Guidelines for Short Circuit System Modeling and Short Circuit Assessment of The Southern Company Electric Transmission System

Version: 1
Date: 03/28/2016

ASSOCIATED NERC STANDARD(S):
TPL-001-4

IMPLEMENTATION:
In effect when approved.

Phase in of individual TPL-001-4 requirements will be based on the effective dates as defined in TPL-001-4. The implementation dates for the requirements applicable to short circuit portion are listed below.

January 1, 2015 - R1 & R7
January 1, 2016 - R2 & R8

PURPOSE:
This guideline documents the study processes and requirements that form the basis for the short circuit assessment covering the Near-Term (years 1-5) planning horizon to ensure consistency with the NERC reliability standard TPL-001-4. This guideline addresses the short circuit portion of TPL-001-4 only.

Guideline

This document covers the requirements of NERC reliability standard TPL-001-4 that applies to short circuit studies. The text in the shaded grey boxes is taken from the NERC standard.

1.0 R1 – System Model Requirement

> 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.

> 1.1. System models shall represent:
> - 1.1.1. Existing Facilities
> - 1.1.2. Known outage(s) of generation or Transmission Facility(ies) with a duration of at least six months.
> - 1.1.3. New planned Facilities and changes to existing Facilities
> - 1.1.4. Real and reactive Load forecasts
> - 1.1.5. Known commitments for Firm Transmission Service and Interchange
> - 1.1.6. Resources (supply or demand side) required for Load

Southern Company Services Transmission (SCST) maintains system modeling data in the form of a CAPE database which is used to perform short circuit studies. This database is also referred to as the base case in this document. The database or base case is consistent with the requirements of NERC standard MOD-032[1].

The system modeling data includes:

1. Existing generation and transmission facilities based on the most recent as-built data provided by the Generation Owner (GO) and the Transmission Owner (TO). This data is updated on a continuous basis as needed to include ongoing system changes.

2. The transmission system topology, including the most recent Corrective Action Plan (CAP) and other expected transmission improvements, for the Near-Term and Long-Term planning horizon is included in the model. The current generation expansion plan is also included.

3. The external system model provided by the SERC Short Circuit Data Working Group and the FRCC.

Information such as load forecast, firm transmission service and interchange etc. are not modeled as they do not have an impact on short circuit studies.

[1] MOD-010 and MOD-012 have been consolidated into MOD-032.

2.0 R2 – Annual Short Circuit Assessment and Corrective Action Plan

> R2. Each Transmission Planner and Planning Coordinator shall prepare an annual Planning Assessment of its portion of the BES. This Planning Assessment shall use current or qualified past studies (as indicated in Requirement R2, Part 2.6), document assumptions, and document summarized results of the steady state analyses, short circuit analyses, and Stability analyses.

The short circuit portion of the Planning Assessment is prepared annually. This portion of the assessment documents the assumptions and summarizes the results of the short circuit studies. The studies are used to develop recommendations such as replacement of breakers with higher interrupting capability and operating guides. The recommendations made are included in the CAP.

> 2.3. The short circuit analysis portion of the Planning Assessment shall be conducted annually addressing the Near-Term Transmission Planning Horizon and can be supported by current or past studies as qualified in Requirement R2, Part 2.6. The analysis shall be used to determine whether circuit breakers have interrupting capability for Faults that they will be expected to interrupt using the System short circuit model with any planned generation and Transmission Facilities in service which could impact the study area.

The short circuit portion of the Planning Assessment for the Near-Term Transmission Planning Horizon is prepared annually and utilizes the applicable current or past studies which have been performed.

Short circuit studies are generally performed for a case in which the short circuit levels are at a maximum, i.e., maximum generation, all lines in, etc. The study is performed on a first year and last year base case in the Near-Term Planning Horizon effectively covering all years in Near-Term Planning Horizon. The study results are used to determine whether circuit breakers have interrupting capability for faults that they are expected to interrupt.

> 2.6. Past studies may be used to support the Planning Assessment if they meet the following requirements:
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> 2.6.1. For steady state, short circuit, or Stability analysis: the study shall be five calendar years old or less, unless a technical rationale can be provided to demonstrate that the results of an older study are still valid.
>
> 2.6.2. For steady state, short circuit, or Stability analysis: no material changes have occurred to the System represented in the study. Documentation to support the technical rationale for determining material changes shall be included.

Qualifying past studies will be used along with current studies for the short circuit assessment. When past studies are used, documentation will be included in the assessment to demonstrate that no material changes have occurred in the system which would affect the

results of the study. Also, when past studies are more than five calendar years old, a technical rationale will be provided to show why the study is still valid.

A possible rationale for no material changes would be that there was no addition of transmission elements in the system or study results show that the change in fault current at all transmission buses in the system is minimal compared to previous years.

> 2.8. For short circuit analysis, if the short circuit current interrupting duty on circuit breakers determined in Requirement R2, Part 2.3 exceeds their Equipment Rating, the Planning Assessment shall include a Corrective Action Plan to address the Equipment Rating violations. The Corrective Action Plan shall:
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> 2.8.1. List System deficiencies and the associated actions needed to achieve required System performance.
>
> 2.8.2. Be reviewed in subsequent annual Planning Assessments for continued validity and implementation status of identified System Facilities and Operating Procedures.

The short circuit portion of the Planning Assessment is based on current and past studies which have been performed. These study results are used to determine whether circuit breakers have interrupting capability for faults that they are expected to interrupt. If it is determined that the short circuit current that is required to be interrupted by the breaker is higher than the breaker's interrupting capability (such breakers are also referred to as overstressed breakers), a CAP is developed to address the problem. In most cases, the CAP will be to replace the overstressed breaker with a breaker with a higher interrupting capability, but it may also include an operating guide. The recommendations made are included in the CAP which contains the list of overstressed breakers and actions needed to achieve required system performance.

Each year the entire CAP from the previous year is reevaluated based on any known or forecasted system changes (including modification or retirement of transmission and/or generation Facilities).

3.0 R7 – SCST Roles and Responsibilities

> R7. Each Planning Coordinator, in conjunction with each of its Transmission Planners, shall determine and identify each entity's individual and joint responsibilities for performing the required studies for the Planning Assessment.

SCST is responsible for all short circuit study related requirements of TPL-001-4. Responsibilities include: the development of the base case, performing short circuit studies, providing summary assessments and coordination/development of any required CAP.

4.0 R8 – Short Circuit Assessment Distribution

> R8. Each Planning Coordinator and Transmission Planner shall distribute its Planning Assessment results to adjacent Planning Coordinators and adjacent Transmission Planners within 90 calendar days of completing its Planning Assessment, and to any functional entity that has a reliability related need and submits a written request for the information within 30 days of such a request.

The most recent short circuit assessment is distributed as a part of the Planning Assessment to the adjacent PC/TPs within 90 days of completing the assessment. Other entities with a valid reliability related request will be provided the most recent Planning Assessment that has been provided to adjacent PC/TPs within 30 days of a request.

Dated records of the Planning Assessment transmittal to each appropriate entity:

- within 90 calendar days of completion of the annual short circuit assessment or
- within 30 days of a request to provide the most recent short circuit assessment

will be retained as evidence. The records will be maintained for a minimum of three calendar years prior to the current year.

> 8.1. If a recipient of the Planning Assessment results provides documented comments on the results, the respective Planning Coordinator or Transmission Planner shall provide a documented response to that recipient within 90 calendar days of receipt of those comments.

SCST will provide a documented response to address documented comments from recipients of the short circuit assessment under R8 within 90 days of receipt of those comments.

Dated records of comments from and responses to each appropriate entity within 90 calendar days of receipt of a Planning Assessment comment will be retained as evidence. The records will be maintained for a minimum of three calendar years prior to the current year.

DOCUMENT CHANGE LOG:

Version #	Date	Description of Key Change
0	11/04/2014	Version 0 approved.
1	03/28/2016	Miscellaneous grammatical changes