NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Project 2015-09 Establish and Communicate System Operating Limits

SOL Standard Drafting Team
October 26, 2017

RELIABILITY | ACCOUNTABILITY




Administrative Items

- NERC Antitrust Guidelines
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- Notice of Open Meeting
  - Participants are reminded that this webinar is public. The access number was widely distributed. Speakers on the call should keep in mind that the listening audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.

Topics

- Topics
  - Concepts and Definitions
    - Vic Howell
      - Manager, Operations Engineering Support
        Peak Reliability
  - FAC-011-4 and FAC-014-3
    - Stephen Solis
      - System Operations Improvement Manager
        ERCOT
  - FAC-010-3 and FAC-015-1
    - Thomas Leslie
      - Principal Engineer
        Georgia Transmission Corporation

Currently-Effective FAC Standards

- FAC-010-3 requires the PC to have an SOL Methodology for establishing SOLs used in the planning horizon
- FAC-011-3 requires the RC to have an SOL Methodology for establishing SOLs used in the operations horizon
- FAC-014-2 requires:
  - The PC and the TP to establish SOLs consistent with its PC's SOL Methodology
  - The TOP to establish SOLs consistent with its RC's SOL Methodology

Project 2015-09 Objectives

- Address issues identified by the FAC Periodic Review Team
- Objectives outlined in the Standard Authorization Request (SAR):
  - Address issues with establishing and communicating System Operating Limits (SOLs) and Interconnection Reliability Operating Limits (IROLs)
  - Enhance consistency with Transmission Operations (TOP) and Interconnection Reliability Operations (IRO) standards
  - Retire planning horizon SOL requirements in FAC-010 and FAC-014 to eliminate overlap with TPL-001-4 requirements; enhance transfer of necessary reliability information from planning to operations

FERC Direction

- FERC Order No. 777:
  - *"As discussed below, we also direct NERC to develop a means to assure that IROLs are communicated to transmission owners." (p6)*
  - *"One way to achieve this objective...is to modify FAC-014 to require the provision of IROLs to transmission owners." (p41)*
- *FERC Order No. 817:*
  - "The Commission, therefore, sought comment on (1) identification of all regional differences or variances in the formulation of IROLs; (2) the potential reliability impacts of such differences or variations, and (3) the value of providing a uniform approach or methodology to defining and identifying IROLs."
  - "…Project 2015-09 standard drafting team will address the clarity and consistency of the requirements for establishing both SOLs and IROLs."

September 29th Posting

- 45-day posting for comment and ballot:
  - Revised FAC-011-4
  - Revised FAC-014-3
  - New FAC-015-1
  - Retirement of FAC-010-3
  - New definition of System Voltage Limit
  - Revised SAR to allow modification of standards to incorporate definitions
- 30-day posting for comment only
  - Revised definition of SOL
  - New definition of SOL Exceedance
- IROL-related standards unchanged
  - Future effort to address IROLs after Methods for Establishing IROLs Task Force (MEITF) work is completed

Background Information

- Project 2015-03 – Periodic Review of System Operating Limit Standards
  - July 2015: Periodic Review Team completed work
  - August 2015: SAR submitted to Standards Committee (SC)

Background Information

Project 2015-09 – Establish and Communicate System Operating Limits

- August 2015: SAR approved by SC and Project 2015-09 authorized to post SAR for informal comment
- December 2015-March 2016: SDT meetings
- May 4-6 2016: Technical conference
- July 2016: Posted draft FAC-011-4 and FAC-014-3 and definitions for informal comment
- August 2016-present: Standard drafting team (SDT) discussed comments, modified draft standards, discussed IROL topic at length (led to MEITF), addressed FAC-010 retirement, and created new FAC-015

The Holistic Approach

- SDT stepped back and looked at the big picture
  - What is the ultimate reliability objective?
  - Given the content of the latest standards, what is essential for the FAC standards? Which activities add real value to operations reliability? Which ones do not?
  - Where are the redundancies?
- Proposed standards and definitions examine and consider many issues:
  - Changes in the body of Reliability Standards
  - Evolution of technology and industry practices
  - Balancing specificity with flexibility
- Proposed standards and definitions integrate seamlessly with one another and with the latest body of standards

Overarching Context

- The following bullets establish the context for the proposed FAC standards and definitions:
  - Transmission Planners (TP) and Planning Coordinators (PC) are required to perform Planning Assessments in accordance with TPL-001-4
  - TPs, PCs, Transmission Operators (TOP), Balancing Authorities (BA), and Reliability Coordinators (RC) are required to address planned outages in accordance with IRO-017-1
  - TOPs and RC are required to perform Operational Planning Analyses (OPAs) and to develop and communicate Operating Plans for any SOL exceedances identified in those OPAs
  - TOPs and RCs are required to perform Real-time Assessments (RTAs) at least once every 30 minutes and are required to implement Operating Plans for any SOL exceedances identified in those RTAs
  - The definitions of OPA and RTA have been revised: assessment of pre- and post-Contingency states and required inputs

Overarching Principles

- How do SOLs and IROLs fit into the given context?
- Foundational principles:
  - We need to know the Facility Ratings, the voltage limits, and the stability limits that are used in operations – we need to know what and where they are
  - These three types of limits used in operations need to be established in accordance with a methodology
  - These three types of limits are inputs to OPAs and RTAs to determine whether or not the system performs acceptably in the pre-Contingency and post-Contingency states
  - The Operating Plan is the primary mechanism for providing acceptable system performance
  - It is important that there is continuity between planning and operations

What do we actually do?

- The proposed FAC standards and definitions are intended to reflect what we actually do, given the context and the foundational principles
- Without using terms like SOL and IROL, what do we actually do?
  - Planning Horizon and Operations Horizon activities
- We are all doing this today; however, the existing FAC standards and SOL definition:
  - Muddy the waters and create confusion – “having” an SOL vs “exceeding” an SOL
  - Intermingle operations concepts and limit establishment concepts
  - Imply that “SOL establishment” may be something other than what we already do today with regard to Facility Ratings, System Voltage Limits, and stability limits

Definitions

- Proposed definitions:
  - System Voltage Limit definition
  - Revised SOL definition
  - SOL Exceedance definition
- System Voltage Limit
  - *The maximum and minimum steady-state voltage limits (both normal and emergency) that provide for acceptable System performance*
    - Allows for flexibility
    - Does not include voltage deviation or transient voltage dip
    - To be incorporated into operations and planning standards

SOL and SOL Exceedance Definitions

- SOL
  - *Facility Ratings, System Voltage Limits, and stability limits used in the operation of the Bulk Electric System (BES)*
- SOL Exceedance
  - *An operating condition or analysis result characterized by any of the following, as determined in Real-time monitoring, Real-time Assessments (RTA) or Operational Planning Analysis (OPA):*
    - *The pre-Contingency state indicates any of the following:*
      - *Actual flow through a Facility is above the Facility's Normal Rating*
      - *Actual bus voltage is outside normal System Voltage Limits*
      - *A stability limit established to prevent instability without a Contingency is exceeded*
      - *A stability limit established to prevent the Contingency from resulting in instability is exceeded*

SOL and SOL Exceedance Definitions

- SOL Exceedance (continued)
  - *The calculated post-Contingency state indicates any of the following:*
    - *Flow through a Facility is above the Facility's highest Emergency Rating, or above a Facility Rating for which there is not sufficient time to reduce the flow to established acceptable levels should the Contingency occur*
    - *Bus voltage is outside the highest or lowest emergency System Voltage Limit, or outside a System Voltage Limit for which there is not sufficient time to bring the bus voltage to established acceptable levels should the Contingency occur*
    - *Defined stability performance criteria are not met*
- Definitions are intended to:
  - Clearly identify what an SOL is and what it means to exceed one
  - Better align with TPL, TOP, and IRO standards (the given context)
  - Provide improved clarity and reduced redundancy
  - Codify the concepts in the NERC SOL White Paper

SOL and SOL Exceedance Definitions

- Posted for comment only
- If the industry supports having a revised SOL definition and a new SOL Exceedance definition, the SDT will subsequently post for ballot
- It is critical to read the supporting documents to fully understand the rationales behind the definitions:
  - Definitions Rationale – provides the rationale for revising the SOL definition and for creating a new definition for SOL Exceedance
  - SOL Definition Impact Spreadsheet – identifies every occurrence of the SOL term in the body of standards and recommends changes, if any, including integration of the SOL Exceedance term

Conceptual Changes in FAC-011

- Focus on the establishment of:
  - Facility Ratings (Requirement R2)
  - System Voltage Limits (Requirement R3)
  - Stability performance criteria and limits (Requirement R4)
- Departure from currently-effective Requirement R2:
  - "The Reliability Coordinator's SOL Methodology shall include a requirement that SOLs provide BES performance consistent with the following…"
- SDT asserts that BES performance is not determined by SOLs in and of themselves, rather through OPAs and RTAs

Conceptual Changes in FAC-011

- Departure from the inclusion of "operating rules" in FAC standards
  - Currently effective FAC-011-3 Requirement R2.3 and subparts and R2.4 describe acceptable System response to single Contingencies:
    - 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..."
    - 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."
- The drafting team contends that TOPs need to have the flexibility in their Operating Plans
- Operating Plans address (as needed) the interruption of customers and preparation for the next Contingency

Revised FAC-011-4 Summary

- R1 – Requirement for RC to have a Methodology for establishing SOLs within its Reliability Coordinator Area
- Requirements for RC's SOL Methodology to include:
  - R2 – The method for TOP's to determine which owner-provided Facility Ratings to be used in operations
  - R3 – The method for TOP's to determine the System Voltage Limits to be used in operations
  - R4 – The method for determining stability limits to be used in operations
  - R5 – The method for identifying the single Contingencies and multiple Contingencies for use in determining stability limitations and performing OPAs and RTAs

Revised FAC-011-4 Summary

- Requirements for RC's SOL Methodology to address (continued):
  - R6 – The method for identifying IROLs – no change from current language
  - R7 – The method for TOPs to communicate SOLs it established to its RC(s), including periodicity
- R8 – addresses communication of SOL Methodology
- Please review:
  - The FAC-011-4 Rationales Document
  - The background section of the FAC-011-4 Comment Form
  - The FAC-011-3 Mapping Document

Revised FAC-014-3 Summary

- Applicable to TOPs and RCs
- R1 – Requirement for RCs to establish IROLs in accordance with its SOL Methodology
- R2 – Requirement for TOPs to establish SOLs in accordance with its RC's SOL Methodology
- R3 – Requirement for TOPs to provide SOLs to its RC in accordance with the RC's SOL Methodology
- R4 – Requirement for RCs to establish stability limits when the limit impacts more than one TOP in its Reliability Coordinator Area in accordance with its SOL Methodology

Revised FAC-014-3 Summary

- R5 – Requirement for the RC to communicate SOL and IROL information to other entities
- R6 – Requirement for the RC to provide Transmission Owners and Generation Owners the list of Facilities owned by that entity that are critical to the derivation of the IROL

FAC-010 and FAC-015

- SDT proposing a new construct to:
  - Minimize redundancy
  - Allow for better continuity between planning and operations
  - Improve the efficiency and effectiveness of the tasks performed by planners and operators to achieve the ultimate reliability objective of reliable system performance in operations
- The new construct involves the retirement of FAC-010-3 and the adoption of FAC-015-1
- SDT considerations:
  - Redundancies between FAC-010-3 and TPL-001-4
  - With the changes in TPL-001-4, the establishment of planning horizon SOLs is unnecessary and not useful for ensuring reliable planning or reliable operations

FAC-010 and FAC-015

- SDT considerations (continued):
  - Differences in RC's and PC's SOL Methodology could result in potential reliability gaps, thus there is a need for improved continuity between planning and operations
- Characteristics of the new construct
  - The terms "SOL" and "IROL" are only applicable to the operations horizon
  - Planners no longer have an obligation to have an SOL Methodology applicable for the planning horizon
  - Planners are no longer required to establish SOLs and IROLs for use in the planning horizon
  - Instead, planners would continue to perform Planning Assessments in accordance with TPL-001-4, and to work with operating entities per the proposed new standard FAC-015-1 to ensure continuity between planning and operations

Continuity Between Planning and Operations

- The Facility Ratings, System Voltage Limits, and stability performance criteria used in planning should be equally limiting or more limiting that those established in accordance with (or described in) the RC's SOL Methodology
- Adverse reliability consequences can arise if planners use less limiting Facility Ratings, System Voltage Limits, or stability performance criteria – the system may be unable to be operated as planned:
  - Example 1 – Facility X has an Emergency Rating of 100 MVA in operations and 120 MVA in planning (not resulting from an upgrade)
  - Example 2 – a 230kV bus has a low emergency System Voltage Limit of 0.92 p.u. in operations and 0.90 p.u. in planning
  - Example 3 – the allowable transient voltage dip is more restrictive in operations than it is in planning

FAC-015-1

- R1 – R3 requirement for PCs to implement a process to ensure that Facility Ratings (R1) System steady-state voltage limits (R2) and stability performance criteria (R3) are equally limiting or more limiting than those established in accordance with (or described in) the RC's SOL Methodology
  - Allows for exceptions, provided the PC provides a technical justification to its RC
- R1 (Facility Ratings) correlates to
  - MOD-032-1 R1. Each PC and each of its TPs shall jointly develop […] modeling data requirements […] for the PC's planning area…
  - TPL-001-4 R1. Each TP and PC shall maintain System models within its respective area for performing the studies needed to complete its Planning Assessment…

FAC-015-1

- R2 (System steady-state voltage limits) correlates to:
  - TPL-001-4 R5. Each TP and PC shall have criteria for acceptable System steady state voltage limits… and the transient voltage response for its System. For transient voltage response, the criteria shall at a minimum, specify a low voltage level and a maximum length of time that transient voltages may remain below that level.
- R3 (stability performance criteria) correlates to:
  - TPL-001-4 R5. Each TP and PC shall have criteria for […] the transient voltage response for its System. For transient voltage response, the criteria shall at a minimum, specify a low voltage level and a maximum length of time that transient voltages may remain below that level.
  - TPL-001-4 R6. Each TP and PC shall define and document, within their Planning Assessment, the criteria or methodology used in the analysis to identify System instability for conditions such as Cascading, voltage instability, or uncontrolled islanding.

FAC-015-1

- R4 – Requires the PC to provide the Facility Ratings, System steady-state voltage limits, and stability performance criteria for use in its Planning Assessment to its TPs
- R5 – Requires TPs to use Facility Ratings, System steady-state voltage limits, and stability performance criteria in its Planning Assessment that are equally limiting or more limiting than those provided by its PC
- R6 – Requires PCs to communicate any instability, Cascading or uncontrolled separation identified in either its Planning Assessment of the Near-Term Transmission Planning Horizon or its Transfer Capability assessment to each impacted RC and TOP
  - Subparts require communication of specific information

Supporting Documents

- FAC-011-4 and FAC-014-3
  - Rationale Document
  - Mapping Document
  - Background section of comment forms
- FAC-010-3 retirement and FAC-015-1
  - FAC-010-3 Mapping document
  - FAC-015-1 Rationale document
  - FAC-10/FAC-015 Rationale
  - Standards Impacted by Retirement of FAC-010-3
- Definitions
  - Definitions Rationale
  - SOL Definition Impact on Other Standards Spreadsheet
  - Background section of comment forms

Project Status

- Documents posted for 45-day comment period from 09/29/2017 – 11/13/2017
- Ballot pools for each ballot are being formed during the first 30 days of the comment period: 09/29/2017 – 10/30/2017
- Initial ballots end at **8 p.m. Eastern, Monday, November 13, 2017**
- 30-day informal comment period for SOL and SOL Exceedance definitions ends at **8 p.m. Eastern, Monday, October 30, 2017**
- Next SDT meeting at NERC Office – Atlanta GA
  - Dec 5-7, 2017
- More information is available on the project page

Questions and Answers