Definitions of Terms Used in Standard

This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.

Cascading Outages: The uncontrolled successive loss of Bulk Electric System Facilities triggered by an incident (or condition) at any location resulting in the interruption of electric service that cannot be restrained from spreading beyond a pre-determined area.

Delayed Fault Clearing: Fault clearing consistent with correct operation of a breaker failure protection system and its associated breakers, or of a backup protection system with an intentional time delay.

Interconnection Reliability Operating Limit (IROL): A System Operating Limit that, if violated, could lead to instability, uncontrolled separation, or Cascading Outages that adversely impact the reliability of the Bulk Electric System.

Interconnection Reliability Operating Limit T_v (IROL T_v): The maximum time that an Interconnection Reliability Operating Limit can be violated before the risk to the interconnection or other Reliability Coordinator Area(s) becomes greater than acceptable. Each Interconnection Reliability Operating Limit's T_v shall be less than or equal to 30 minutes.

Normal Clearing: A protection system operates as designed and the fault is cleared in the time normally expected with proper functioning of the installed protection systems.

A. Introduction

1. **Title:** **System Operating Limits Methodology**

2. **Number:** FAC-010-1

3. **Purpose:** To ensure that System Operating Limits (SOLs) used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

4. **Applicability**

   4.1. Reliability Coordinator

   4.1. Planning Authority

5. **Proposed Effective Date:** Six months after BOT adoption.

B. Requirements

R1. The Reliability Coordinator shall have a documented methodology for use in developing SOLs (SOL Methodology) within its Reliability Coordinator Area. This SOL Methodology shall:

R1.1. Be applicable for developing SOLs used in the operations horizon.

R1.2. State that SOLs shall not exceed associated Facility Ratings.

R1.3. Include a description of how to identify the subset of SOLs that qualify as IROLs.

R1. The Planning Authority shall have a documented SOL Methodology for use in developing SOLs within its Planning Authority Area. This SOL Methodology shall:

R1.1. Be applicable for developing SOLs used in the planning horizon.

R1.2. State that SOLs shall not exceed associated Facility Ratings.

R1.3. Include a description of how to identify the subset of SOLs that qualify as IROLs.

R3. The Reliability Coordinator and Planning Authority shall, by mutual agreement[1], identify and document in their respective SOL Methodologies the planning and operating time horizons addressed in one another's SOL Methodologies.

R3.1. The combined horizons shall cover real-time through the end of the planning horizon.

R2. The Reliability Coordinator's SOL Methodology and the Planning Authority's SOL Methodology shall each include a requirement that SOLs provide BES performance consistent with the following:

R2.1. 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 the determination of SOLs, the BES condition used shall reflect current or expected system conditions and shall reflect changes to system topology such as Facility outages.

R2.2. Following the single Contingencies[2] identified in FAC-010 Requirement 42.2.1 through Requirement 42.2.3, the system shall demonstrate transient, dynamic and

[1] If mutual agreement cannot be reached, the planning horizon shall be one year and beyond and the operating horizon shall be real-time up to one year.

[2] The Contingencies identified in FAC-010 R42.2.1 through R4R2.2.3 are the minimum contingencies that must be studied but are not necessarily the only Contingencies that should be studied.

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.

R2.2.1. Single line to ground or three-phase Fault (whichever is more severe), with Normal Clearing, on any Faulted generator, line, transformer, or shunt device.

R2.2.2. Loss of any generator, line, transformer, or shunt device without a Fault.

R2.2.3. Single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system.

R2.3. Starting with all Facilities in service, ~~In determining~~ the system's response to a single Contingency, may include any of the following: ~~shall be acceptable:~~

R2.3.1. 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.

R2.3.2. System reconfiguration through automatic control or other pre-established methods.

~~**R4.2.2.** Interruption of other network customers, only if the system has already been adjusted, or is being adjusted, following at least one prior outage[3], or, if the real-time operating conditions are more adverse than anticipated in the corresponding studies, e.g., load greater than studied.~~

~~**R4.2.3.** System reconfiguration through manual or automatic control or protection actions.~~

R2.3.3. 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.

R2.4. Starting with all facilities in service, the system's response to one of the multiple Contingencies identified in Reliability Standard TPL-003, the system shall demonstrate 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.

R2.5. In determining the system's response to a multiple Contingency, in addition to the actions identified in R2.3.1 and R2.3.2, the following shall be acceptable:

R2.5.1. Planned or controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power Transfers

~~**R4.3.** Following a Regional Reliability Organization identified credible multiple Contingency, the system shall meet criteria established by the Region for that Contingency.~~

[3] An intact system must be able to supply all network customers other than those identified in FAC-010 Requirement 4.3.1 after any single Contingency identified in FAC-010 R4.2. Thus, interruption of such network customers as a response to any single Contingency is not acceptable for a SOL, as developed by a Reliability Coordinator for a system intact condition in the operating horizon or a SOL, as developed by a Planning Authority, for a system intact condition in the planning horizon.

R5.R3. The Reliability Coordinator's methodology and the Planning Authority's methodology for determining SOLs, shall include, as a minimum, a description of the following, along with any reliability margins applied for each:

R5.1.R3.1. Area of study (must include at least the entire Reliability Coordinator Area as well as the critical modeling details from other Reliability Coordinator Areas that would impact the Facility or Facilities under study).

R5.2.R3.2. Selection of applicable Contingencies

R5.3.R3.3. Level of detail of system models used to determine SOLs

R5.4.R3.4. Allowed uses of Special Protection Systems or Remedial Action Plans

R5.5.R3.5. Anticipated transmission system configuration, generation dispatch and Load level

R5.6.R3.6. Criteria for determining when violating a SOL qualifies as an Interconnection Reliability Operating Limit (IROL) and criteria for developing any associated IROL T_v.

R6. The Reliability Coordinator shall issue its SOL Methodology and any changes to that methodology, to all of the following:

R6.1. Each adjacent Reliability Coordinator and each Reliability Coordinator that indicated it has a reliability-related need for the methodology.

R6.2. Each Planning Authority and Transmission Planner that models any portion of the Reliability Coordinator's Reliability Coordinator Area.

R6.3. Each Transmission Operator that operates in the Reliability Coordinator Area.

R7.R4. The Planning Authority shall issue its SOL Methodology, and any change to that methodology, to all of the following prior to the effectiveness of the change:

R7.1.R4.1. Each adjacent Planning Authority and each Planning Authority that indicated it has a reliability-related need for the methodology.

R7.2.R4.2. Each Reliability Coordinator and Transmission Operator that operates any portion of the Planning Authority's Planning Authority Area.

R7.3.R4.3. Each Transmission Planner that works in the Planning Authority's Planning Authority Area.

R8. The Reliability Coordinator and Planning Authority shall each issue its SOL Methodology and any changes to that methodology to required entities prior to the effectiveness of the change.

R9.R5. If a recipient of the SOL Methodology provides documented technical comments on the methodology, the Reliability Coordinator or Planning Authority shall provide a documented response to that recipient within 45 calendar days of receipt of those comments. The response shall indicate whether a change will be made to the SOL Methodology and, if no change will be made to that SOL Methodology, the reason why.

C. Measures

M1. The Reliability Coordinator and the Planning Authority's SOL Methodology shall each include a statement that Facility Ratings shall not be exceeded and shall address all of the items listed in FAC-010address all of the items listed in Requirement 3 1 through Requirement 53.

~~M2.~~ ~~The Reliability Coordinator shall have evidence it issued its SOL Methodology, and any changes to that methodology, including the date they were issued, in accordance with FAC-010 Requirement 6.~~

M2. The Planning Authority shall have evidence it issued its SOL Methodology and any changes to that methodology, including the date they were issued, in accordance with ~~FAC-010~~ Requirement ~~7~~4.

M3. If the recipient of the SOL Methodology provides documented comments on its technical review of that SOL methodology, the ~~Reliability Coordinator or~~ Planning Authority that distributed that SOL Methodology shall have evidence that it provided a written response to that commenter within 45 calendar days of receipt of those comments~~. The response shall indicate whether a change will be made to the SOL Methodology and, if no change will be made to that SOL Methodology, the reason why.~~ In accordance with Requirement 5.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Reliability Organization

1.2. Compliance Monitoring Period and Reset Time Frame

Each Planning Authority ~~and Reliability Coordinator~~ shall self-certify its compliance to the Compliance Monitor at least once every three years. New Planning Authorities ~~and Reliability Authorities~~ shall ~~each~~ demonstrate compliance through an on-site audit conducted by the Compliance Monitor within the first year that it commences operation. The Compliance Monitor shall also conduct an on-site audit once every nine years and an investigation upon complaint to assess performance.

The Performance-Reset Period shall be twelve months from the last non-compliance.

1.3. Data Retention

The Planning Authority ~~and Reliability Coordinator~~ shall each keep all superseded portions to its SOL Methodology for 12 months beyond the date of the change in that methodology and shall keep all documented comments on its SOL Methodology and associated responses for three years. In addition, entities found non-compliant shall keep information related to the non-compliance until found compliant.

The Compliance Monitor shall keep the last audit and all subsequent compliance records.

1.4. Additional Compliance Information

The Planning Authority ~~and Reliability Coordinator~~ shall ~~each~~ make the following available for inspection during an on-site audit by the Compliance Monitor or within 15 business days of a request as part of an investigation upon complaint:

1.4.1 SOL Methodology.

1.4.2 Documented comments provided by a recipient of the SOL Methodology on its technical review of a SOL Methodology, and the associated responses.

1.4.3 Superseded portions of its SOL Methodology that had been made within the past 12 months.

1.4.4 Evidence that the SOL Methodology and any changes to the methodology that occurred within the past 12 months were issued to all required entities.

2. Levels of Non-Compliance (Does not apply to the Western Interconnection)

2.1. Level 1: There shall be a level one non-compliance if either of the following conditions exists:

2.1.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded.

2.1.2 No evidence of responses to a recipient's comments on the SOL Methodology.

2.2. Level 2: The SOL Methodology did not include a requirement to address all of the elements in ~~FAC-010-~~R~~4~~2.

2.3. Level 3: There shall be a level three non-compliance if either of the following conditions exists:

2.3.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded **and** the methodology did not include a requirement for evaluation of system response to one of the three types of single Contingencies identified in ~~FAC-010-~~R~~4~~2.2.

2.3.2 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded **and** the methodology did not address two of the six required topics in ~~FAC-010-~~R~~5~~3.

2.4. Level 4: The SOL Methodology was not issued to all required entities in accordance with ~~FAC-010-~~R~~4~~6 ~~and R7~~.

3. Levels of Non-Compliance for Western Interconnection:

3.1. Level 1: There shall be a level one non-compliance if either of the following conditions exists:

3.1.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded.

3.1.2 No evidence of responses to a recipient's comments on the SOL Methodology.

3.2. Level 2: The SOL Methodology did not include a requirement to address all of the elements in ~~FAC-010-~~R~~4~~2.1 ~~and FAC-010~~through R2.3 and E1.

3.3. Level 3: There shall be a level three non-compliance if any of the following conditions exists:

3.3.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not include evaluation of system response to one of the three types of single Contingencies identified in ~~FAC-010-~~R4.2.

3.3.2 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not include evaluation of system response to two of the seven types of multiple Contingencies identified in ~~FAC-010-~~E1.1.

3.3.3 The System Operating Limits Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not address two of the six required topics in ~~FAC-010-~~R5.

3.4. Level 4: The SOL Methodology was not issued to all required entities in accordance with R4.

E. Regional Differences

1. The following Interconnection-wide Regional Difference shall be applicable in the Western Interconnection:

1.1. As governed by the requirements of ~~FAC-010,~~ R~~4.5~~ 2.4 and R2.5, starting with all Facilities in service, shall require the evaluation of the following multiple Facility Contingencies when establishing SOLs:

1.1.1 Simultaneous permanent phase to ground Faults on different phases of each of two adjacent transmission circuits on a multiple circuit tower, with Normal Clearing. If multiple circuit towers are used only for station entrance and exit purposes, and if they do not exceed five towers at each station, then this condition is an acceptable risk and therefore can be excluded.

1.1.2 A permanent phase to ground Fault on any generator, transmission circuit, transformer, or bus section with Delayed Fault Clearing except for bus sectionalizing breakers or bus-tie breakers addressed in ~~FAC-010~~ E1.1.7

1.1.3 Simultaneous permanent loss of both poles of a direct current bipolar Facility without an alternating current Fault.

1.1.4 The failure of a circuit breaker associated with a Special Protection System to operate when required following: the loss of any element without a Fault; or a permanent phase to ground Fault, with Normal Clearing, on any transmission circuit, transformer or bus section.

1.1.5 A non-three phase Fault with Normal Clearing on common mode Contingency of two adjacent circuits on separate towers unless the event frequency is determined to be less than one in thirty years.

1.1.6 A common mode outage of two generating units connected to the same switchyard, not otherwise addressed by FAC-~~008~~010.

1.1.7 The loss of multiple bus sections as a result of failure or delayed clearing of a bus tie or bus sectionalizing breaker to clear a permanent Phase to Ground Fault.

1.2. SOLs shall be established such that for multiple Facility Contingencies in ~~FAC-010~~ E1.1.1 through ~~FAC-010~~ E1.1.5 operation within the SOL shall provide system performance consistent with the following:

1.2.1 All Facilities are operating within their applicable Post-Contingency thermal, frequency and voltage limits.

1.2.2 Cascading Outages do not occur.

1.2.3 Uncontrolled separation of the system does not occur.

1.2.4 The system demonstrates transient, dynamic and voltage stability.

1.2.5 Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted firm (non-recallable reserved) electric power transfers may be necessary to maintain the overall security of the interconnected transmission systems.

1.2.6 Interruption of firm transfer, Load or system reconfiguration is permitted through manual or automatic control or protection actions.

1.2.7 To prepare for the next Contingency, system adjustments are permitted, including changes to generation, Load and the transmission system topology when determining limits.

1.3. SOLs shall be established such that for multiple Facility Contingencies in ~~FAC-010~~ E1.1.6 through ~~FAC-010~~ E1.1.7 operation within the SOL shall provide system performance consistent with the following with respect to impacts on other systems:

1.3.1 Cascading Outages do not occur.

1.4. The Western Interconnection may make changes (performance category adjustments) to the Contingencies required to be studied and/or the required responses to Contingencies for specific facilities based on actual system performance and robust design. Such changes will apply in determining SOLs.

Version History

Version	Date	Action	Change Tracking

Definitions of Terms Used in Standard

This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.

~~**Cascading Outages:** The uncontrolled successive loss of Bulk Electric System Facilities triggered by an incident (or condition) at any location resulting in the interruption of electric service that cannot be restrained from spreading beyond a pre-determined area.~~

~~**Delayed Fault Clearing:** Fault clearing consistent with correct operation of a breaker failure protection system and its associated breakers, or of a backup protection system with an intentional time delay.~~

~~**Interconnection Reliability Operating Limit (IROL):** A System Operating Limit that, if violated, could lead to instability, uncontrolled separation, or Cascading Outages that adversely impact the reliability of the Bulk Electric System.~~

~~**Interconnection Reliability Operating Limit T_v (IROL T_v):** The maximum time that an Interconnection Reliability Operating Limit can be violated before the risk to the interconnection or other Reliability Coordinator Area(s) becomes greater than acceptable. Each Interconnection Reliability Operating Limit's T_v shall be less than or equal to 30 minutes.~~

~~**Normal Clearing:** A protection system operates as designed and the fault is cleared in the time normally expected with proper functioning of the installed protection systems.~~

None introduced in this standard.

A. Introduction

1. Title: **System Operating Limits Methodology**

2. Number: FAC-0110-1

3. Purpose: To ensure that System Operating Limits (SOLs) used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

4. Applicability

4.1. Reliability Coordinator

4.2. Planning Authority

5. Proposed Effective Date: Six Nine months after BOT adoption.

B. Requirements

R1. The Reliability Coordinator shall have a documented methodology for use in developing SOLs (SOL Methodology) within its Reliability Coordinator Area. This SOL Methodology shall:

R1.1. Be applicable for developing SOLs used in the operations horizon.

R1.2. State that SOLs shall not exceed associated Facility Ratings.

R1.3. Include a description of how to identify the subset of SOLs that qualify as IROLs.

R2. The Planning Authority shall have a documented SOL Methodology for use in developing SOLs within its Planning Authority Area. This SOL Methodology shall:

R2.1. Be applicable for developing SOLs used in the planning horizon.

R2.2. State that SOLs shall not exceed associated Facility Ratings.

R2.3. Include a description of how to identify the subset of SOLs that qualify as IROLs.

R3. The Reliability Coordinator and Planning Authority shall, by mutual agreement[1], identify and document in their respective SOL Methodologies the planning and operating time horizons addressed in one another's SOL Methodologies.

R3.1. The combined horizons shall cover real-time through the end of the planning horizon.

R2. The Reliability Coordinator's SOL Methodology and the Planning Authority's SOL Methodology shall each include a requirement that SOLs provide BES performance consistent with the following:

R2.1. 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 the determination of SOLs, the BES condition used shall reflect current or expected system conditions and shall reflect changes to system topology such as Facility outages.

R2.2. Following the single Contingencies[2] identified in FAC-010 Requirement 42.2.1 through Requirement 42.2.3, the system shall demonstrate transient, dynamic and

[1] If mutual agreement cannot be reached, the planning horizon shall be one year and beyond and the operating horizon shall be real-time up to one year.

[2] The Contingencies identified in FAC-010 R4R2.2.1 through R4R2.2.3 are the minimum contingencies that must be studied but are not necessarily the only Contingencies that should be studied.

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.

R2.2.1. Single line to ground or 3-phase Fault (whichever is more severe), with Normal Clearing, on any Faulted generator, line, transformer, or shunt device.

R2.2.2. Loss of any generator, line, transformer, or shunt device without a Fault.

R2.2.3. Single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system.

R2.3. In determining the system's response to a single Contingency, the following shall be acceptable:

R2.3.1. 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.

R2.3.2. Interruption of other network customers, only if the system has already been adjusted, or is being adjusted, following at least one prior outage[3], or, if the real-time operating conditions are more adverse than anticipated in the corresponding studies, e.g., load greater than studied.

R2.3.3. System reconfiguration through manual or automatic control or protection actions.

R2.4. 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.

~~**R4.5.** Following a Regional Reliability Organization identified credible multiple Contingency, the system shall meet criteria established by the Region for that Contingency.~~

R3. The Reliability Coordinator's methodology ~~and the Planning Authority's methodology~~ for determining SOLs, shall include, as a minimum, a description of the following, along with any reliability margins applied for each:

R3.1. Area of study (must include at least the entire Reliability Coordinator Area as well as the critical modeling details from other Reliability Coordinator Areas that would impact the Facility or Facilities under study.)

R3.2. Selection of applicable Contingencies

R3.3. A process for determining which of the stability limits associated with the list of multiple contingencies (provided by the Planning Authority in accordance with FAC-014 Requirement 6) are applicable for real-time use given the real-time system conditions. The process shall address recalculating these stability limits and expanding this list of stability limits and the list of stability-related multiple contingencies.

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[3] ~~An intact system must be able to supply all network customers other than those identified in FAC-010 Requirement 4.3.1 after any single Contingency identified in FAC-010 R4.2. Thus, interruption of such network customers as a response to any single Contingency is not acceptable for a SOL, as developed by a Reliability Coordinator for a system intact condition in the operating horizon or a SOL, as developed by a Planning Authority, for a system intact condition in the planning horizon.~~

R3.3.R3.4. Level of detail of system models used to determine SOLs

R3.4.R3.5. Allowed uses of Special Protection Systems or Remedial Action Plans

R3.5.R3.6. Anticipated transmission system configuration, generation dispatch and Load level

R3.6.R3.7. Criteria for determining when violating a SOL qualifies as an Interconnection Reliability Operating Limit (IROL) and criteria for developing any associated IROL T_V.

R4. The Reliability Coordinator shall issue its SOL Methodology and any changes to that methodology, prior to the effectiveness of the Methodology or of a change to the Methodology, to all of the following:

R4.1. Each adjacent Reliability Coordinator and each Reliability Coordinator that indicated it has a reliability-related need for the methodology.

R4.2. Each Planning Authority and Transmission Planner that models any portion of the Reliability Coordinator's Reliability Coordinator Area.

R4.3. Each Transmission Operator that operates in the Reliability Coordinator Area.

R7. The Planning Authority shall issue its SOL Methodology, and any change to that methodology, to all of the following:

R7.1. Each adjacent Planning Authority and each Planning Authority that indicated it has a reliability-related need for the methodology.

R7.2. Each Reliability Coordinator and Transmission Operator that operates any portion of the Planning Authority's Planning Authority Area.

R7.3. Each Transmission Planner that works in the Planning Authority's Planning Authority Area.

R8. The Reliability Coordinator and Planning Authority shall each issue its SOL Methodology and any changes to that methodology to required entities prior to the effectiveness of the change.

R7.R5. If a recipient of the SOL Methodology provides documented technical comments on the methodology, the Reliability Coordinator or Planning Authority shall provide a documented response to that recipient within 45 calendar days of receipt of those comments. The response shall indicate whether a change will be made to the SOL Methodology and, if no change will be made to that SOL Methodology, the reason why.

C. Measures

M1. The Reliability Coordinator and the Planning Authority's SOL Methodology shall each include a statement that Facility Ratings shall not be exceeded and shall address all of the items listed in FAC-010 Requirement 3-1 through Requirement 53.

M2. The Reliability Coordinator shall have evidence it issued its SOL Methodology, and any changes to that methodology, including the date they were issued, in accordance with FAC-010 Requirement 64.

M3. The Planning Authority shall have evidence it issued its SOL Methodology and any changes to that methodology, including the date they were issued, in accordance with FAC-010 Requirement 7.

M4.M3. If the recipient of the SOL Methodology provides documented comments on its technical review of that SOL methodology, the Reliability Coordinator or Planning

Authority that distributed that SOL Methodology shall have evidence that it provided a written response to that commenter within 45 calendar days of receipt of those comments . The response shall indicate whether a change will be made to the SOL Methodology and, if no change will be made to that SOL Methodology, the reason why.in accordance with Requirement 5

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Reliability Organization

1.2. Compliance Monitoring Period and Reset Time Frame

Each Planning Authority and Reliability Coordinator shall self-certify its compliance to the Compliance Monitor at least once every three years. New Planning Authorities and Reliability Authorities shall each demonstrate compliance through an on-site audit conducted by the Compliance Monitor within the first year that it commences operation. The Compliance Monitor shall also conduct an on-site audit once every nine years and an investigation upon complaint to assess performance.

The Performance-Reset Period shall be twelve months from the last non-compliance.

1.3. Data Retention

The Planning Authority and Reliability Coordinator shall each keep all superseded portions to its SOL Methodology for 12 months beyond the date of the change in that methodology and shall keep all documented comments on its SOL Methodology and associated responses for three years. In addition, entities found non-compliant shall keep information related to the non-compliance until found compliant.

The Compliance Monitor shall keep the last audit and all subsequent compliance records.

1.4. Additional Compliance Information

The Planning Authority and Reliability Coordinator shall each make the following available for inspection during an on-site audit by the Compliance Monitor or within 15 business days of a request as part of an investigation upon complaint:

1.4.1 SOL Methodology.

1.4.2 Documented comments provided by a recipient of the SOL Methodology on its technical review of a SOL Methodology, and the associated responses.

1.4.3 Superseded portions of its SOL Methodology that had been made within the past 12 months.

1.4.4 Evidence that the SOL Methodology and any changes to the methodology that occurred within the past 12 months were issued to all required entities.

2. Levels of Non-Compliance (Does not apply to the Western Interconnection)

2.1. Level 1: There shall be a level one non-compliance if either of the following conditions exists:

2.1.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded.

2.1.2 No evidence of responses to a recipient's comments on the SOL Methodology.

2.2. Level 2: The SOL Methodology did not include a requirement to address all of the elements in FAC-010 R43.

2.3. Level 3: There shall be a level three non-compliance if either of the following conditions exists:

2.3.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded **and** the methodology did not include a requirement for evaluation of system response to one of the three types of single Contingencies identified in FAC-010 R42.2.

2.3.2 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded **and** the methodology did not address two of the six seven required topics in FAC-010 R53.

2.4. Level 4: The SOL Methodology was not issued to all required entities in accordance with FAC-010 R6 and R74.

3. Levels of Non-Compliance for Western Interconnection:

3.1. Level 1: There shall be a level one non-compliance if either of the following conditions exists:

3.1.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded.

3.1.2 No evidence of responses to a recipient's comments on the SOL Methodology

3.2. Level 2: The SOL Methodology did not include a requirement to address all of the elements in R3.1, R3.2, R3.4 through R3.7 and FAC-010 R4 and FAC-010 E1.

3.3. Level 3: There shall be a level three non-compliance if any of the following conditions exists:

3.3.1 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not include evaluation of system response to one of the three types of single Contingencies identified in R2.2. FAC-010 R4.2.

3.3.2 The SOL Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not include evaluation of system response to two of the seven types of multiple Contingencies identified in FAC-010 E1.1.

3.3.3 The System Operating Limits Methodology did not include a statement indicating that Facility Ratings shall not be exceeded and the methodology did not address two of the six required topics in FAC-010 R3.1, R3.2, R3.4 through R3.7R5.

3.4. Level 4: The SOL Methodology was not issued to all required entities in accordance with R4.

E. Regional Differences

1. The following Interconnection-wide Regional Difference shall be applicable in the Western Interconnection:

1.1. As governed by the requirements of FAC-010, R3.3, starting with all Facilities in service, 4.5 shall require the evaluation of the following multiple Facility Contingencies when establishing SOLs:

1.1.1 Simultaneous permanent phase to ground Faults on different phases of each of two adjacent transmission circuits on a multiple circuit tower, with Normal Clearing. If multiple circuit towers are used only for station entrance and exit purposes, and if they do not exceed five towers at each station, then this condition is an acceptable risk and therefore can be excluded.

1.1.2 A permanent phase to ground Fault on any generator, transmission circuit, transformer, or bus section with Delayed Fault Clearing except for bus sectionalizing breakers or bus-tie breakers addressed in ~~FAC-010-~~E1.1.7

1.1.3 Simultaneous permanent loss of both poles of a direct current bipolar Facility without an alternating current Fault.

1.1.4 The failure of a circuit breaker associated with a Special Protection System to operate when required following: the loss of any element without a Fault; or a permanent phase to ground Fault, with Normal Clearing, on any transmission circuit, transformer or bus section.

1.1.5 A non-three phase Fault with Normal Clearing on common mode Contingency of two adjacent circuits on separate towers unless the event frequency is determined to be less than one in thirty years.

1.1.6 A common mode outage of two generating units connected to the same switchyard, not otherwise addressed by FAC-~~008~~011.

1.1.7 The loss of multiple bus sections as a result of failure or delayed clearing of a bus tie or bus sectionalizing breaker to clear a permanent Phase to Ground Fault.

1.2. SOLs shall be established such that for multiple Facility Contingencies in ~~FAC-010~~ E1.1.1 through ~~FAC-010-~~E1.1.5 operation within the SOL shall provide system performance consistent with the following:

1.2.1 All Facilities are operating within their applicable Post-Contingency thermal, frequency and voltage limits.

1.2.2 Cascading Outages do not occur.

1.2.3 Uncontrolled separation of the system does not occur.

1.2.4 The system demonstrates transient, dynamic and voltage stability.

1.2.5 Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted firm (non-recallable reserved) electric power transfers may be necessary to maintain the overall security of the interconnected transmission systems.

1.2.6 Interruption of firm transfer, Load or system reconfiguration is permitted through manual or automatic control or protection actions.

1.2.7 To prepare for the next Contingency, system adjustments are permitted, including changes to generation, Load and the transmission system topology when determining limits.

1.3. SOLs shall be established such that for multiple Facility Contingencies in ~~FAC-010~~ E1.1.6 through ~~FAC-010-~~E1.1.7 operation within the SOL shall provide system performance consistent with the following with respect to impacts on other systems:

1.3.1 Cascading Outages do not occur.

1.4. The Western Interconnection may make changes (performance category adjustments) to the Contingencies required to be studied and/or the required responses to Contingencies for specific facilities based on actual system performance and robust design. Such changes will apply in determining SOLs.

Version History

Version	Date	Action	Change Tracking

Definitions of Terms Used in Standard

This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the Glossary.

None introduced in this standard.

A. Introduction

1. **Title:** **Establish and Communicate System Operating Limits**

2. **Number:** FAC-~~011~~014-1

3. **Purpose:** To ensure that System Operating Limits (SOLs) used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies.

4. **Applicability**

   4.1. Reliability Coordinator

   4.2. Planning Authority

   4.3. Transmission Planner

   4.4. Transmission Operator

5. **Proposed Effective Date:** ~~Eight~~ Twelve months after BOT adoption.

B. Requirements

R1. The Reliability Coordinator shall ensure that SOLs, including Interconnection Reliability Operating Limits (IROLs), for its Reliability Coordinator Area are established and that the SOLs (including Interconnection Reliability Operating Limits) are consistent with its SOL Methodology.

R2. The Transmission Operator shall establish SOLs (as directed by its Reliability Coordinator) for its portion of the Reliability Coordinator Area that are consistent with its Reliability Coordinator's SOL Methodology.

R3. The Planning Authority shall establish SOLs, including IROLs, for its Planning Authority Area that are consistent with its SOL Methodology.

R4. The Transmission Planner shall establish SOLs, including IROLs, for its Transmission Planning Area that are consistent with its Planning Authority's SOL Methodology.

R5. The Reliability Coordinator, Planning Authority and Transmission Planner shall each provide its SOLs and IROLs to those entities that have a reliability-related need for those limits and provide a written request that includes a schedule for delivery of those limits as follows:

R5.1 The Reliability Coordinator shall provide its SOLs (including the subset of SOLs that are IROLs) to adjacent Reliability Coordinators and Reliability Coordinators who indicate a reliability-related need for those limits, and to the Transmission Operators, Transmission Planners, Transmission Service Providers and Planning Authorities within its Reliability Coordinator Area. For each IROL, the Reliability Coordinator shall provide the following supporting information:

R5.1.1 Identification and status of the associated Facility (or group of Facilities) that is (are) critical to the derivation of the IROL.

R5.1.2 The value of the IROL and its associated T_v.

R5.1.3 The associated Contingency(ies).

R5.1.4 The type of limitation represented by the IROL (e.g., voltage collapse, angular stability).

R5.2 The Transmission Operator shall provide any SOLs it developed to its Reliability Coordinator and to the Transmission Service Providers that share its portion of the Reliability Coordinator Area.

R5.3 The Planning Authority shall provide its SOLs (including the subset of SOLs that are IROLs) to adjacent Planning Authorities, and to Transmission Planners, Transmission Service Providers, Transmission Operators and Reliability Coordinators that work within its Planning Authority Area.

R5.4 The Transmission Planner shall provide its SOLs (including the subset of SOLs that are IROLs) to its Planning Authority, Reliability Coordinators, Transmission Operators, and Transmission Service Providers that work within its Transmission Planning Area and to adjacent Transmission Planners.

R6. The Planning Authority shall identify the subset of multiple contingencies from Reliability Standard TPL-003 which result in stability limits.

R4.1. The Planning Authority shall provide this list of multiple contingencies and the associated stability limits to the Reliability Coordinators that monitor the facilities associated with these contingencies and limits.

C. Measures

M1. The Reliability Coordinator, Planning Authority, Transmission Operator, and Transmission Planner shall each be able to demonstrate that it developed its SOLs (including the subset of SOLs that are IROLs) consistent with the applicable SOL Methodology in accordance with Requirements 1 through 4.

M2. The Reliability Coordinator, Planning Authority, Transmission Operator, and Transmission Planner shall each have evidence that its SOLs (including the subset of SOLs that are IROLs) were supplied in accordance with schedules supplied by the requestors of such SOLs as specified in Requirement 5.

M3. The Planning Authority shall have evidence it identified a list of multiple contingencies and their associated stability limits and provided the list and the limits to its Reliability Coordinators in accordance with Requirement 6.

D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Regional Reliability Organization

1.2. Compliance Monitoring Period and Reset Timeframe

The Reliability Coordinator, Planning Authority, Transmission Operator, and Transmission Planner shall each verify compliance through self-certification submitted to its Compliance Monitor annually. The Compliance Monitor may conduct a targeted audit once in each calendar year (January – December) and an investigation upon a complaint to assess performance.

The Performance-Reset Period shall be twelve months from the last finding of non-compliance.

1.3. Data Retention

The Reliability Coordinator, Planning Authority, Transmission Operator, and Transmission Planner shall each keep documentation for 12 months. In addition, entities found non-compliant shall keep information related to non-compliance until found compliant.

The Compliance Monitor shall keep the last audit and all subsequent compliance records.

1.4. Additional Compliance Information

The Reliability Coordinator, Planning Authority, Transmission Operator, and Transmission Planner shall each make the following available for inspection during a targeted audit by the Compliance Monitor or within 15 business days of a request as part of an investigation upon complaint:

1.4.1 SOL Methodology(ies)

1.4.2 SOLs, including the subset of SOLs that are IROLs and the IROL's supporting information

1.4.3 Evidence that SOLs were distributed

1.4.4 Distribution schedules provided by entities that requested SOLs

2. Levels of Non-Compliance

2.1. Level 1: Not applicable.

2.2. Level 2: Not all SOLs were provided in accordance with their respective schedules.

2.3. Level 3: SOLs provided were not developed consistent with the SOL Methodology.

2.4. Level 4: There shall be a level four non-compliance if either of the following conditions exist:

2.4.1 No SOLs were provided in accordance with their respective schedules.

2.4.2 No evidence the Planning Authority delivered a set of stability-related multiple contingencies and their associated limits to Reliability Coordinators in accordance with R6.

E. Regional Differences

None identified

Version History

Version	Date	Action	Change Tracking