



Reliability Coordinator Area System Operating Limit Methodology

Revision 1.0

MAINTAINED BY
SPP Operations Staff

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REVISIONS

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TABLE OF CONTENTS

1.1 Methodology for the Determination of Operating Horizon SOLs.....3

1.2 SOL Provisions5

1.3 System Modeling and Contingency Definition.....6

1.1 Methodology for the Determination of Operating Horizon SOLs

SPP's Methodology designates System Operating Limits (SOLs) in the Operating Horizon to consist of defined Flowgate limits, limits defined in operating guides, and limits designated by agreement between the RC and TOP to prevent other reliability concerns such as instability. SPP respects all BES Facility Ratings in both Real-Time Assessments and through Operational Planning Analysis. SPP primarily controls the BES using both permanent and temporary Flowgates per defined congestion management processes. SPP also controls the BES using coordinated operating plans or operator actions in specific situations in the absence of a Flowgate. During the time a Flowgate or an operating guide is being created, SPP shall issue Operating Instructions to implement manual actions as deemed necessary by the Reliability Coordinator to control the BES and operate within SOLs.

- 1) TOPs shall develop, at minimum, SOLs that respect all BES Facility Ratings in coordination with the SPP RC. In addition, SOLs may be developed based on other operating criteria.
- 2) SOLs shall not exceed Facility Ratings. SOLs equal applicable Facility Ratings unless additional studies have established a lower limit based on other operational issues such as transient, dynamic and voltage stability, etc. The Facility Ratings used in the Operating Horizon or Real-Time Horizon may be higher or lower than the Facility Ratings used in the Planning Horizon. All Facility Ratings shall be calculated in accordance with the appropriate Transmission Owner's Facility Rating methodology. Ratings that have been adjusted must be coordinated so that the impacted operating entities are aware of the duration that the adjusted rating may be used.
- 3) Including anticipated system topology, generation dispatch, and load levels, SOLs shall be determined per this SOL methodology and based on results of system studies as described below.
- 4) Pre-contingency and first contingency studies will be conducted to identify potential SOL exceedances for current and next day.
- 5) Voltage stability and angular stability issues are studied as deemed necessary by operator and engineer experience and engineering judgment to identify stability SOLs.
- 6) As deemed necessary by study results, an operating guide to aid operators in mitigating potential SOL exceedances may be produced. These guides may be temporary or

permanent, depending whether the potential SOL exceedance is due to a short-term outage, seasonal loading issues, etc. At a minimum, this operating guide will include:

- a. Statement of type(s) of potential SOL exceedances revealed by study (voltage/thermal/stability)
 - b. Applicable dates
 - c. Available/recommended mitigation methods, including generation redispatch (maximum MW and/or minimum Mvar generation), transmission reconfiguration, reclosing reconfiguration, load shedding, and Transmission Loading Relief (TLR).
- 7) Identified SOLs are screened to compile a list of potential IROLs per the following criteria:
- a. Potential IROLs will be investigated when a contingency analysis highlights a thermal overload in excess of 120% of the SOL of the monitored Facility.
 - b. Potential IROLs will also be investigated when a contingency analysis highlights an under-voltage condition characterized by bus voltages of less than 90% across three or more BES Facilities. The potential IROL condition will be reviewed further by evaluating the system response to the loss of the Facility with the SOL expected to be exceeded. The original potential IROL condition will be assumed to be a confirmed IROL condition if the evaluation reveals that the ensuing loss of the Facility with the SOL exceedance results in another BES Facility being overloaded to greater than 120% of its SOL or three or more additional BES Facilities with bus voltages in the area experiencing projected post-contingency voltages less than 90% of nominal voltage, unless there are studies or system knowledge that the SOL is not an IROL.
- 8) The IROL TV is 30 minutes unless studies dictate a shorter time.
- 9) Remedial Action Schemes (RAS's) are allowed to prevent prolonged undervoltage and to preserve system voltage and machine stability.

1.2 SOL Provisions

- 1) In the pre-contingency state, the BES shall demonstrate transient, dynamic, and voltage stability; all Facilities shall be within their Facility Ratings and within their thermal, voltage, and stability limits. In determining SOLs, the BES condition used shall reflect future system conditions with all Facilities operated in their normal operating condition.
- 2) Following single contingencies as defined in (a), (b), and (c) below, the system shall demonstrate transient, dynamic, and voltage stability; all Facilities shall be operating within their Facility Ratings and within their thermal, voltage, and stability limits; and Cascading Outages or uncontrolled separation shall not occur.
 - a. Single-line-to-ground or three-phase fault (whichever is more severe), with normal clearing, on any faulted generator, line, transformer, or shunt device.
 - b. Loss of any generator, line, transformer, or shunt device without a Fault.
 - c. Single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system.
- 3) In determining the system's response to a single Contingency starting with all Facilities operated in their normal operating condition, the following shall be acceptable:
 - a. Planned or controlled interruption of electric supply to radial customers or some local network customers connected to or supplied by the Faulted Facility or by the affected area. System reconfiguration should be implemented to minimize the interruption of electric supply to the extent possible.
 - b. System reconfiguration through manual or automatic control or protection actions.
- 4) To prepare for the next Contingency, system adjustments may be made, including changes to generation, uses of the transmission system, and the transmission system topology.
- 5) Starting with all Facilities operated in their normal operating condition and following any of the multiple contingencies identified in Reliability Standard TPL-001 the system shall demonstrate transient, dynamic and voltage stability; all Facilities shall be operating within their Facility ratings and within their thermal, voltage and stability limits; and Cascading or uncontrolled separation shall not occur.
- 6) In determining the applicable multiple contingencies identified by the Planning Coordinator, in addition to the actions identified in 3(a) and 3(b) above, the following shall be acceptable:

- a. Planned or controlled interruption of electric supply to customers (load shedding) the planned removal from service of certain generators, and/or curtailment of contracted firm electric power transfers. System reconfiguration should be implemented to minimize the interruption of electric supply to the extent possible.

1.3 System Modeling and Contingency Definition

- 1) All offline models shall be based on a coordinated model of the Eastern Interconnect and any necessary Facilities in other Interconnections. The model shall include all Transmission Operator (TOP) Areas within the SPP RC footprint as well as Facilities in adjacent TOP Areas that have been determined to have impact on the SPP RC footprint.
- 2) The model shall include all non-radial Facilities within the BES. Loads served over radial lines may be modeled as aggregate at the delivery bus. Distribution capacitors can be modeled as aggregate at a load bus.
- 3) The online model used by the SPP EMS application is constructed from data in the offline model (PSS/E).
- 4) At a minimum the contingency list used in the operating horizon shall include all non-radial BES transmission lines and transformers and all generators rated 150MW and above. Additional contingencies will be included as provided by other applicable registered entities.