

## **Reliability Tests Utilized in Phase II, Tasks 7 and 8**

### **Introduction**

The overall purpose of Tasks 7 and 8 is to develop the transmission necessary for each of the three scenarios determined in Task 6. The Statement of Project Objectives (SOPO) states that the EIPC is to “identify transmission expansion options for each Expansion Scenario” and to further “perform reliability analyses consistent with NERC reliability criteria for transmission planning to assess in aggregate for the Eastern Interconnection the interregional transmission options developed.” Further, the SOPO states that Tasks 7 and 8 will:

- 7.A Develop and/or adjust transmission reinforcements needed to support the Expansion Scenarios.
- 7.B Develop an Eastern Interconnection model for each scenario.
- 8.A Perform reliability analysis for each scenario.
- 8.B Review Detailed Transmission Analysis results with the SSC and stakeholders.
- 8.C Develop flowgates (for use in Task 9 Production Cost Modeling).

This document describes the tests that will be utilized in Tasks 7 and 8 to develop the transmission necessary to accommodate the three (3) scenarios developed in Task 6. These tests are consistent with NERC reliability criteria and are appropriate for developing the transmission necessary to accommodate the scenarios. This analysis will identify transmission which supports inter-regional transfers as defined in the scenario for the most critical load conditions including projected system peak load and “less than peak” load system demands, as applicable. All thermal and voltage violations identified for facilities 230 kV or greater should be mitigated through transmission expansion and not through applying operating guides or the curtailment of firm transactions. The criteria for determining thermal and voltage violations are identified in Table 1 below. In addition to developing transmission expansion projects to mitigate violations of the criteria in Table 1, the EIPC will report facilities whose thermal loading is above 95% of the applicable facility rating in order to identify potential future constraints that may occur.

Lower voltage facilities (less than 230 kV) will be monitored and reported in the analyses. However, correction of thermal and voltage issues related to these facilities will generally be omitted from this exercise, recognizing that this resolution requires specific resource and other detailed configuration information that is typically only known within a near term planning horizon.

## **System Performance Tests**

For purposes of this analysis, an “Element” is defined as a generator, transformer, or transmission circuit, whereas, a transmission circuit is any component of a transmission line (including DC) between two substations (i.e. breaker, switch, conductor, etc). Consistent with existing and proposed NERC TPL standards and the description in the SOPO, the following test will be utilized. Additional regional criteria may be applied by an individual Planning Authority to integrate new resources into their area and in developing the transmission reinforcements as part of Task 7.

### **Test 1: System Performance with all Elements in Service**

- The transmission developed for each of the three scenarios determined in Task 6A will be assessed to ensure there are no thermal or voltage violations identified with all system Elements in service (no contingency). This test is consistent with all category A contingencies as defined in the currently approved NERC TPL-001-1 standard.

### **Test 2: System Performance Following the Loss of a Single Element**

- The transmission developed for each of the three scenarios determined in Task 6A will be assessed to ensure there are no thermal or voltage violations identified with the loss of a single Element (single contingency). Additionally, this test provides for the loss of a single component of a transmission circuit without a fault that results in the open ending of a transmission line. This test is consistent with all category B contingencies as defined in the currently approved NERC TPL-002-1B standard.

### **Test 3: System Performance Following Loss of a Single Element under Generator Out Scenarios**

- The transmission developed for each of the three scenarios determined in Task 6A will be assessed to ensure there are no thermal or voltage violations identified with any contingency defined in Test 2 in addition to a generator-out scenario (N-G-1). Each generator across the Eastern Interconnection greater than 500 MW and interconnected at 230 kV or greater will be taken offline individually prior to the N-1 screen of Test 2. This test is consistent with a subset of category C3 contingencies as defined in the currently approved NERC TPL-003-1a standard.

### **Test 4: System Performance Following the Loss of Multiple Transmission Lines Sharing Common Towers/Structures**

- The transmission developed for each of the three scenarios determined in Task 6A will be assessed to ensure there are no thermal or voltage violations identified with the loss of multiple transmission circuits that share common towers/structures. In general, this

does not apply to circuits that only share a minimal number of towers/structures, such as, into and out of substations or other unique situations. This test is consistent with category C4 and C5 contingencies as defined in the currently approved NERC TPL-003-1a standard.

**Test 5: System Performance Following the Loss of Multiple Elements as a Result of a Bus Section Fault on buses 300 kV and Above**

- The transmission developed for each of the three scenarios determined in Task 6A will be assessed to ensure there are no thermal or voltage violations identified with the loss of multiple Elements that result from the normal clearing of a fault on a bus section of voltage of 300 kV or higher. This test is consistent with category C1 contingencies as defined in the currently approved NERC TPL-003-1a standard.

A summary table of the above Tests are listed in the below in Table 1.

**Table 1: System Performance Tests**

Test	Description	Minimum Criteria to Mitigate	
		Thermal	Voltage
T1	No Contingency	> 100 % of Applicable Rating	< 0.95 p.u. > 1.1 p.u.
T2	Loss of Single Element		
T3	Loss of Single Element in conjunction with a generator outage		
T4	Loss of Multiple Transmission Circuits that Share Common Towers/Structures		
T5	Loss of Multiple Transmission Circuits that result from a Bus Fault on Buses Greater than 300 kV		