# ERCOT ROS System Protection Working Group (SPWG) Procedures

1. Scope

The System Protection Working Group (SPWG) is responsible to review and coordinate protective relay scheme design/performance standards and practices which may bear on the reliability of the ERCOT interconnection in compliance with applicable ERCOT and NERC Operating Guides and other appropriate engineering criteria. The SPWG is responsible to support the investigation, analysis, evaluation, and documentation of ERCOT system disturbance events in close cooperation with the other working groups as well as ERCOT. The SPWG is responsible to consider reliability as its prime objective with consideration given to economics or other factors as appropriate. ERCOT is responsible for collecting data updates and maintaining the ERCOT short circuit databases.

2. Administrative Procedures

Membership consists of representatives appointed by the Reliability and Operations Subcommittee (ROS). Special projects may necessitate the SPWG Chair to obtain ROS approval for additional representation on an ad hoc basis.

The ROS Chair, with ROS approval, appoints the SPWG Chair and Vice-Chair.

When consensus cannot be achieved on an issue, it is presented to the ROS for disposition.

Meetings of the SPWG are scheduled by the chair as necessary to discharge its responsibilities. Meetings are typically held in February, July, and November.

To facilitate keeping the ROS informed with regard to activities of the SPWG, a copy of all official correspondence (from Chair and his designates) shall be sent to the ROS Chair in the same manner as other ERCOT working group work. Each SPWG Member shall keep his ROS member informed of his activities.

The responsibilities of the SPWG Chair include:

a. Attend ROS meetings representing SPWG. (Present information in written form)
b. Preside at SPWG meetings.
c. Make arrangements with sponsoring utility for SPWG meeting.
d. Notify members of upcoming SPWG meeting date, information needed, and

matters to be discussed.

e. Develop agenda for SPWG meeting. (Action items from ROS)
f. Contact ERCOT regarding distribution of NERC System Disturbances (DAWG) Report. (August or early September)
g. Take minutes at SPWG meetings (includes mailing draft and final copy to members).
h. Contact ERCOT regarding dates for short circuit data submittal.
i. Coordinate short circuit database between SPWG members and ERCOT.
j. Coordinate with the Steady State Working Group Chair to insure consistency between the short circuit and load flow cases.
k. Notify members of dates short circuit data is due.
l. Maintain SPWG Mailing and Phone List.

Responsibilities g – l above may be delegated to the SPWG Vice-Chair.

3. Sharing System Protection Information

The membership should share system protection information, including but not limited to protection philosophies, design practices, and operating experience. This sharing of information may address:

a. One-line diagrams / relay functional diagrams
b. Control and relay schematic diagrams
c. Relay installation and checkout procedures
d. Relay maintenance
e. Relay test facilities / equipment information
f. Relay settings
g. Changes in system protection schemes
h. Tie line protection coordination
i. Fault recorders and applications
j. Relay communications
k. Under frequency tripping
l. Co-generation – utility interface
m. Functional testing
n. System disturbance

4. Procedure for the Short Circuit Database

This data shall be maintained by ERCOT Transmission Services. The transmission and generation systems of each equipment owner in ERCOT shall be represented completely for the subject year, or in not less detail than in the corresponding ERCOT base load flow. To the extent practicable, bus numbers and names shall match the names and bus

numbers of corresponding buses in the load flow cases. Additional bus numbers used in the short circuit case shall not conflict with bus numbers used in the load flow case. In case that it becomes necessary to limit the number of buses or lines of any area, the allotment of maximum number of elements shall be agreed to by the working group as a group. Positive sequence impedance of circuit elements shall be the same in both the load flow and short circuit databases.

Minimum short circuit data applying to the near future, and therefore being principally useful for the purposes of protective relaying, shall consist of positive and zero sequence systems at predicted conditions for the summer peak of the current year and the following four years. Generating sources shall include those units on line in the summer peak of each year. Zero sequence data shall include mutual impedance of multi-circuit lines and of adjacent circuits on the same right-of-way, unless the representative of the area who is in charge of preparation of the data considers such impedance to be insignificant in studies made from this data.

Updating of the new data may either proceed on the basis of revision of existing data or by preparing complete new data sets, at the option of the individual area representatives. The previous year's data may be re-used if there are no changes.

All data required for setting up the new current year case shall be submitted to ERCOT not later than the second week of January, based on a Steady State Working Group (SSWG) base case completion date of August 1 of the previous year. ERCOT shall assume responsibility for the collection and coordination of data, and distribution of results for the current year. The representative for each individual area shall notify ERCOT if there are no changes to the previous year's data by the first week of February. Completion of the revision and distribution of the new data in final form shall be scheduled not later than March 15 of the year of the revision. The January deadline for providing data to ERCOT is intended to allow time for distribution of initial runs to working group members for review and corrections or additional revisions, if necessary, prior to the final processing. The initial runs shall include a listing of data differences between the previous year corresponding case and the proposed current year case. The initial runs shall also include a comparison of three-phase and ground fault currents at all generating plant transmission busses and all tie busses between areas. Any interim short circuit data (i.e. review and correction passes) as well as the final data shall be posted by ERCOT at a publicly available internet site.

All data required for setting up the future years 1 through 4 cases shall be submitted to ERCOT not later than April 15, based on a SSWG base case completion date of December 1 of the previous year. ERCOT shall assume responsibility for the collection and coordination of data, and distribution of results for the future year cases. The representative for each individual area shall notify ERCOT if there are no changes to the

data for the future year cases by the first week of May.

Completion of the revision and distribution of the new data in final form shall be scheduled not later than June 15. The April 15 deadline for providing data to ERCOT is intended to allow time for distribution of initial runs to working group members for review and corrections or additional revisions, if necessary, prior to the final processing. Any interim short circuit data (i.e. review and correction passes) as well as the final data shall be posted by ERCOT at a publicly available internet site. Fault studies on an ERCOT basis for short-range applications will not be regularly scheduled. Nevertheless, if the SPWG or the ROS feels at any time that such studies should be made to determine voltage and current conditions at critical points, the question shall be in order for discussion, and if approved by the ROS and the TAC, such studies may be included in the work of the SPWG.

In general, however, each individual member of ERCOT shall be responsible for conducting studies it considers necessary, utilizing the available ERCOT data.

5. Procedure for the Special Protection Systems Database

A database of the Special Protection Systems (SPS) installed in ERCOT shall be maintained in accordance with ERCOT and NERC requirements. The database shall consist of a file for each SPS. The documentation contained in each of these files shall include details of the design, operation, functional testing, and coordination of the SPS with other protection and control systems. The file shall also contain the results and dates of reviews. The file shall also contain documentation and analysis of SPS operations, mis-operations, and failures.

ERCOT shall conduct a review of any proposed or modified SPS prior to the SPS being placed in service. The SPWG shall support ERCOT by providing the technical assistance required for these reviews. Any interim as well as the final reviews shall be posted by ERCOT at a publicly available internet site.

ERCOT shall conduct a periodic review of all existing SPS at least every five years and at other times if system changes dictate that it is necessary. The SPWG shall support ERCOT by providing the technical assistance required for these reviews. Any interim as well as the final reviews shall be posted by ERCOT at a publicly available internet site.

6. Procedures for the Review of System Disturbance Reports

NERC DAWG Report

The SPWG shall review the annual System Disturbances report published by the North

American Electric Reliability Council (NERC). Each of the major disturbances described in the report shall be reviewed by the members of the SPWG from a design perspective to identify any lessons that can be learned.

To accomplish this, a copy of the System Disturbances report, which is published in June each year, should be obtained by the SPWG Chair and distributed to each SPWG Member by October 1.

ERCOT Disturbance Report

The SPWG should also review the reported ERCOT disturbances. Each SPWG Member should report disturbances on their system that meet the ERCOT SPWG Disturbance Analysis Criteria (See Appendix A.)

The disturbances shall be discussed at the first meeting following distribution of the NERC System Disturbances Report, and a list should be made of all items to be included in a summary report. A summary report should be prepared that highlights items that merit design review by the individual ERCOT member companies. A copy of this report shall be presented to ROS.

345 kV System Disturbance Database

All data collected between October 1 of the previous year through September 30 of the current year shall be submitted to ERCOT not later than October 31 of each year.

The 345 kV System Disturbance database shall be used to evaluate the accuracy of the SPWG maintained current year short circuit case. This short circuit case evaluation shall be performed annually. This evaluation shall be completed by the November meeting of the SPWG. Any discrepancies or deficiencies in the short circuit case identified during this evaluation shall be corrected before the next year short circuit case update.

7. Procedures for the Review of Relay Mis-operation Reports

The Relay Mis-operation Report shall be submitted to ERCOT not later than June 1 each year. The report shall be in an acceptable electronic file format. The report shall include all mis-operations occurring at 100 kV and above. In the SPWG's regular July meetings, the SPWG shall review the Relay Mis-operation Reports of equipment owners for analysis of PRS performance and compliance in accordance with the ERCOT Operating Guides.

8. Procedures for the Review of Fault Recording Equipment

Fault recorder locations and data requirements shall be reviewed by the SPWG for adequacy and compliance with ERCOT Operating Guides, "Disturbance Monitoring Requirements," when significant changes are made to the transmission system. A complete review shall be conducted at least every five years, beginning in the summer of 1999.

9. Procedures for the Review and Maintenance of Operating Guide Requirements on Disturbance Monitoring and System Protection

The SPWG shall be responsible for the review and maintenance of ERCOT Operating Guide requirements on disturbance monitoring and system protection. Revisions to the Operating Guides shall be presented to the ROS for approval in accordance with ERCOT "Process for Revising and Approving ERCOT Guides". As a minimum, the review of this guide shall be done on an annual basis during the November SPWG meeting.

# APPENDIX A

03/11/97

**ERCOT RELIABILITY & OPERATIONS SUBCOMMITTEE**
**SPWG**
**DISTURBANCE ANALYSIS CRITERIA**

The following are the reporting criteria for the ERCOT utilities to submit disturbances for review by utilities' SPWG member. These criteria are derived from and are less severe than the DOE/NERC reporting requirements. By studying the smaller disturbances, perhaps ERCOT can prevent larger disturbances from occurring. Underlined portions have changed from the DOE/NERC requirements, using the same format.

A. Loss of Firm System Loads

1.1. Any load shedding actions resulting in the reduction of over 50 megawatts (MW) of firm customer load for reasons of maintaining the continuity of the bulk electric power supply system.

1.2. Equipment failure/system operational actions which result in the loss of firm system loads for a period in excess of 7 minutes, as described below:

1.2.1. Reports from entities with a previous year recorded peak load of over 3,000 MW are required for all such losses of firm load which total over 150 MW.

1.2.2. Reports from all other entities are required for all such losses of firm loads which total over 100 MW or 25% of the total customers being supplied immediately prior to the incident, whichever is less.

1.3. Other events or occurrences which result in a continuous interruption for three hours or longer to over 25,000 customers, or more than 25% of the system load being served immediately prior to the interruption, whichever is less.

B. Voltage Reduction or Public Appeals – No Report Required

C. Vulnerabilities That Could Impact Bulk Electric Power System Adequacy or Reliability

1.1 It includes any actual or suspected act of sabotage (not vandalism) or terrorism.

D. Reports for Other Emergency Conditions or Abnormal Events

1.1 It includes any actual or projected deterioration in bulk power supply adequacy and reliability caused by natural disaster, failure of a large generator or transformer, federal or state actions with impacts on the bulk electric power system.

E. Fuel Supply Emergencies

1.1 It includes any actual or anticipated fuel supply emergency situation. It also includes any failures or manufacturer problems in the fuel supply.

F. General Events of Interest – Including but not limited to:

1.1 Transmission equipment sustained forced outages; for example: transformer, breaker, surge arrester failure, communications system.

1.2 Multiple transmission circuit and/or multiple generator trips at the same time period.

1.3 Unusual watt/var/voltage swings or system disturbances with no breaker operations.