.5</p> <p>Parts 2.6, 2.6.1, 2.6.2</p> <p>Parts 2.7.1, 2.7.2, 2.7.3, 2.7.4</p> <p>Parts 2.8, 2.8.1, 2.8.2</p>	<p>TPL-001-5, Requirement R2</p> <p>Parts 2.1, 2.1.1, 2.1.2, and 2.1.5</p> <p>Parts 2.2, 2.2.1</p> <p>Part 2.3</p> <p>Parts 2.4, 2.4.1, 2.4.2</p> <p>Part 2.5</p> <p>Parts 2.6, 2.6.1, 2.6.2</p> <p>Parts 2.7.1, 2.7.2, 2.7.3, 2.7.4</p> <p>Parts 2.8, 2.8.1, 2.8.2</p>	<p>No modifications made.</p>
<p>TPL-001-4, Requirement R2</p> <p>R2 Part 2.1.4</p> <p>2.1.4 For each of the studies described in Requirement R2, Parts 2.1.1 and 2.1.2, sensitivity case(s) shall be utilized to demonstrate the impact of changes to the basic assumptions used in the model. To accomplish this, the sensitivity analysis in the Planning Assessment must vary one or more of the following conditions by a sufficient</p>	<p>TPL-001-5, Requirement R2</p> <p>R2 Part 2.1.3</p> <p>2.1.43For each of the studies described in Requirement R2, Parts 2.1.1 and 2.1.2, sensitivity case(s) shall be utilized to demonstrate the impact of changes to the basic assumptions used in the model. To accomplish this, the sensitivity analysis in the Planning Assessment must vary one or more of</p>	<p><u>Requirement R2, Part 2.1.4 moved to Requirement R2, Part 2.1.3</u></p>

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<p>amount to stress the System within a range of credible conditions that demonstrate a measurable change in System response :</p> <ul style="list-style-type: none"> • Real and reactive forecasted Load. • 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. • Duration or timing of known Transmission outages. 	<p>the following conditions by a sufficient amount to stress the System within a range of credible conditions that demonstrate a measurable change in System response:</p> <ul style="list-style-type: none"> • Real and reactive forecasted Load. • 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. • Duration or timing of known Transmission outages. 	
<p>TPL-001-4, Requirement R2</p> <p>2.1.3. P1 events in Table 1, with known outages modeled as in Requirement R1, Part 1.1.2, under those System peak or Off-Peak</p>	<p>TPL-001-5, Requirement R2</p> <p>2.1.3. P1 events in Table 1 expected to produce more severe System impacts on its portion of the BES, with known outages modeled as in</p>	<p><u>Requirement R2 Part 2.1.3 moved to Requirement R2 Part 2.1.4</u></p> <p>A properly planned Transmission system should facilitate maintenance outages</p>

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<p>conditions when known outages are scheduled.</p>	<p>Requirement R1, Part 1.1.2, under those System peak or Off-Peak conditions when known outages are scheduled.</p> <p><u>2.1.4. When known outage(s) of generation or Transmission Facility(ies) are planned in the Near-Term Planning Horizon, the impact of selected known outages on System performance shall be assessed. These known outage(s) shall be selected for assessment consistent with a documented outage coordination procedure or technical rationale by the Planning Coordinator or Transmission Planner. Known outage(s) shall not be excluded solely based upon outage duration. The assessment shall be performed for the P0 and P1 categories identified in Table 1 with the System peak or Off-Peak conditions that the System is expected to experience when the known outage(s) are planned. This assessment shall include, at a minimum known outages expected to produce more severe System impacts on the Planning coordinator or Transmission Planners’s portion of the BES. Past or current studies may support the selection of known outage(s), if the study(s) has</u></p>	<p>without Non-Consequential Load Loss, maintain a stable System without Cascading and uncontrolled islanding. (FERC Order 786, Paragraph 41). Therefore, consistent with the principle of TPL-001-5 Requirement R3, Part 3.4 which requires the Transmission Planner and Planning Coordinator to identify those planning events in Table 1 that are expected to produce more severe System impacts on its portion of the BES, only those P1 events in Table 1 expected to produce more severe System impacts on its portion of the BES are to be assessed for System models that include known outages pursuant to Requirement R2, Part 2.1.4.</p>

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	<u>comparable post-Contingency System conditions and configuration such as those following P3 or P6 category events in Table 1</u>	
<p>TPL-001-4, Requirement R2</p> <p>2.4.3. For each of the studies described in Requirement R2, Parts 2.4.1 and 2.4.2, sensitivity case(s) shall be utilized to demonstrate the impact of changes to the basic assumptions used in the model. To accomplish this, the sensitivity analysis in the Planning Assessment must vary one or more of the following conditions by a sufficient amount to stress the System within a range of credible conditions that demonstrate a measurable change in performance:</p> <ul style="list-style-type: none"> • Load level, Load forecast, or dynamic Load model assumptions. • Expected transfers. • Expected in service dates of new or modified Transmission Facilities. • Reactive resource capability. • Generation additions, retirements, or other dispatch scenarios. 	<p>TPL-001-5, Requirement R2</p> <p>2.4.43. For each of the studies described in Requirement R2, Parts 2.4.1 and 2.4.2, sensitivity case(s) shall be utilized to demonstrate the impact of changes to the basic assumptions used in the model. To accomplish this, the sensitivity analysis in the Planning Assessment must vary one or more of the following conditions by a sufficient amount to stress the System within a range of credible conditions that demonstrate a measurable change in performance:</p> <ul style="list-style-type: none"> • Load level, Load forecast, or dynamic Load model assumptions. • Expected transfers. • Expected in service dates of new or modified Transmission Facilities. • Reactive resource capability. • Generation additions, retirements, or other dispatch scenarios. 	<p><u>Requirement R2, Part 2.4.3 has been moved back to 2.4.3 as it was in TPL-001-4.</u></p>

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	<p>TPL-001-5, Requirement R2</p> <p>2.4.3. P1 events in Table 1 expected to produce more severe System impacts on its portion of the BES, with known outages modeled as in Requirement R1, Part 1.1.2, under those System peak or Off-Peak conditions when known outages are scheduled.</p> <p><u>2.4.34. When known outage(s) of generation or Transmission Facility(ies) are planned in the Near-Term Planning Horizon, the impact of selected known outages on System performance shall be assessed. These known outage(s) shall be selected for assessment consistent with a documented outage coordination procedure or technical rationale by the Planning Coordinator or Transmission Planner. Known outage(s) shall not be excluded solely based upon outage duration. The assessment shall be performed for the P1 categories identified in Table 1 with the System peak or Off-Peak conditions that the System is expected to experience when the known outage(s) are planned. This assessment shall include, at a minimum, those known outages expected to produce more severe System</u></p>	<p><u>TPL-001-5, Requirement R2, Part 2.4.4</u></p> <p><u>TPL-001-4, Part 2.4.3 moved to TPL-001-5, Part 2.4.4</u></p> <p>Modified the standard to add a Stability analysis requirement for P1 events in Table 1, with known outages under appropriate System conditions, that includes similar language to that used for the steady state analysis stated in Requirement R2, Part 2.1.4. For reasons similar to those justifying changes to Requirement R2 Part 2.1.4, the Transmission Planner and Planning Coordinator shall identify those P1 events in Table 1 expected to produce more severe System impacts on its portion of the BES to be assessed for System models that include known outages pursuant to Requirement R2 Part 2.4.4.</p>

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	<p><u>impacts on the Planning Coordinator or Transmission Planner’s portion of the BES. Past or current studies may support the selection of known outage(s), if the study(s) has comparable post-Contingency System conditions and configuration such as those following P3 or P6 category events in Table 1.</u></p>	
	<p>TPL-001-5, Requirement R2</p> <p>2.4.5. When an entity’s spare equipment strategy could result in the unavailability of major Transmission equipment that has a lead time of one year or more (such as a transformer), the impact of this possible unavailability on System performance shall be assessed. Based upon this assessment, an analysis shall be performed for the selected P1 and P2 category events identified in Table 1 for which the unavailability is expected to produce more severe System impacts on its portion of the BES. The analysis shall simulate the conditions that the System is expected to experience during the possible unavailability of the long lead time equipment.</p>	<p><u>TPL-001-5, Requirement R2, Part 2.4.5</u></p> <p>Consistent with FERC Order 786 Para 89, modified the standard to add Requirement R2, Part 2.4.5, which includes similar language to that used for the steady-state analysis stated in Requirement R2, Part 2.1.5 to address stability analysis for spare equipment strategy.</p>

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<p>TPL-001-4, Requirement R2 Requirement R2 Part 2.7</p> <p>2.7 For planning events shown in Table 1, when the analysis indicates an inability of the System to meet the performance requirements in Table 1, the Planning Assessment shall include Corrective Action Plan(s) addressing how the performance requirements will be met. Revisions to the Corrective Action Plan(s) are allowed in subsequent Planning Assessments but the planned System shall continue to meet the performance requirements in Table 1. Corrective Action Plan(s) do not need to be developed solely to meet the performance requirements for a single sensitivity case analyzed in accordance with Requirements R2, Parts 2.1.4 and 2.4.3. The Corrective Action Plan(s) shall:</p>	<p>TPL-001-5, Requirement R2 Requirement R2 Part 2.7</p> <p>2.7 For planning events shown in Table 1, when the analysis indicates an inability of the System to meet the performance requirements in Table 1, the Planning Assessment shall include Corrective Action Plan(s) addressing how the performance requirements will be met. Revisions to the Corrective Action Plan(s) are allowed in subsequent Planning Assessments but the planned System shall continue to meet the performance requirements in Table 1. Corrective Action Plan(s) do not need to be developed solely to meet the performance requirements for a single sensitivity case analyzed in accordance with Requirements R2, Parts 2.1.43 and 2.4.3. The Corrective Action Plan(s) shall:</p>	<p><u>TPL-001-5, Requirement R2, Part 2.4.5</u> <u>Requirement R2, Part 2.7</u></p> <p>Changed Requirement subpart reference in Requirement 2, Part R2.7 in standard.</p>
<p>TPL-001-4, Requirement R3</p> <p>R3. For the steady state portion of the Planning Assessment, each Transmission Planner and Planning Coordinator shall perform studies for</p>	<p>TPL-001-5, Requirement R3</p> <p>R3. For the steady state portion of the Planning Assessment, each Transmission Planner and Planning Coordinator shall perform studies for</p>	<p><u>Requirement R3, Part 3.2</u></p> <p>Document internal conforming clean-up to move the last sentence of</p>

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<p>the Near-Term and Long-Term Transmission Planning Horizons in Requirement R2, Parts 2.1, and 2.2. The studies shall be based on computer simulation models using data provided in Requirement R1. <i>[Violation Risk Factor: Medium]</i> <i>[Time Horizon: Long-term Planning]</i></p> <p>3.1. Studies shall be performed for planning events to determine whether the BES meets the performance requirements in Table 1 based on the Contingency list created in Requirement R3, Part 3.4.</p> <p>3.2. Studies shall be performed to assess the impact of the extreme events which are identified by the list created in Requirement R3, Part 3.5.</p> <p>3.3. Contingency analyses for Requirement R3, Parts 3.1 & 3.2 shall:</p>	<p>the Near-Term and Long-Term Transmission Planning Horizons in Requirement R2, Parts 2.1, and 2.2. The studies shall be based on computer simulation models using data provided in Requirement R1. <i>[Violation Risk Factor: Medium]</i> <i>[Time Horizon: Long-term Planning]</i></p> <p>3.1. Studies shall be performed for planning events to determine whether the BES meets the performance requirements in Table 1 based on the Contingency list created in Requirement R3, Part 3.4.</p> <p>3.2. Studies shall be performed to assess the impact of the extreme events which are identified by the list created in Requirement R3, Part 3.5. <u>If the analysis concludes there is Cascading caused by the occurrence of extreme events, an evaluation of possible actions designed to reduce the</u></p>	<p>Requirement R3, Part 3.5 to Requirement R3, Part 3.2.</p>

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<p>3.3.1. Simulate the removal of all elements that the Protection System and other automatic controls are expected to disconnect for each Contingency without operator intervention. The analyses shall include the impact of subsequent:</p> <p>3.3.1.1. Tripping of generators where simulations show generator bus voltages or high side of the generation step up</p>	<p><u>likelihood or mitigate the consequences and adverse impacts of the event(s) shall be conducted.</u></p> <p>3.3. Contingency analyses for Requirement R3, Parts 3.1 & 3.2 shall:</p> <p>3.3.1. Simulate the removal of all elements that the Protection System and other automatic controls are expected to disconnect for each Contingency without operator intervention. The analyses shall include the impact of subsequent:</p> <p>3.3.1.1. Tripping of generators where simulations show generator bus voltages or</p>	

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<p>(GSU) voltages are less than known or assumed minimum generator steady state or ride through voltage limitations. Include in the assessment any assumptions made.</p> <p>3.3.1.2. Tripping of Transmission elements where relay loadability</p>	<p>high side of the generation step up (GSU) voltages are less than known or assumed minimum generator steady state or ride through voltage limitations. Include in the assessment any assumptions made.</p> <p>3.3.1.2. Tripping of Transmission elements where relay loadability</p>	

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<p style="text-align: right;">limits are exceeded.</p> <p>3.3.2. Simulate the expected automatic operation of existing and planned devices designed to provide steady state control of electrical system quantities when such devices impact the study area. These devices may include equipment such as phase-shifting transformers, load tap changing transformers, and switched capacitors and inductors.</p> <p>3.4. Those planning events in Table 1, that are expected to produce more severe System impacts on its</p>	<p style="text-align: right;">limits are exceeded.</p> <p>3.3.2. Simulate the expected automatic operation of existing and planned devices designed to provide steady state control of electrical system quantities when such devices impact the study area. These devices may include equipment such as phase-shifting transformers, load tap changing transformers, and switched capacitors and inductors.</p> <p>3.4. Those planning events in Table 1, that are expected to produce more severe System impacts on its portion of the BES, shall be identified and a list of those Contingencies to</p>	

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<p>portion of the BES, shall be identified and a list of those Contingencies to be evaluated for System performance in Requirement R3, Part 3.1 created. The rationale for those Contingencies selected for evaluation shall be available as supporting information.</p> <p>3.4.1. The Planning Coordinator and Transmission Planner shall coordinate with adjacent Planning Coordinators and Transmission Planners to ensure that Contingencies on adjacent Systems which may impact their Systems are</p>	<p>be evaluated for System performance in Requirement R3, Part 3.1 created. The rationale for those Contingencies selected for evaluation shall be available as supporting information.</p> <p>3.4.1. The Planning Coordinator and Transmission Planner shall coordinate with adjacent Planning Coordinators and Transmission Planners to ensure that Contingencies on adjacent Systems which may impact their Systems are included in the Contingency list.</p> <p>3.5 Those extreme events in Table 1 that are expected to produce more severe System impacts shall be identified and a list created of those events to be evaluated in</p>	

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<p>included in the Contingency list.</p> <p>Those extreme events in Table 1 that are expected to produce more severe System impacts shall be identified and a list created of those events to be evaluated in Requirement R3, Part 3.2. The rationale for those Contingencies selected for evaluation shall be available as supporting information. If the analysis concludes there is Cascading caused by the occurrence of extreme events, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s) shall be conducted.</p>	<p>Requirement R3, Part 3.2. The rationale for those Contingencies selected for evaluation shall be available as supporting information. If the analysis concludes there is Cascading caused by the occurrence of extreme events, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s) shall be conducted.</p>	
<p>TPL-001-4, Requirement R4</p> <p>Parts 4.1, 4.1.1, 4.1.2, 4.1.3</p> <p>Parts 4.3, 4.3.1, 4.3.1.1, 4.3.1.2, 4.3.1.3, 4.3.2</p> <p>Parts 4.4, 4.4.1</p> <p>Part 4.5</p>	<p>TPL-001-5, Requirement R4</p> <p>Parts 4.1, 4.1.1, 4.1.2, 4.1.3</p> <p>Parts 4.3, 4.3.1, 4.3.1.1, 4.3.1.2, 4.3.1.3, 4.3.2</p> <p>Parts 4.4, 4.4.1</p> <p>Part 4.5</p>	<p>No modifications made.</p>
<p>TPL-001-4, Requirement R4</p>	<p>TPL-001-5, Requirement R4,</p>	<p><u>TPL-001-5, Requirement R4, Part 4.2</u></p>

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<p>4.2. Studies shall be performed to assess the impact of the extreme events which are identified by the list created in Requirement R4, Part 4.5.</p>	<p>R4. For the Stability portion of the Planning Assessment, as described in Requirement R2, Parts 2.4 and 2.5, each Transmission Planner and Planning Coordinator shall perform the Contingency analyses listed in Table 1. The studies shall be based on computer simulation models using data provided in Requirement R1. <i>[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]</i></p> <p>4.1. Studies shall be performed for planning events to determine whether the BES meets the performance requirements in Table 1 based on the Contingency list created in Requirement R4, Part 4.4.</p> <p>4.1.1. For planning event P1: No generating unit shall pull out of synchronism. A generator being disconnected from the System by fault clearing</p>	<p>Prior to this change, TPL-001-4 Requirement R4, Part 4.5 discussed analysis performed during studies referenced in TPL-001-4 Requirement R4, Part 4.2. To eliminate confusion and better separate the discussion of studies and analysis from the discussion of the necessary pre-conditional selection of extreme events in Table 1 that are expected to produce more severe System impacts, identical language from Requirement R4, Part 4.5 was moved to Requirement R4, Part 4.2.</p>

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	<p>action or by a Remedial Action Scheme is not considered pulling out of synchronism.</p> <p>4.1.2. For planning events P2 through P7: When a generator pulls out of synchronism in the simulations, the resulting apparent impedance swings shall not result in the tripping of any Transmission system elements other than the generating unit and its directly connected Facilities.</p> <p>4.1.3. For planning events P1 through P7: Power oscillations shall exhibit acceptable damping as established by the Planning Coordinator and Transmission Planner.</p>	

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	<p>4.2. Studies shall be performed to assess the impact of the extreme events which are identified by the list created in Requirement R4, Part 4.5. <u>If the analysis concludes there is Cascading caused by the occurrence of extreme events, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences of the event (s) shall be conducted.</u></p> <p>4.3. Contingency analyses for Requirement R4, Parts 4.1 and 4.2 shall:</p> <p>4.3.1. Simulate the removal of all elements that the Protection System and other automatic controls are expected to disconnect for each Contingency without</p>	

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	<p>operator intervention. The analyses shall include the impact of subsequent:</p> <p>4.3.1.1. Successful high speed (less than one second) reclosing and unsuccessful high speed reclosing into a Fault where high speed reclosing is utilized.</p> <p>4.3.1.2. Tripping of generators where simulations show generator bus voltages or high side of the GSU</p>	

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	<p>voltages are less than known or assumed generator low voltage ride through capability. Include in the assessment any assumptions made.</p> <p>4.3.1.3. Tripping of Transmission lines and transformers where transient swings cause Protection System operation based on generic or</p>	

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	<p>actual relay models.</p> <p>4.3.2. Simulate the expected automatic operation of existing and planned devices designed to provide dynamic control of electrical system quantities when such devices impact the study area. These devices may include equipment such as generation exciter control and power system stabilizers, static var compensators, power flow controllers, and DC Transmission controllers.</p> <p>4.4. Those planning events in Table 1 that are expected to produce more severe System impacts on its portion of the BES, shall</p>	

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	<p>be identified, and a list created of those Contingencies to be evaluated in Requirement R4, Part 4.1. The rationale for those Contingencies selected for evaluation shall be available as supporting information.</p> <p>4.4.1. Each Planning Coordinator and Transmission Planner shall coordinate with adjacent Planning Coordinators and Transmission Planners to ensure that Contingencies on adjacent Systems which may impact their Systems are included in the Contingency list.</p> <p>4.5. Those extreme events in Table 1 that are expected to produce more severe System impacts shall be identified</p>	

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	<p>and a list created of those events to be evaluated in Requirement R4, Part 4.2. The rationale for those Contingencies selected for evaluation shall be available as supporting information. If the analysis concludes there is Cascading caused by the occurrence of extreme events, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences of the event(s) shall be conducted.</p>	
TPL-001-4, Requirement R5	TPL-001-5, Requirement R5	No modifications made.
TPL-001-4, Requirement R6	TPL-001-5, Requirement R6	No modifications made.
TPL-001-4, Requirement R7	TPL-001-5, Requirement R7	No modifications made.
TPL-001-4, Requirement R8	TPL-001-5, Requirement R8	No modifications made.