# Mapping Document

## Project 2015-09 Establish and Communicate System Operating Limits

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
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| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| FAC-011-3, Requirement 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: | FAC-011-4, Requirement R1. Each Reliability Coordinator shall have a documented methodology for establishing SOLs (i.e., SOL methodology) within its Reliability Coordinator Area. | No change. |
| FAC-011-3, Requirement R1, R1.1. [This SOL methodology shall] Be applicable for developing SOLs used in the operations horizon. | This requirement was removed. | The stated purpose of FAC-011-4 is "To ensure that System Operating Limits (SOLs) used in the reliable operation of the Bulk Electric System (BES) are determined based on an established methodology or methodologies." The title of FAC-011-4 is "System Operating Limits Methodology for the Operations Horizon". Therefore, every requirement in FAC-011-4 is intended for developing SOLs used in the operations |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | | horizon. Accordingly, there is no reliability-related need to have a requirement specifying that the Reliability Coordinator's (RC's) SOL methodology is applicable for developing SOLs used in the operations horizon. |
| FAC-011-3, Requirement R1, R1.2.<br><br>[This SOL methodology shall] State that SOLs shall not exceed associated Facility Ratings. | This requirement is addressed in proposed FAC-011-4 Requirement R2 in conjunction with the definitions for Operational Planning Analysis and Real-time Assessment in the NERC Glossary of Terms.<br><br>FAC-011-4 Requirement R2: Each Reliability Coordinator shall include in its SOL methodology the method for Transmission Operators to determine which owner-provided Facility Ratings are to be used in operations such that the Transmission Operator and its Reliability Coordinator use common Facility Ratings.<br><br>Operational Planning Analysis is defined in the NERC Glossary of Terms as *"An evaluation of projected system conditions to assess anticipated (pre-Contingency) and potential (post-Contingency) conditions for* | Facility Ratings to be used in operations as SOLs is addressed through FAC-011-4, Requirement R2.<br><br>Facility Ratings that are determined per Requirement R2 are a required input for Operational Planning Analyses (OPA) and Real-time Assessments (RTA) per the definitions, and therefore address the analysis of system performance with respect to Facility Ratings. Facility Rating exceedances are determined through OPAs and RTAs. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | next-day operations. The evaluation shall reflect applicable inputs including, but not limited to, load forecasts; generation output levels; Interchange; known Protection System and Special Protection System status or degradation; Transmission outages; generator outages; Facility Ratings; and identified phase angle and equipment limitations. (Operational Planning Analysis may be provided through internal systems or through third-party services.)" <br><br> Real-time Assessment is defined in the NERC Glossary of Terms as "An evaluation of system conditions using Real-time data to assess existing (pre-Contingency) and potential (post-Contingency) operating conditions. The assessment shall reflect applicable inputs including, but not limited to: load, generation output levels, known Protection System and Special Protection System status or degradation, Transmission outages, generator outages, Interchange, Facility Ratings, and identified phase angle and equipment limitations. (Real-time Assessment may be provided through | |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | *internal systems or through third-party services.)"* | |
| FAC-011-3, Requirement R1, R1.3.<br><br>[This SOL methodology shall] Include a description of how to identify the subset of SOLs that qualify as IROLs. | FAC-011-4, Requirement R7 and Part 7.1.<br><br>R7. Each Reliability Coordinator shall include in its SOL methodology<br><br>7.1. A description of how to identify the subset of SOLs that qualify as Interconnection Reliability Operating Limits (IROLs). | The language from the approved standard was maintained in the proposed FAC-011-4. |
| FAC-011-3, Requirements R2, R2.1 and R2.2.<br><br>R2. The Reliability Coordinator's SOL methodology shall include a requirement that SOLs provide BES performance consistent with the following:<br><br>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 | 011-4, Requirement R6 and Parts 6.1, 6.2, 6.3, and 6.4.<br><br>R6. Each Reliability Coordinator shall include the following performance framework in its SOL methodology to determine SOL exceedances when performing Real-time monitoring, Real-time Assessments, and Operational Planning Analyses:<br><br>6.1. System performance for no Contingencies | The items in approved FAC-011-3, Requirement R2.1 and R2.2 are addressed through proposed FAC-011-4, Requirement R6 and its subparts as well as proposedTOP-001-5 R25 and IRO-008-3 R7.<br><br>While FAC-011-3 R2.1 focuses on pre-contingency BES performance for all three types of SOL (Facility Ratings, System Voltage Limits and stability limits) together, FAC-011-4 Requirement R6 Parts R6.1, 6.1.1, 6.1.2, 6.1.3 and 6.1.4 divide system performance requirements for the no contingency state (N-0) into each of the |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| conditions and shall reflect changes to system topology such as Facility outages.<br><br>R2.2. Following the single Contingencies identified in Requirement R2, R2.2.1 - R2.2.3, 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. | demonstrates the following:<br><br>6.1.1. Steady State flow through Facilities are within Normal Ratings; however, Emergency Ratings may be used only when System adjustments to return the flow within its Normal Rating can be executed and completed within the specified time duration of those Emergency Ratings.<br><br>6.1.2. Steady State voltages are within normal System Voltage Limits; however, emergency System Voltage Limits may be used only when | three categories (Facility Ratings, System Voltage Limits, and stability limits) into its own subpart for clarity. Cascading and uncontrolled separation were included in Part 6.1.4. The proposed language adds clarity by clearly identifying expectations relative to normal and emergency Facility Ratings and System Voltage Limits.<br><br>Similarly, FAC-011-3 Requirement R2.2 focuses on post-contingency BES performance for all three types of SOL (Facility Ratings, System Voltage Limits and stability limits) together, while FAC-011-4 Requirement R6 Parts 6.2, 6.2.1, 6.2.2, 6.2.3 and 6.2.4 divides system performance requirements for the evaluation of Contingencies against the pre-Contingency state for the anticipated post-Contingency state (N-1) or (N-x) into each of the three categories (Facility Ratings, System Voltage Limits, and stability limits) into its own subpart for clarity. Cascading and uncontrolled separation were included in |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | System adjustments to return the voltage within its normal System Voltage Limits can be executed and completed within the specified time duration of those emergency System Voltage Limits.<br><br>6.1.3. Predetermined stability limits are not exceeded.<br><br>6.1.4. Instability, Cascading or uncontrolled separation that adversely impact the reliability of the Bulk Electric System does not occur.<br><br>6.2. System performance for the single Contingencies listed in Part 5.1. | Part 6.2.4. The proposed language adds clarity by clearly identifying expectations relative to normal and emergency Facility Ratings and System Voltage Limits.<br><br>In a similar fashion, Part 6.3 identifies the minimum requirement for BES performance for those Contingencies identified in FAC-011-4 Requirement R5 Part 5.2 which is to demonstrate "that instability, Cascading, or uncontrolled separation that adversely impact the reliability of the Bulk Electric System does not occur."<br><br>FAC-011-4 Proposed Part 6.4 is meant to clearly identify that, in determining the System's response to any Contingency identified in Requirement R5, planned manual load shedding is an acceptable only after all other available System adjustments have been made.<br><br>TOP-001-5, Requirement R25 and IRO-008-3, Requirement R7 support FAC-011-4 Requirement R6 and its parts by requiring TOPs and RCs to determine SOL |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | demonstrates the following:<br><br>6.2.1. Steady State post-Contingency flow through Facilities within applicable Emergency Ratings. Flow through a Facility must not be above the Facility's highest Emergency Rating.<br><br>6.2.2. Steady State post-Contingency voltages are within emergency System Voltage Limits.<br><br>6.2.3. The stability performance criteria defined in Reliability Coordinator's SOL methodology are met.<br><br>6.2.4. Instability, Cascading or uncontrolled | exceedances in accordance with its RC's the SOL methodology. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | separation that adversely impact the reliability of the Bulk Electric System does not occur.<br><br>6.3. System Performance for applicable Contingencies identified in Part 5.2 demonstrates that instability, Cascading, or uncontrolled separation that adversely impact the reliability of the Bulk Electric System does not occur.<br><br>6.4 In determining the System's response to any Contingency identified in Requirement R5, planned manual load shedding is acceptable only after all other available System adjustments have been made. | |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | TOP-001-5, Requirement R25.<br><br>R25.  Each Transmission Operator shall use the applicable RC's SOL methodology when determining SOL exceedances for Real-time Assessments, Real-time Monitoring, and Operational Planning Analysis..<br><br>IRO-008-3, Requirement R7.<br><br>R7.      Each Reliability Coordinator shall use its SOL methodology when determining SOL exceedances for Real-time Assessments, Real-time Monitoring, and Operational Planning Analysis. | |
| FAC-011-3, Requirement R2, sub-requirements R2.2.1, R2.2.2, and R2.2.3<br><br>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. | FAC-011-4, Requirement R5, Part 5.1<br><br>5.1 Specify the following single Contingency events<br><br>5.1.1 Loss of any of the following either by single phase to ground or three phase Fault (whichever is more severe) with Normal Clearing, or without a Fault: | The requirements in approved FAC-011-3 were consolidated into a single requirement in proposed FAC-011-4 Requirement R5, Part 5.1.<br><br>FAC-011-4 Requirement R5, Part 5.1. is also referenced in FAC-011-4 Requirement R6, Part 6.2 for the system performance |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| R2.2.2. Loss of any generator, line, transformer, or shunt device without a Fault.<br><br>R2.2.3. Single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system. | • generator;<br>• transmission circuit;<br>• transformer;<br>• shunt device;<br>• single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system. | requirements for anticipated post-contingency state. |
| FAC-011-3, Requirement R2.3, sub-requirements R2.3.1, R2.3.2, R2.3.3, and Requirement R2.4.<br><br>R2.3 In determining the system's response to a single Contingency, the following shall be acceptable:<br><br>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.<br><br>R2.3.2. Interruption of other network customers, (a) only if the system has already been adjusted, or is being adjusted, following at least one prior outage, or (b) if the real- | The issues that pertain to the establishment of SOLs are addressed through FAC-011-4 Requirement R4 :<br><br>FAC-011-4 Requirement R4:   Each Reliability Coordinator shall include in its SOL methodology the method for determining the stability limits to be used in operations. The method shall:<br><br>4.1.    Specify stability performance criteria, including any margins applied. The criteria shall, at a minimum, include the following:<br><br>4.1.1.   steady-state voltage stability;<br><br>4.1.2.   transient voltage response;<br><br>4.1.3.   angular stability; and | The reliability issues denoted in FAC-011-3 Requirement R2.3, sub-requirements R2.3.1, R2.3.2, R2.3.3, and R2.4 represent a combination of issues that are relevant to the establishment of SOLs and those that are relevant to "how the system is to be operated."<br><br>Requirement R2, R2.3 describes an acceptable System response to single Contingencies. These requirements are sub-requirements of Requirement R2, which addresses the establishment of SOLs that "provide a certain level of BES performance". "BES performance" as stated in FAC-011-3, Requirement R2 is not determined through SOLs in and of themselves. SOLs are an input into OPAs |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| time operating conditions are more adverse than anticipated in the corresponding studies<br><br>R2.3.3. System reconfiguration through manual or automatic control or protection actions.<br><br>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. | 4.1.4.   System damping.<br><br>4.2.   Require that stability limits are established to meet the criteria specified in Part 4.1 for the Contingencies identified in Requirement R5 applicable to the establishment of stability limits that are expected to produce more severe System impacts on its portion of the BES.<br><br>4.3.   Describe how the Reliability Coordinator establishes stability limits when there is an impact to more than one Transmission Operator in its Reliability Coordinator Area or other Reliability Coordinator Areas.<br><br>4.4.   Describe how stability limits are determined, considering levels of transfers, Load and generation dispatch, and System conditions including any changes to System topology such as Facility outages;<br><br>4.5.   Describe the level of detail that is required for the study model(s), including the extent of the Reliability Coordinator Area, as well as the critical modeling details from other Reliability Coordinator Areas, | and RTAs. The OPA and RTA evaluation against those SOLs provide for reliable system performance by ensuring through these analyses/assessments that the system performs reliably in the pre- and post-Contingency states (i.e., that the system is within thermal (Facility Ratings), System Voltage Limits, and stability limits pre- and post-Contingency). Per the TOP and IRO standards, RTAs must be performed at least once every 30 minutes. Accordingly, each new operating state is "studied" at least once every 30 minutes. Additionally, per the TOP standards, SOL exceedance triggers the development and implementation of an Operating Plan to address that SOL exceedance.<br><br>Insofar as the issues in FAC-011-3, Requirement R2, R2.3 and R2.4 correlate to the establishment of SOLs, automatic control actions relevant to the establishment of stability limits are addressed in FAC-011-4 Requirement R4, Part 4.6 which requires the SOL methodology to describe the allowed uses |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | necessary to determine different types of stability limits. 4.6. Describe the allowed uses of Remedial Action Schemes and other automatic post-Contingency mitigation actions. 4.7 State that the use of underfrequency load shedding (UFLS) and Undervoltage Load Shedding Programs are not allowed in the establishment of stability limits. The issues that are more centric to "how the system is to be operated" are more appropriately addressed in the development and implementation of Operating Plans as denoted in the following standards:    1. <u>TOP-002-4, Requirement R2</u>: Each Transmission Operator shall have an Operating Plan(s) for next-day operations to address potential System Operating Limit (SOL) exceedances identified as a result of its Operational Planning Analysis as required in Requirement R1. | of Remedial Action Schemes (RAS) and other automatic post-Contingency mitigation actions as part of stability limit establishment. Accordingly, any RAS or automatic mitigation scheme (which includes those that interrupt customers or reconfigure the system) are required to be reflected in the establishment of stability limits per Requirement R4, Part 4.6. Furthermore, per Requirement R4, Part 4.4, stability limits are required to take into consideration the configuration of the system, which may include any necessary manual actions taken by the System Operator to configure the system in a manner that supports the use of a given stability limit. However, insofar as FAC-011-3, Requirement R2, R2.3 and R2.4 correlate to "how the system is to be operated", the operational decisions related to customer interruption and system reconfiguration are governed by the Operating Plan, if such actions are necessary to address SOL exceedance. The SDT has proposed |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | 2. <u>TOP-002-4, Requirement R3</u>: Each Transmission Operator shall notify entities identified in the Operating Plan(s) cited in Requirement R2 as to their role in those plan(s).<br><br>3. <u>TOP-002-4, Requirement R6</u>: Each Transmission Operator shall provide its Operating Plan(s) for next-day operations identified in Requirement R2 to its Reliability Coordinator.<br><br>4. <u>TOP-002-4, Requirement R14</u>: Each Transmission Operator shall initiate its Operating Plan to mitigate a SOL exceedance identified as part of its Real-time monitoring or Real-time Assessment.<br><br>5. <u>IRO-008-3, Requirement R2</u>: Each Reliability Coordinator shall have a coordinated Operating Plan(s) for next-day operations to address potential System Operating Limit (SOL) and Interconnection Reliability Operating Limit (IROL) exceedances identified as a result of its Operational Planning Analysis as | retaining the concept captured in FAC-011-3 Requirement R2.3.2 in proposed FAC-011-4 Requirement R6.4 albeit with improved language for clarity.  Rather than specifying the operating conditions where interruption of network customers is allowed, the SDT has clarified when planned manual load shedding is acceptable.  This recognizes that RTAs must be conducted every 30 minutes (i.e. system is constantly being evaluated and readjusted at least every 30 minutes) as well as incorporating the principle that load shed will be a measure of last resort as supported by FERC Orders (e.g. FERC Order 693 para 591.)  While a System Operator maintains authority to take whatever action is needed to ensure reliability, entities should not "plan" to shed load until all other system adjustments (e.g. generation commitment, generation redispatch, transmission system adjustments, interruptible loads, etc.) have been made.<br><br>Regarding FAC-011-3 Requirement R2.4, the need for making system adjustments to prepare for the next Contingency is |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | performed in Requirement R1 while considering the Operating Plans for the next-day provided by its Transmission Operators and Balancing Authorities.<br>6. <u>IRO-008-3, Requirement R3</u>: Each Reliability Coordinator shall notify impacted entities identified in its Operating Plan(s) cited in Requirement R2 as to their role in such plan(s).<br>7. <u>IRO-008-3, Requirement R5</u>: Each Reliability Coordinator shall notify, in accordance with its SOL methodology impacted Transmission Operators and Balancing Authorities within its Reliability Coordinator Area, and other impacted Reliability Coordinators as indicated in its Operating Plan, when the System Operating Limit (SOL) or Interconnection Reliability Operating Limit (IROL) exceedance identified in Requirement R5 has been prevented or mitigated. | standard operational practice and does not need to be specified or required by the Reliability standards. Any such actions related to the interruption of customers, reconfiguration of the system, or operational preparations for the next Contingency are expected to be included in an Operating Plan, if such actions are required by System Operators to address SOL exceedances.<br><br>In the current body of TOP and IRO reliability standards, the Operating Plan is the mechanism for addressing SOL exceedances. The mitigation actions that System Operators take to prevent or address SOL exceedances are expected to be contained within the Operating Plan. TOPs need to have the flexibility in their Operating Plan to address the wide-ranging operational issues they may encounter. There is no reliability need for reliability standards to provide such highly prescriptive requirements which specify how TOPs are to operate the system. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | The SDT has proposed retaining the concept captured in FAC-011-3 R2.3.2 in proposed FAC-011-4 R6.4 albeit with improved language for clarity.<br><br>FAC-011-4  Requirement R6. Each Reliability Coordinator shall include the following performance framework in its SOL methodology to determine SOL exceedances when performing Real-time monitoring, Real-time Assessments, and Operational Planning Analyses:<br><br>R6.4 In determining the System's response to any Contingency identified in Requirement R5, planned manual load shedding is acceptable only after all other available System adjustments have been made. | Because the development and implementation of Operating Plans is addressed in the current body of reliability standards and proposed FAC-011-4 Requirement 6.4, reliability is not compromised by the removal of FAC-011-3, Requirement R2, R2.3 and R2.4. |
| FAC-011-3, Requirement R3, R3.1<br><br>R3. The Reliability Coordinator's methodology for determining SOLs, shall include, as a minimum, a description of the following, | FAC-011-4, Requirement R4, Part 4.5<br><br>R4.      Each Reliability Coordinator shall include in its SOL methodology the method | FAC-011-3, Requirement R3, R3.1 and R3.4 both address the study model. These two requirements are addressed with the single requirement in proposed FAC-011-4, Requirement R4, Part 4.5. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| along with any reliability margins applied for each:<br><br>R3.1 Study model (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.) | for determining the stability limits to be used in operations. The method shall:<br><br>4.5. Describe the level of detail that is required for the study model(s), including the extent of the Reliability Coordinator Area, as well as the critical modeling details from other Reliability Coordinator Areas, necessary to determine different types of stability limits. | Facility Ratings are created and provided through FAC-008 and further examined through FAC-011-4, Requirement R2. System Voltage Limits are created per FAC-011-4, Requirement R3. Neither of these types of SOLs are necessarily a byproduct of a "study" or study model. As a result, no study model reference is needed in FAC-011-4 for Facility Ratings or System Voltage Limits.<br><br>However, for those RCs or TOPs that determine stability limits, a study model is needed to perform the "study". Therefore, the level of detail of the study model falls under the requirement associated with establishing stability limits (R4).<br><br>FAC-011-4, Requirement R4, Part 4.5 affords the RC with the flexibility to the extent of the modeling area (including other RC areas) that must be modeled to reflect the varying needs for different types of stability limits (e.g. local single unit stability up to wide-area or inter-area instability). Part 4.5 acknowledges that some types of localized |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | | stability issues do not require a model of the entire RC area to establish certain types of stability limits. |
| FAC-011-3, Requirement R3, R3.2<br><br>R3.2 [The RC's SOL methodology shall include] Selection of applicable Contingencies | FAC-011-4, Requirement R5<br><br>R5.      Each Reliability Coordinator shall identify in its SOL methodology the set of Contingency events for use in determining stability limits and the set of Contingency events for use in performing Operational Planning Analysis (OPAs) and Real-time Assessments (RTAs). The SOL methodology for each set shall:<br><br>5.1.      Specify the following single Contingency events5.1.1.      Loss of any of the following, either by single phase to ground or three phase Fault (whichever is more severe) with Normal Clearing, or without a Fault:<br><br>• generator;<br><br>• transmission circuit;<br><br>• transformer;<br><br>• shunt device; | All requirements regarding Contingencies are consolidated and addressed in proposed FAC-011-4, Requirement R5. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | • single pole block, with Normal Clearing, in a monopolar or bipolar high voltage direct current system.<br><br>5.2. Specify additional single or multiple Contingency events or types of Contingency events, if any.<br><br>5.3. Describe the method(s) for identifying which, if any, of the Contingency events provided by the Planning Coordinator in accordance with FAC-014-3, Requirement R7, to use in determining stability limits. | |
| FAC-011-3, Requirement R3, R3.3 and R3.3.1.<br><br>R3.3 [The RC's SOL methodology shall include] 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 use in the operating horizon given the actual or expected system conditions. | FAC-011-4, Requirement R5, Part 5.3<br><br>R5. Each Reliability Coordinator shall identify in its SOL methodology the set of Contingency events for use in determining stability limits and the set of Contingency events for use in performing Operational Planning Analysis (OPAs) and Real-time Assessments (RTAs). The SOL methodology shall: | FAC-011-4, Requirement R5, Part 5.3 and FAC-014-3 Requirement R7 address the reliability objective in FAC-011-3, Requirement R3, R3.3.1.<br><br>In FAC-014-3, Requirement R7, the Planning Coordinator is required to identify and annually communicate information for Corrective Action Plans developed to address any instability identified in its Planning Assessment of the Near-Term |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| R3.3.1. This process shall address the need to modify these limits, to modify the list of limits, and to modify the list of associated multiple contingencies. | 5.3.     Describe the method(s) for identifying which, if any, of the Contingency events provided by the Planning Coordinator in accordance with FAC-014-3, Requirement R7, to use in determining stability limits.<br><br><br>FAC-014-3 Requirement R7:<br><br>R7.   Each Reliability Coordinator shall include in its SOL methodology a risk-based approach for determining how SOL exceedances identified as part of Real-time monitoring and Real-time Assessments must be communicated and if so, the timeframe that communications must occur.  The approach shall include:<br><br>7.1.  A requirement that the following SOL exceedances will always be communicated, within a | Transmission Planning Horizon, to the RC and associated TOPs. Once the RC receives this information, the RC then applies the method required by FAC-011-4, Requirement R5, Part 5.3 for considering those Contingencies for use in determining stability limits.<br><br>These requirements collectively address the reliability objectives of FAC-011-3, Requirement R3, R3.1. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
|---|---|---|
| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | timeframe identified by the Reliability Coordinator.<br><br>7.1.1.     IROL exceedances;<br><br>7.1.2.     SOL exceedances of stability limits;<br><br>7.1.3.     Post-contingency SOL exceedances that are identified to have a validated risk of instability, Cascading Outages, and uncontrolled separation;<br><br>7.1.4.     Pre-contingency SOL exceedances of Facility Ratings; and<br><br>7.1.5.     Pre-contingency SOL exceedances of normal low System Voltage Limits. | |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
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| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | 7.2.     A requirement that the following SOL exceedances must be communicated, if not resolved within 30 minutes, within a timeframe identified by the Reliability Coordinator.<br><br>7.2.1.     Post-contingency SOL exceedances of Facility Ratings and emergency System Voltage limits, and<br><br>7.2.2.     Pre-contingency SOL exceedances of normal high System Voltage Limits. | |
| FAC-011-3, Requirement 3, R3.4.<br><br>R3.4 [The RC's SOL methodology shall include] Level of detail of system models used to determine SOLs. | FAC-011-4, Requirement R4, Part 4.5<br><br>R4.     Each Reliability Coordinator shall include in its SOL methodology the method for determining the stability limits to be used in operations. The method shall:<br><br>4.5.     Describe the level of detail that is required for the study model(s), including the extent of the Reliability Coordinator Area, as well as the critical modeling details | Reference the explanation provided for FAC-011-3, Requirement R3, R3.1. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
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| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| | from other Reliability Coordinator Areas, necessary to determine different types of stability limits. | |
| FAC-011-3, Requirement R3, R3.5.<br><br>R3.5 [The RC's SOL methodology shall include] Allowed uses of Remedial Action Schemes. | FAC-011-4, Requirement R4, Part 4.6 and Part 4.7<br><br>R4.    Each Reliability Coordinator shall include in its SOL methodology the method for determining the stability limits to be used in operations. The method shall:<br><br>4.6  Describe the allowed uses of Remedial Action Schemes and other automatic post-Contingency mitigation actions.<br><br><br>4.7  State that the use of underfrequency load shedding (UFLS) programs and Undervoltage Load Shedding (UVLS) Programs are not allowed in the establishment of stability limits. | FAC-011-3, Requirement R3, R3.5 was carried over into FAC-011-4, Requirement R4, Part 4.6. The requirement has been clarified by adding Part 4.7 which restricts the use of UFLS programs and UVLS Programs in the establishment of stability limits. |
| FAC-011-3, Requirement R3, R3.6.<br><br>R3.6 [The RC's SOL methodology shall include] Anticipated transmission system | FAC-011-4, Requirement R4, Part 4.4:<br><br>R4.    Each Reliability Coordinator shall include in its SOL methodology the method | The requirements in FAC-011-3, Requirement R3, R3.6 are addressed in proposed FAC-011-4, Requirement R4, Part 4.4. |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
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| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| configuration, generation dispatch and Load level | for determining the stability limits to be used in operations. The method shall:<br><br>4.4.　Describe how stability limits are determined, instability risks are identified, considering levels of transfers, Load and generation dispatch, and System conditions including any changes to System topology such as Facility outages;<br><br>TOP-002-4, Requirement R1: Each Transmission Operator shall have an Operational Planning Analysis that will allow it to assess whether its planned operations for the next day within its Transmission Operator Area will exceed any of its System Operating Limits (SOLs).<br><br>IRO-008-2, Requirement R1: Each Reliability Coordinator shall perform an Operational Planning Analysis that will allow it to assess whether the planned operations for the next-day will exceed System Operating Limits (SOLs) and Interconnection Operating Reliability Limits (IROLs) within its Wide Area. | Part 4.4 was included as a Part to Requirement R4 because the information is relevant to the establishment of stability limits. Facility Ratings are created and provided through FAC-008 and further examined through FAC-011-4, Requirement R2, and System Voltage Limits are created through FAC-011-4, Requirement R3. Neither of these types of SOLs are necessarily a byproduct of a "study" or study model that requires inclusion of the items in FAC-011-3, Requirement R3, R3.6.<br><br>Additionally, TOP-002-4, Requirement R1 and IRO-008-2, Requirement R1 require the TOP and the RC respectively to have/perform an OPA.<br><br>Per the definition of OPA, the OPA shall reflect applicable inputs which include the items required by FAC-011-3, Requirement R3, R3.6.<br><br>Accordingly, when stability limits include the information required in Requirement R4, and the TOPs and RCs perform their required OPAs, the information in FAC-011- |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
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| | Operational Planning Analysis is defined in the NERC Glossary of Terms as *"An evaluation of projected system conditions to assess anticipated (pre-Contingency) and potential (post-Contingency) conditions for next-day operations. The evaluation shall reflect applicable inputs including, but not limited to, load forecasts; generation output levels; Interchange; known Protection System and Special Protection System status or degradation; Transmission outages; generator outages; Facility Ratings; and identified phase angle and equipment limitations. (Operational Planning Analysis may be provided through internal systems or through third-party services.)"* | 3, Requirement R3, R3.6 is inherently addressed. |
| FAC-011-3, Requirement R3, R3.7.<br><br>R3.7 [The RC's SOL methodology shall include] Criteria for determining when violating a SOL qualifies as an Interconnection Reliability Operating Limit (IROL) and criteria for developing any associated IROL $T_v$. | FAC-011-4, Requirement R8, Part 8.2<br><br>R8.2 Criteria for determining when exceeding a SOL qualifies as exceeding an IROL and criteria for developing any associated IROL $T_v$. | The reliability objective of FAC-011-3, Requirement R3, R3.7 was carried over into FAC-011-4, Requirement R8, Part 8.2. |

## Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon

| Requirement in Approved Standard | Translation to New Standard or Other Action | Description and Change Justification |
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| FAC-011-3, Requirement R4 and Requirement R4.1:<br><br>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:<br><br>R4.1. Each adjacent Reliability Coordinator and each Reliability Coordinator that indicated it has a reliability-related need for the methodology. | FAC-011-4, Requirement R9, Parts 9.1, 9.2.1 and 9.2.4:<br><br>R9.     Each Reliability Coordinator shall provide its new or revised SOL methodology to:<br><br>9.1.     Each Reliability Coordinator that requests and indicates it has a reliability-related need within 30 days of a request<br><br>9.2. Each of the following entities prior to the effective date of the SOL methodology:<br><br>9.2.1.  Each adjacent Reliability Coordinator within an Interconnection<br><br>9.2.4.  Each Reliability Coordinator that has requested to receive updates and indicated it had a reliability-related need. | The reliability objective of FAC-011-3, Requirement R4 was carried over to FAC-011-4, Requirement R9, Parts 9.1, 9.2.1 and 9.2.4.<br><br>FAC-011-4 Requirement 9 was re-organized to address timely provisions of the RC's methodology to requesting RCs in Part 9.1 and to those entities that are directly impacted and therefore must be informed for any change, in Part 9.2.<br><br>Non-adjacent RCs, which are addressed in Parts 9.1 and 9.2.4., do not require communication of the SOL methodology prior to its effective date because these RCs are less likely to be directly impacted; however, provisions are made with Parts 9.1 and 9.2.4 for non-adjacent RCs to obtain the SOL methodology within 30 days of the request if they indicate a reliability-related need for it. 8 |
| FAC-011-3, Requirement R4, R4.2<br><br>R4.2 [communicate the SOL methodology to] Each Planning Authority and Transmission | FAC-011-4, Requirement R9, Part 9.2 and subpart 9.2.2. | The language was changed to better reflect the intent of the requirement. The requirement is intended to addresses PCs |

| Standard FAC-011-3 - System Operating Limits Methodology for the Operations Horizon | | |
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| **Requirement in Approved Standard** | **Translation to New Standard or Other Action** | **Description and Change Justification** |
| Planner that models any portion of the Reliability Coordinator's Reliability Coordinator Area. | R9.     Each Reliability Coordinator shall provide its SOL methodology to:<br><br>9.2.     Each of the following entities prior to the effective date of the SOL methodology:<br><br>9.2.2.   Each Planning Coordinator and Transmission Planner that is responsible for planning any portion of the Reliability Coordinator Area; | and TPs that are responsible for planning within the RC Area rather than just because it has a model for an RC Area. |
| FAC-011-3, Requirement R4, R4.3<br><br>R4.3 [communicate the SOL methodology to] Each Transmission Operator that operates in the Reliability Coordinator Area. | FAC-011-4, Requirement R9, Part 9.2 and subpart 9.2.3.<br><br>R9.     Each Reliability Coordinator shall provide its new or revised SOL methodology to:<br><br>9.2.     Each of the following entities  prior to the effective date of the SOL methodology:<br><br>9.2.3   Each Transmission Operator within its Reliability Coordinator Area. | The reliability objective of FAC-011-3, Requirement R4, R4.3 was carried over to FAC-011-4, Requirement R9, Part 9.2. and Subpart 9.2.3. |