



Procedure

Intra-regional Short Circuit Database Working Group Technical Procedural Manual

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1.0 Purpose

This procedure is the product of the SERC Short Circuit Database Working Group (SCDWG) under the direction of the SERC Planning Coordination Subcommittee (PLCS). It provides the guidelines and procedures that define and support the activities of the SCDWG.

This procedure is intended to guide the maintenance and development of fault base cases for the SERC Region, including equivalents of the SERC Region’s neighboring utilities. It is updated regularly to meet the changing needs and requirements of the SCDWG and PLCS.

1.1 Background

The VACAR-Southern-TVA-Entergy (VSTE) Steering Committee (SC) established the Short Circuit Database Task Force (SCDTF) in November 2001 to evaluate alternatives for meeting concurrent needs for the coordinated exchange of short circuit modeling data addressing both the electric system planning and protection functions among the VSTE members.

The Short Circuit Database Task Force (SCDTF) developed a preliminary process for exchanging short circuit equivalents among the VSTE members responsible for bulk transmission system planning and protection. Following the work of the SCDTF, the VSTE-SC authorized the establishment of the VSTE SCDWG in June 2002. Its purpose is to develop processes and procedures to permit routine exchanges of short circuit data among participating VSTE members. The goal is to meet defined needs of both system planning and protection functions.

The first exchange of short circuit data among participating VSTE members occurred in 2004. In 2006, a group of members now known as the Gateway subregion joined SERC. In 2007, the VSTE SCDWG became the SERC SCDWG, and additional members joined SERC. Also in 2007, the Southwest Power Pool (SPP) agreed to participate. The exchange of short circuit data allows the SPP and SERC Region to attach updated fault equivalents from each other to their own Region’s fault equivalents annually.

1.2 Business Need

This procedure is to facilitate exchanging short circuit data among SERC utility members and neighboring utilities to maintain the reliability of the interconnected network.

2.0 Scope

This SCDWG procedure includes the guidelines and procedures that define the SCDWG’s purpose: to maintain the SERC regional short circuit database.

3.0 Definitions

This procedure uses the following definitions:

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Term or Acronym	Definition
EC	SERC Engineering Committee
ERAG	Eastern Interconnection Reliability Assessment Group
FERC	Federal Energy Regulatory Commission
IPP	Independent Power Producer
LTWG	Long Term Working Group
MAA	Master Account Administrator
MMWG	Multi-Regional Modeling Working Group
PC	Planning Coordinator
PLCS	Planning Coordination Subcommittee
SC	Steering Committee
SCDTF	Short Circuit Database Task Force
SCDWG	Short Circuit Database Working Group
SERC Utility Member	SERC members that own transmission and generation facilities
SPP	Southwest Power Pool
VSTE	VACAR-Southern-TVA-Entergy

4.0 Responsible SERC Groups

SERC PLCS and SCDWG are responsible for this procedure.

5.0 Review and Re-approval Requirements

This document will be reviewed every three years or as appropriate by the SCDWG and PLCS for possible revision. The existing or revised document will be re-certified and posted on the SERC standards website. Notice of the re-certification will be sent to SERC registered entities and members of the SERC Engineering Committee (EC).

6.0 General Procedure

This section includes the following subsections:

- Introduction
- Purpose of the SCDWG
- Guidelines for Developing Short Circuit Cases

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- Non-SERC Equivalent Updates
- Master Tie Line Database
- Model Building Data Exchange

6.1 Introduction

Each SERC Planning Coordinator (PC) must submit a full detailed model, which includes all Bulk Electric System (BES) elements. This model is to include all border buses with neighboring systems as well as tie facility information. Guidelines established for developing short circuit equivalents shall be consistently applied to all interfaces.

6.2 Purpose of the SCDWG

The SCDWG enhances the coordination of short circuit data and information among SERC members as well as the SERC Region’s neighboring utilities. SCDWG members recognize the need to share system short circuit data and information that is essential to maintaining the reliability of the interconnected network.

1. Scope of Activities

The SERC Short Circuit Database Working Group will do the following to fulfill its purpose:

- Develop, maintain, and share accurate short circuit modeling data of the SERC member systems.
- Provide reports to the SERC PLCS summarizing activities of the SCDWG.
- As directed by the SERC PLCS, perform inter-area short circuit studies.

2. Administrative Procedure for SCDWG Roster Changes

Representatives are appointed by their companies or entities. They must be signatories to the SERC Confidentiality Agreement and cannot be marketing function employees as defined by FERC regulations and the FERC Standards of Conduct. Liaison will also be maintained with the Chairs of the EC and PLCS, as appropriate. Before changing the SCDWG roster, the following criteria must be met:

- A. The sitting SCDWG member (or the new member’s company representative from a leadership committee) should notify the SCDWG’s Primary SERC staff contact of the upcoming transition onto the SCDWG. SERC Support (support@serc1.org) should be copied on this notification.
- B. Each SERC member company has assigned a designated employee to assist in administering requirements of the SERC Confidentiality Agreement (also known as a “non-disclosure agreement”). If the new representative has not yet signed this agreement, they must contact the company’s designated employee to complete the signatory process. Their signature verifies that they agree to comply with the terms of the agreement, so that by virtue of their

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involvement with the SCDWG, they may have access to confidential information in order to perform SERC functions. If required, SERC Support can assist in identifying their company's designated employee.

- C. The company's designated employee will ensure that SERC Support is provided the new representative's name on an updated employee list indicating that they have signed the SERC Confidentiality Agreement.
- D. Each SERC member company has also identified a SERC Master Account Administrator (MAA) to provide local assistance in accessing information and data available through the SERC Portal/FTP site. A new SCDWG representative should contact their company's MAA to establish appropriate access for their role on the SCDWG. If required, SERC Support can assist in identifying the company's MAA.
- E. The sitting SCDWG member (or their company's representative from a leadership committee) should notify the Chair of the SCDWG and the SCDWG SERC support representative of their transition out of the SCDWG. SERC Support (support@serc1.org) should be copied on this notification. If a replacement is known, the incoming member should follow the same procedures as a new member entering the group.

Roster changes shall be emailed to SERC Support (support@serc1.org). The Primary SERC staff contact will notify the committee Chair, PLCS Chair, and company steering and Engineering Committee representatives of the requested changes.

The SCDWG Chair should notify the group that a member has been added or removed from the roster.

3. Chair and Vice Chair

The PLCS Chair shall appoint a member of the SCDWG to serve as Chair of the SCDWG and a member to serve as Vice Chair. The Chair and Vice Chair shall serve for a two-year term that commences on November 1 of the appointment year and ends on October 31 of the second year. The Vice Chair will normally succeed the Chair.

The Chair's duties include the following:

- Prepare schedule of SCDWG work activities.
- Ensure the schedule is met.
- Represent the SCDWG at meetings of the PLCS.
- Provide regular updates on activities of the SCDWG to the PLCS.
- Assist SERC staff in setting the agenda and preparing minutes for all SCDWG meetings and telephone conferences.
- Coordinate periodic updates of the SCDWG roster.
- Coordinate periodic updates of the procedural manual.

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The Vice Chair’s duties include the following:

- Perform the duties of the Chair if the Chair is unable to attend a PLCS meeting.
- Assume the Chair position if the Chair leaves the group before their term is complete.
- Assist SERC staff in preparing minutes.
- Prepare the final fault cases from the data provided by SERC and non-SERC members of the SCDWG.

4. Annual Schedule of Activities

Each year, SCDWG members shall provide to the Vice Chair updates to the Tie Facility Drawings, Tie Facility Spreadsheets, and full detailed model, which includes all BES elements on the following schedule. The dates of the schedule are approximate. A full schedule is to be developed and approved on an annual basis:

- Fault model (.raw and .seq files) – September 12
- Review and submit changes to Tie Facility Drawings and Master Tie Line Database – September 19

The SCDWG shall have an annual meeting during the third full week of October to do the following:

- Review PSS/E read errors and correct data discrepancies.
- Continue updating fault model submittals (.raw and .seq files), Tie Facility Drawings, and Master Tie Line Database as discrepancies are identified and corrected.

Coordination activities and resolution of data discrepancies among participants should be completed no later than one month after the last day of the SCDWG annual meeting.

No later than two months after the last day of the SCDWG annual meeting, the Vice Chair shall prepare the final fault cases from the data that SERC and non-SERC members provide.

6.3 Guidelines for Developing Short Circuit Cases

The following general guidelines establish and outline development of short circuit models for coordinated exchange among SERC utility member systems:

1. The SCDWG requires all data submittals by Planning Coordinators (PCs) to be full detailed models, which include all Bulk Electric System (BES) elements.
2. Short circuit models will be developed and exchanged for the following study seasons:
 - a. **Future Case representing the projected summer peak season one year from current.** This model should be taken (when practical) from the same database used by each PC for system protection settings and testing (e.g., if

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generating a case in the fall of 2017, the model to be developed is to represent the summer of 2018).

- b. **Future Case representing the projected summer peak season seven years from current.** This model may be taken from internal databases used for system protection or planning purposes, but should include future additions deemed most likely to be operational in this timeframe (e.g., if generating an equivalent in the fall 2017, the model to be developed is to represent the summer of 2024).

The schedule and models developed for short circuit data exchanges accommodated by the SCDWG do not replace good utility practice and routine communication between neighboring systems required to coordinate specific power system developments or network changes.

3. PCs must open ties between all neighboring systems for their data submittal. Non-SERC system equivalents should be developed with all interconnections to SERC open. Interconnections to non-SERC systems may be maintained in these models.
4. Tie Facility Diagrams are required to clarify tie facility information. A revision number or revision date should be specified for each Tie Facility Diagram. Tie facilities that are normally open must also be identified on the Diagrams.
5. Completed models are to be finalized in PSS/E format (.raw and .seq files) for merger with those of other participating systems as part of the consolidated data exchange process. These files must contain area number and name information. Participants may also wish to exchange data in other software formats to meet specific user requirements.
6. SCDWG submits data following the ERAG structure for Bus Number Ranges and Area Number. Refer to the current MMWG Procedure Manual for the current number range assignments.
7. If PCs are unable to fit their data in the allotted ERAG bus range, they should contact the SCDWG Chair and Vice Chair to be assigned additional bus numbers. The current list of additionally assigned bus numbers can be found on the SERC Portal on a file called "Additional Bus Assignments.pdf"

6.4 Non-SERC Equivalent Updates

Based on assignments, a representative of the SCDWG will serve as a liaison for obtaining equivalent data from neighboring non-SERC systems for use in annual short circuit equivalent updates. This process is particularly important to address non-SERC systems interconnected to more than one SERC system.

The short circuit equivalent guidelines outlined in Appendix A should be provided to each non-SERC system for which an equivalent model is requested. The review and update of appropriate interconnection data must be included as part of this data exchange. If possible, Tie Data Drawings for connections to non-SERC participants should be provided. In exchange for

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updated short circuit models, the SCDWG will provide its system representation(s) to non-SERC systems, as requested. If desired, a non-SERC member may provide a non-voting representative to the SCDWG to participate directly in the sharing of fault equivalents.

Short circuit representations of neighboring systems interconnected to a single SERC system will be the responsibility of that SERC system.

If a neighboring non-SERC system is unable to provide an updated short circuit equivalent representation of its system, the SERC participant assigned to that neighbor should provide the best available model of this non-SERC neighbor to address short circuit contributions in the compiled SERC model to be developed.

6.5 Master Tie Line Database

The SCDWG has developed a Master Tie Line Database in the form of an Excel spreadsheet to retain system interconnection data and to accommodate the reconnection of system ties in short circuit-modeling activities that are part of the SCDWG processes. This self-contained database includes user instructions for data input and maintenance and is used to produce PSS/E-ready data files required to complete short circuit model construction.

SCDWG participants are responsible for insuring that the information retained in this database is accurate for the models being constructed. A review and update of this database is included as part of the SCDWG’s annual model building process.

6.6 Model Building Data Exchange

The SCDWG meets annually to complete an exchange of short circuit models and to validate the accuracy of these models. By compiling updated short circuit data from each participant into a single model, a coordinated data exchange can be simultaneously completed among all the SERC member systems.

The ERAG MMWG currently uses Siemens Power Technologies’ PSS/E software for power flow and dynamic modeling of the Bulk Electric System. Data is routinely exchanged in formats developed for PSS/E, and, in general, other software tools can use this format. The SCDWG has developed processes for exchanging short circuit data that utilize the existing commonality of PSS/E among the participating systems.

Short circuit models are to be exchanged in PSS/E format (.raw and .seq files). Participants may also wish to exchange data in other software formats to meet specific user requirements. If possible, the SCDWG will utilize the version of PSS/E adopted by the LTSG in conjunction with power flow base case development activities of the SERC Data Bank Update.

Short circuit model data from each SCDWG participant, and those of neighboring non-SERC systems, are merged through available PSS/E functions. Information extracted from the SCDWG Master Tie Line Database is then used to re-establish ties between participating systems that were removed during the model building process. Once validation tests of the compiled models are performed, the completed SERC short circuit models will be released to each participant in PSS/E format (.raw and .seq). Each SCDWG participant may then perform

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additional reductions of the updated SERC model to meet their own specific internal requirements.

7.0 Revision History

Revision	Date	Originator	Comments
0	February 28, 2008		General revision to the existing SCDWG Procedure Manual to reformat as a SERC document. Working Group name changed to SCDWG.
1	RSSC: August 4, 2010 EC: TBD		<p>Correct error in Appendix B – SCDWG Rotation Schedule.</p> <p>Instead of the Chair, make the Vice Chair responsible for preparing the final fault equivalent cases from the data provided by SERC and non-SERC members.</p> <p>Include pre-annual SCDWG meeting deadlines for providing the Vice Chair updated Tie Facility Drawings, Tie Facility Spreadsheets, and two-breaker deep fault equivalents.</p> <p>Add the requirement for the Vice Chair to complete final two-breaker deep fault cases no later than two months after the last day of the annual SCDWG meeting.</p> <p>Make the annual SCDWG meeting mandatory during the third full week of October.</p> <p>Drop the number of required fault equivalent cases from three to two.</p> <p>Require all data discrepancies be resolved by SCDWG members no later than one month after the last day of the annual SCDWG meeting.</p> <p>Require each member to provide fault current comparisons between retained buses from the two-breaker deep fault cases and the full fault cases with all ties open.</p>

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Revision	Date	Originator	Comments
2	March 14, 2012		Added section II.B, administrative procedure for SCDWG Roster Changes, revised approval period.
3	October 17, 2013		Revisions made to allow full fault current model in addition to two breaker deep model. Updated Appendix A (Scope Document) and Appendix B (Rotation Schedule). Updated to latest SERC Document template.
4	November 5, 2015	Joel Mathewson	Reviewed and updated for consistency
5	November 17, 2016	Matthew Gant	Revision was made to section 6.3 to include item #14, SCDWG submits data following the Eastern Interconnection Reliability Assessment Group (ERAG) structure for Bus Number Ranges, Area Number and Name, and Zone Number. Refer to the current MMWG Procedure Manual for the current number range assignments.
6	June 30, 2017	SCDWG Task Force	Due to 2017 ERAG data request (MOD-032 R4), SCDWG participants will submit full detailed models which include all Bulk Electric System (BES) elements, rather than equivalent models.
7		Dave Krueger	Updated for Committee Restructure and modified 6.3.7 to reference a new document, instead of keeping extra bus assignments within the procedure

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Appendix A Guidelines for Developing Short Circuit Equivalent

The following guidelines are to aid non SERC-participants in developing short circuit equivalent models:

1. Each system equivalent is to incorporate two-breaker deep buses from the point of interconnection with neighboring utility systems with the following guidelines:
 - A. Any buses with sources between the breakered buses and the point of interconnection are to be retained as real buses during the equivalencing process. Such examples may include generation on the tie line or any zero sequence (e.g., auto with tertiary) sources as real in the model.
 - B. Any in-feed sources, such as three terminal lines, should be considered real.
 - C. Neighboring utilities may request special consideration to keep real any zero-sequence source or generator that is connected to the second bus.
 - D. Concerned entities will arrive at agreeable methods to handle Independent Power Producer (IPP) facilities (or other model details) that should be retained between utilities in all models.
2. In instances where the equivalent must be produced manually or a software constraint exists, a threshold transfer impedance cutoff of no less than 30 per unit may be used as the criterion to retain the transfer impedance. It is optional to discard transfer impedances greater than or equal to 30 per unit.
3. All internal lines that are connected to any of the two-breaker deep buses being retained must be explicitly retained in the equivalent to satisfy the needs of relay issues.
4. Explicitly retain those facilities pertaining to line impedance (and mutual coupling, as needed), generation, zero sequence sources, and radial tapped lines of significant impact whereby the apparent impedance seen at either breaker terminal is greater than the impedance of the line installed between the point of interconnection and the second level of retained buses.
5. The mutual coupling impedances and their respective voltages shall be specified in the Master Tie Line Database and should be held real.
6. Mutual coupling shall be retained for parallel lines if one is more than 10 percent of the length of the shortest parallel line. If a member considers that mutual coupling is significant based on internal needs, it may request neighboring systems to provide this data in short circuit equivalent models.
7. If a tie line is mutually coupled with an internal line, the internal line must be held real in the equivalent regardless of its depth into the system.

Fault current comparisons shall be provided for buses retained in the two-breaker deep equivalents and the full fault equivalents with all ties open.

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