

# Rationales for FAC-010-3 (Retirement) and FAC-015-1

September 2017

## Background

The Facilities Design, Connections, and Maintenance (FAC) group of Reliability Standards provide for, among other things, the important reliability objective of establishing and communicating System Operating Limits (SOLs) and Interconnection Reliability Operating Limits (IROLs) that help ensure reliable operation of the Bulk Electric System (BES). Specifically, under currently-effective Reliability Standard FAC-010-3, each Planning Authority must have a documented methodology for establishing SOLs (including IROLs) used in the planning horizon. Currently-effective Reliability Standard FAC-011-3 requires each Reliability Coordinator (RC) to have a documented methodology for establishing SOLs (including IROLs) within its Reliability Coordinator Area for the operations horizon. Further, under currently-effective Reliability Standard FAC-014-2, Transmission Operators (TOPs) must establish and communicate SOLs consistent with the RC's methodology and RCs must determine and communicate which of those SOLs are deemed as IROLs. Likewise, FAC-014-2 requires Planning Coordinators (PCs) and Transmission Planners (TPs) to establish and communicate SOLs and IROLs used in the planning horizon consistent with the PC's SOL Methodology.

The FAC-010, FAC-011, and FAC-014 Reliability Standards, however, have remained essentially unchanged since they were initially developed and became effective in 2008. Since that time there have been many improvements to other mandatory NERC Reliability Standards that work in concert with those FAC Reliability Standards, namely, those in the Transmission Planning (TPL), Transmission Operations (TOP), and Interconnection Reliability Operations and Coordination (IRO) groups of Reliability Standards. Specifically, the retired versions TPL-001, 002, 003, and 004 Reliability standards have been replaced with currently-effective TPL-001-4, all of the TOP standards have been replaced with the currently-effective TOP-001-3, TOP-002-4, and TOP-003-3, and all of the IRO standards have been modified. The FAC Reliability Standards that address SOLs and IROLs are inextricably linked to many of these TPL, TOP, and IRO Reliability Standards, as they all address in some manner the foundational reliability concept of reliable system performance as it relates to SOLs and IROLs. While the changes to the TPL, TOP, and IRO standards have been significant and have evolved as industry practices and needs have changed, there have been no consequential substantive changes to the related FAC Reliability Standards. One of the primary objectives of Project 2015-09 is to make changes to the SOL/IROL-related FAC standards to create better alignment with the currently-effective TPL, TOP, and IRO Reliability Standards.

The Project 2015-09 standard drafting team (SDT) is proposing to make a significant improvement to the SOL/IROL-related FAC standards by minimizing redundancy, allowing for better continuity from the establishment to communication of SOLs, and improving the efficiency and effectiveness of the tasks performed by planners and operators to achieve the ultimate reliability objective of reliable system performance in operations. As discussed in this whitepaper, one of the fundamental changes proposed by

the SDT is to retire the FAC-010-3 Reliability Standard, eliminating the requirement for PCs to have a methodology for establishing SOLs for use in the planning horizon, as well as the corresponding requirements in the FAC-014 Reliability Standard related to the establishment and communication of planning horizon SOLs and IROLs. As discussed further below, the SDT concluded that, with the changes in TPL-001-4, the establishment of planning horizon SOLs were unnecessary and not useful for ensuring reliable planning or reliable operations. Rather, the SDT concluded, the reliability need was for the limits and criteria used in the TPL-001-4 Planning Assessments to be equally limiting or more limiting than those established in accordance with or identified within its RC's SOL Methodology. The SDT developed proposed FAC-015-1 to ensure the coordination of the limits and criteria used in the Planning Assessment with the RC's SOL Methodology.

Under the current construct, PCs and RCs may have significantly different SOL Methodologies as the currently-effective Reliability Standards (FAC-010-3, FAC-011-3 & FAC-014-2) do not have any link requiring coordination between the methodologies. Furthermore, the nature of the current construct does not address continuity between planning and operations and may potentially result in a system not adequately planned for operational needs. The SDT's proposed changes help address the potential for inconsistencies between the PC's SOL Methodology and the RC's SOL Methodology.

Additionally, because of the evolution of the TPL standards, there are many redundancies in the responsibilities for PCs and Transmission Planners (TPs) between those in FAC-010/FAC-014 and those in TPL-001-4. In fact, planners are under no obligation to use (and many do not use) the PC's SOL Methodology for their Planning Assessments. Under Reliability Standard TPL-001-4, the SOLs established for the planning horizon pursuant to the FAC-010 and FAC-014 Reliability Standards are not necessary for reliable planning.

The SDT's proposal addresses both of these issues by providing for better continuity between planning and operations and by eliminating any redundancies that exist. To accomplish these objectives, the SDT is proposing a new construct. Under the proposed construct, the terms "SOL" and "IROL" are only applicable to the operations horizon and, in turn, only the RC would have an obligation to develop an SOL Methodology. RCs and TOPs would continue to have the responsibility under the FAC-014 Reliability Standard for establishing SOLs and IROLs consistent with the RCs' SOL Methodology. Planners, however, would no longer have an obligation to have an SOL Methodology applicable for the planning horizon, nor would planners be 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 work with operating entities per the proposed new standard FAC-015-1 to ensure continuity between planning and operations. Specifically, under proposed FAC-015-1, planners are responsible for ensuring that the Facility Ratings, System (steady-state) voltage limits, and stability performance criteria used in their planning assessments for the Near-Term Transmission Planning Horizon are equally limiting or more limiting than the Facility Ratings, System Voltage Limits, and stability performance criteria as determined in accordance with the RC's SOL Methodology.

This whitepaper demonstrates that the proposed construct would improve reliability by eliminating redundancies and by providing better continuity between planning and operations. The primary principles of the proposed approach include:

- Clarifying that SOLs are established only for the *operations horizon*, which aligns with the “*Operating*” term in System “*Operating*” Limits. Additionally, IROLs are better identified by the RC in the operations time horizon.
- The existing FAC-010-3 and related requirements in FAC-014-2 are addressed by TPL-001-4 and proposed FAC-015-1 such that the retirement of FAC-010 and related requirements in FAC-014-2 would not create any reliability gaps.
- The addition of FAC-015-1 consolidates PC and TP requirements related to coordination of limits and criteria utilized in the planning horizon with those used in the operations horizon into one standard. This reduces the risk of multiple varying methodologies/processes, clarifies the usage of such limits and criteria (TPL-001-4, FAC-010-3, FAC-013-2) and eliminates any redundancy with such limits and criteria.
- Clarity and efficiency of communication of limits and criteria between planning and operating entities is improved with FAC-015-1.

## System Operating Limits in the Planning Horizon

There are two different time frames in which the system is analyzed to ensure reliable operation: the planning horizon and the operations horizon. The time frame covered by the PC’s SOL methodology developed pursuant to FAC-010-3 is for the *planning horizon*. The planning horizon covers the period from one year and beyond, while the operations horizon covers real-time (now) to one year. Between those two time horizons, the topology of the system could be quite different based on the addition of new projects, changes in generation, planned or forced outages of elements, and different uses of the system (power transfers), and weather.

Under the currently-effective FAC Reliability Standards, planners must establish SOLs for use in the planning horizon and operators must establish SOLs for use in operations. The initial intent for requiring planners to establish SOLs for use in the planning horizon was to develop a consistent set of limits to be used by the TPs while *planning* for the reliability of the transmission system. To ensure this consistency, the PC develops the SOL Methodology to be used by its TPs and thus provide for an overall, coherent transmission plan for a PC area.

The purpose of requiring the establishment of SOLs for the operations horizon is to identify limits that if operated within, will result in the system being *operated* reliably. TOPs must establish SOLs in the operations horizon that account for real-time characteristics (generation, load, topology and transfers) of their system. To ensure the consistent use of limits within a RC area, the RC is obligated to develop the SOL methodology to be used by its TOPs. The RC’s methodology includes how Facility Ratings, System Voltage Limits, and stability performance criteria will be used to establish limits for use in assessments that determine whether the system is being reliably *operated*. Additionally, the RC’s methodology prescribes what tests (Contingencies) must be used during the reliability assessment of the system during operations.

One of the key aspects of the proposed new construct is to eliminate the use of the SOL term as applied to the planning horizon. The SDT views SOLs as limits that are used in operations, hence the use of the term

“Operating” in System “Operating” Limits. The components of SOLs include the use of Facility Ratings, System Voltage Limits, and stability limits. These SOLs are based on specifications and criteria identified in the RC’s SOL Methodology. While planners also use Facility Ratings provided by Facility Owners, System steady state voltage limits (TPL-001-4 Requirement R5), and stability performance criteria (TPL-001-4 Requirement R6) for its Planning Assessments, these are not referred to as SOLs.

The SDT determined that there is limited value in requiring PCs and TPs to establish SOLs for use in the planning horizon. Rather, the SDT believes that the reliability objective is to ensure that there is continuity between the limits and criteria used in the Planning Assessments with the limits and criteria (i.e., SOLs) that are used in operations. This adds further clarity that it is the RCs and TOPs – not the PCs and TPs – who determine the SOLs and IROLs that are used in operations. However, the RCs and TOPs may use the information provided by PCs and TPs, especially with regard to risks for System instability, Cascading, and uncontrolled separation, when developing the SOLs and IROLs used in operations. Proposed FAC-015-1 Requirement R6 retains this concept, which is currently in FAC-014-2 Requirement R6, and appropriately points to the TPL-001-4 Reliability Standard rather than FAC-010.

Another key difference in the proposed new construct is seen in the PC’s and TP’s role in addressing instability and the establishment of IROLs. Under the current construct, PCs and TPs are responsible for identifying stability SOLs and IROLs in accordance with the PCs Methodology. As stated above, there is little value in the establishment of SOLs and IROLs (by current definitions a “value” such as MW, Mvar, etc.) for use in the planning horizon; however, there is great value identifying more severe System risks in the planning horizon and communicating those risks to the impacted entities who operate those systems. PCs and TPs are currently responsible for identifying more severe System impacts such as Cascading, voltage instability, or uncontrolled islanding in accordance with TPL-001-4 Requirements R3.4, R3.5, R4.4, and R4.5. The new FAC-015-1 requires continuity in the criteria used and requires that the PC and TP communicate these risks of System instability, Cascading or uncontrolled separation identified in its Planning Assessment to impacted RCs and impacted TOPs. The entities that operate those systems can then use that information, if applicable and appropriate, to assist in establishing stability limits and IROLs that will ultimately be used in operations.

SOLs in the planning horizon are developed starting with a model that has all facilities in service and has different system conditions (different transfers, weather assumptions, load levels) than those in the operations time horizon. The results from the planning horizon SOL methodology application can therefore be quite different and either do not correspond to SOLs (different limiting elements) in the operations time horizon or have very different limiting results (voltage limit violations versus System instability). Therefore, there is little or no value to using planning horizon SOLs during operations horizon conditions.

The use of the word “Operating” within the term “System Operating Limit” when establishing limits in the planning horizon has created confusion as to which value is referred to when referencing “SOL”. Is it the “planning horizon SOL” or the “operations horizon SOL”? Retiring FAC-010-3 and eliminating references to SOLs and IROLs in the planning horizon will eliminate this confusion.

## **Retirement of FAC-010-3**

### **Background**

The purpose of FAC-010-3 (System Operating Limits Methodology for the Planning Horizon) is to ensure that SOLs used in the reliable planning of the (BES are determined based on an established methodology or methodologies. This standard only requires a PC to have a documented SOL Methodology. FAC-014-2 Requirements R3, R4, R4.3 and R5.4 require its use. Retirement of FAC-010-3 would consequently necessitate retirement of the associated requirements in FAC-014-2.

#### **Comprehensive Requirements of TPL-001-4**

The requirements in the TPL-001-4 standard require a comprehensive Planning Assessment and includes the establishment of limits and criteria (Facility ratings, System steady-state voltage limits, and stability performance criteria) and the *methodology* used by the planners (TPL-001-4, Requirement R6) to identify System instability (Cascading, voltage instability, or uncontrolled islanding) for the planning horizon. TPL-001-4 requires that a summary of the results of the assessment (TPL-001-4, Requirement R2) and a list of critical Contingencies that are expected to produce the most severe System impacts (TPL-001-4, Requirement R4.5) be included in the Planning Assessment. Further, TPL-001-4, Requirement R8 requires that the Planning Assessment, which includes all of information listed above, be distributed to any functional entity that has a reliability related need, for which the RC qualifies.

With the introduction of TPL-001-4 in 2013, FAC-010-3 became redundant as TPL-001-4 *is an established methodology* used in the reliable planning of the BES. This comprehensive methodology describes how the transmission system should be studied, addresses the establishment of performance criteria, prescribes the outages that must be analyzed, identifies the outages that do not meet the performance requirements, and requires determination of the corrective actions that should be taken to ensure future system reliability. This established methodology meets and exceeds performance requirements identified in FAC-010-3 SOL methodology. The comprehensive nature of TPL-001-4 is seen in the following excerpts from the TPL-001-4 requirements, which correspond to FAC-010-3:

#### Modeling:

TPL-001-4, Requirement R1 – “Each Transmission Planner and Planning Coordinator shall maintain System models within its respective area for performing the studies needed to complete its Planning Assessment.”

#### Criteria/Methodology:

TPL-001-4, Requirement R5 – “Each Transmission Planner and Planning Coordinator shall have criteria for acceptable System steady state voltage limits, post-Contingency voltage deviations, 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.”

TPL-001-4, Requirement R6 – “Each Transmission Planner and Planning Coordinator 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.”

#### Analyzed Events:

TPL-001-4, Table 1 – “Steady State & Stability Performance Planning Events”

#### Reporting:

TPL-001-4, Requirement R2 – “Each Transmission Planner and Planning Coordinator shall prepare an annual Planning Assessment of its portion of the BES.”

TPL-001-4, Requirement R8 – “Each Planning Coordinator and Transmission Planner shall distribute its Planning Assessment results to adjacent Planning Coordinators and adjacent Transmission Planners within 90 calendar days of completing its Planning Assessment, and to any functional entity that has a reliability related need and submits a written request for the information within 30 days of such a request.”

Corrective Action:

TPL-001-4, R2.7: “For the planning events shown in Table 1, when the analysis indicates an inability of the System to meet the performance requirements in Table 1, the Planning Assessment shall include Corrective Action Plan(s) addressing how the performance requirements will be met.”

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### **Prior Review of FAC-010**

The June 2013 report from the Independent Experts Review Project identified FAC-010-2.1 Requirements R3, R4, and R5 as “Requirements Recommended for Retirement” in Appendix E of the report. Requirement R5 was retired effective January 21, 2014 as part of NERC’s P81 project. The Independent Expert Review team consisted of five independent industry experts and a sixth participant from FERC. The relevant table entries are shown below.

FAC-010-2.1	R3.	More appropriate as a Guideline. This is a checklist.
FAC-010-2.1	R4.	More appropriate as a Guideline. Description of appropriate coordination does not rise to a Standard.
FAC-010-2.1	R5.	P81 Phase 1.

In addition, the Periodic Review Team under the NERC Project 2015-03 recommended retirement of FAC-010-3. Industry comments received and reviewed during the PRT efforts indicate significant support for the retirement of FAC-010-3 due to its redundancy.

### **Creation of FAC-015-1**

#### **Rationale for FAC-015-1**

As noted above, the SDT identified consistency of the limits and criteria used in the planning and operations time horizons as an area in the Reliability Standards that could be improved. To that end, the SDT developed FAC-015-1 to require that the planners use limits and criteria in their Planning Assessments that are as limiting, if not more limiting, than the limits and criteria developed in accordance with the RC’s SOL Methodology.

#### **The Perceived “Gap”**

The perceived *gap* stems from the concern about the potential use of limits and criteria in the planning horizon that is less conservative than that used in the operations time horizon. For example, if planners used less conservative thermal limits when planning the System to meet all-facilities-in-service, peak load conditions, then operations would potentially face Facility Rating exceedances, which may require corrective actions up to and including Load shed to operate within Facility Ratings. Failing to have limit and criteria consistency between planning and operations may result in unacceptable System performance in the operations time horizon for the same conditions that were previously deemed acceptable when assessed in the planning horizon (i.e. planning the System less conservatively than the System is operated).

There is currently no mechanism to require consistency between the limits and criteria used in the two time horizons. By requiring a direct link of coordination between the limits and criteria in the SOL Methodology in the operations horizon with the limits and criteria used in Planning Assessments, which are used for the reliable planning of the BES, reliability and consistency is improved. By retiring FAC-010-3 the coordination is directly linked and a risk for a third and potentially disparate “methodology” around limits and criteria is also removed.

### **Development of FAC-015-1**

Despite the comprehensive requirements in TPL-001-4 and to address the perceived gap, the SDT developed FAC-015-1 with the title “Coordination of Planning Assessments with the RC’s SOL Methodology” and the purpose “to ensure the Facility Ratings, System steady-state voltage limits, and stability criteria used in Planning Assessments are coordinated with the RC’s SOL Methodology.” FAC-015-1 will require the PC to implement processes that ensure that the Facility Ratings, voltage limits, and stability performance criteria used in its planning assessment are equal or more limiting than the Facility Ratings, System Voltage Limits, and stability performance criteria specified in the RC’s SOL Methodology.

## **Improved Communication of Limits and Criteria Between Planning and Operating Entities**

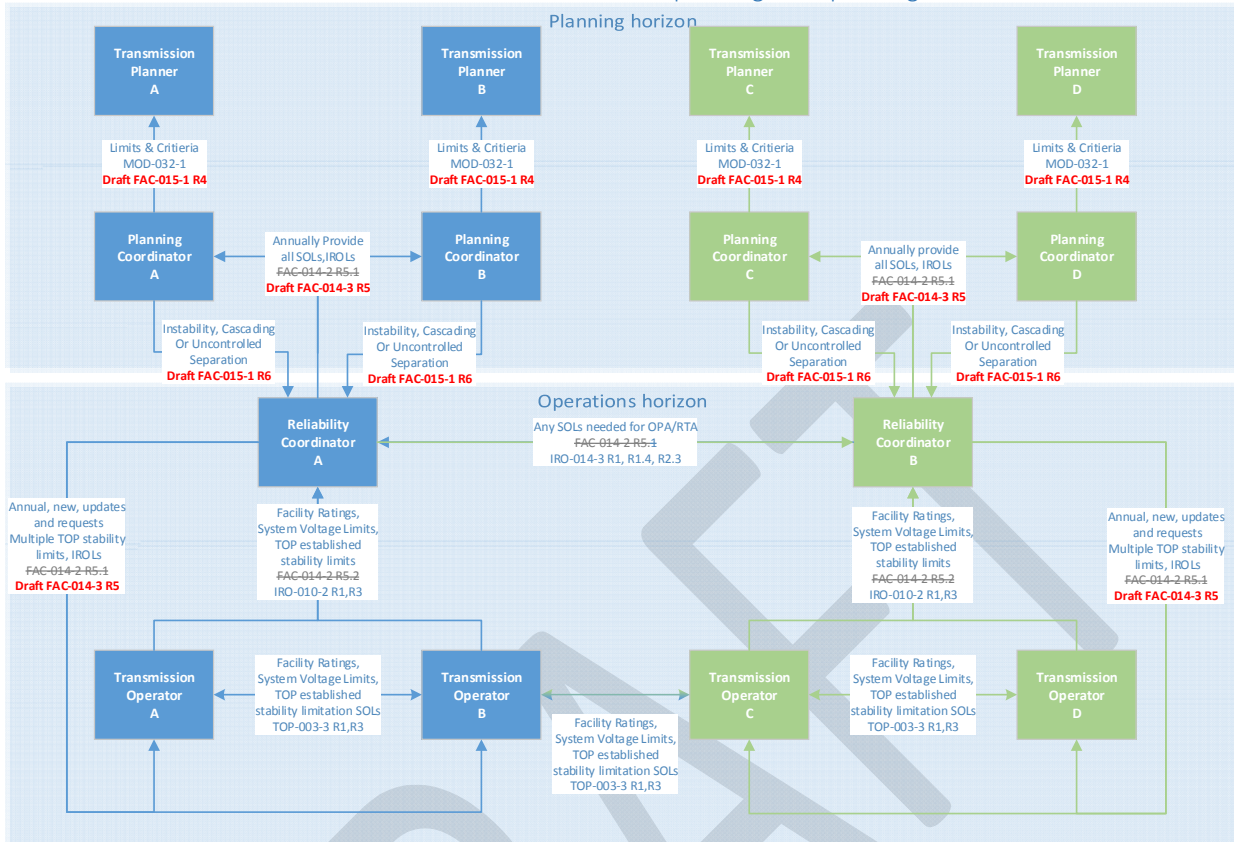
Reliability Standard FAC-014-2 Requirements R5 and R6 address communication of limits and criteria between the planning (PCs and TPs) and operating entities (RCs and TOPs). The requirements lack some clarity with respect to timing of the communication. In proposed FAC-014-3, the SDT revised Requirements R5 and R6 to simplify and streamline the PC’s and TP’s responsibilities for communication of limits and criteria. Proposed FAC-015-1 coordinates with proposed FAC-014-3 by identifying the necessary communication of limits and criteria between the planning and operating entities that utilize such limits and criteria. These two standards also recognize existing requirements that already address some of the necessary communication (e.g. IRO-010-2, TOP-003-3, and IRO-014-3).

The SDT is improving clarity and efficiency of communications by establishing a single point of contact between the RC and the PC for communication of SOLs from the operations horizon to the planning horizon. The PC, which is more familiar with and interacts regularly with TPs, is the entity responsible for communicating the SOLs to impacted Transmission Planners. This removes communications directly from the RC to the TPs and keeps the PC in the direct path of all SOLs from the operations time horizon. The requirements for FAC-015-1 can be thus met during times of annual preparation for its annual Planning Assessments.

The figure below shows examples of how the communication of SOLs would work given the proposed FAC-014-3 and FAC-015-1. The figure details what is communicated, direction of the communication (i.e. from whom to whom), and the respective NERC Reliability Standard Requirements that require or contain a provision for such communication. Requirements that are struck through and grayed out represent currently-effective requirements that are proposed to be replaced and/or not be retained (due to redundancy with the other referenced requirements) in FAC-014-3. Requirements that are bold and red text are proposed requirements that support or replace existing requirements for the noted communication path and content.



Communication of limits and criteria between planning and operating entities



## FAC-015 single standard for PCs and TPs

Currently, planning entities (PCs and TPs) have requirements in FAC-010-3 and FAC-014-2. With FAC-010-3 and FAC-014-2 Requirements R3, R4, R5.3 and R5.4 being effectively replaced by proposed FAC-015-1, the communication of stability related information identified in FAC-014-2 Requirement R6 from the PC to the RC remained. The SDT has opted to relocate the content addressed in FAC-014-2 Requirement R6 into newly proposed FAC-015-1 Requirement R6 rather than keep in FAC-014. This relocation allowed for all PC and TP requirements related to coordination of limits utilized between planning and operations time horizons to be in a single standard.