NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Technical Rationale for Reliability Standard FAC-014-3

April 2021

FAC-014-3 – Establish and Communicate System Operating Limit

Requirement R1

Each Reliability Coordinator shall establish Interconnection Reliability Operating Limits (IROLs) for its Reliability Coordinator Area in accordance with its System Operating Limit methodology (SOL methodology).

Rationale R1

Reliability Standard FAC-014-2 Requirement R1 requires that the Reliability Coordinator (RC) ensure that System Operating Limits (SOLs), including Interconnection Reliability Operating Limits (IROLs), for its RC Area are established and that the SOLs (including IROLs) are consistent with its SOL methodology.

Furthermore, Requirement R2 of FAC-014-2 requires the Transmission Operator (TOP) to establish SOLs consistent with its RC's SOL methodology.

Under this structure the RC is responsible for ensuring that SOLs established by the TOP, per Requirement R2, are consistent with the RC's SOL methodology. This creates a situation where the RC is responsible for "ensuring" the actions of the TOP.

Accordingly, if the TOP does not establish SOLs per its RC's SOL methodology, then 1) the TOP is in violation of Requirement R2, and 2) the RC by default is in violation of Requirement R1 because the RC did not ensure that the TOP's SOL was consistent with its SOL methodology.

The proposed revision addresses this issue and clarifies the appropriate responsibilities of the respective functional entities. Additionally, this requirement carries forward the obligation of the RC to establish IROLs for its RC Area. The RC maintains primary responsibility for establishment of IROLs because these limits have the potential to impact a Wide-area.

Requirement R2

Each Transmission Operator shall establish System Operating Limits (SOL) for its portion of the Reliability Coordinator Area in accordance with its Reliability Coordinator's SOL methodology.

Rationale R2

Requirement R2 preserves the intent of Requirement R2 of FAC-014-2.

The standard drafting team (SDT) removed language from the existing FAC-014-2 Requirement R2 that states the TOP "shall establish SOLs (as directed by its Reliability Coordinator)" because it causes confusion and may be incorrectly understood to mean that the TOPs are only required to establish SOLs if they have been "directed to by their RC." This is not the intended meaning of the requirement, thus, the SDT has removed the unnecessary and potentially confusing language. The proposed language makes clear that the TOP is the entity responsible for establishing SOLs for its portion of the Reliability Coordinator Area, and that these SOLs must be established in accordance with the RC's SOL methodology.

Requirement R3

The Transmission Operator shall provide its SOLs to its Reliability Coordinator.

Rationale R3

Requirement R3 requires TOPs to provide the SOLs it established (under Requirement R2) to the RC. The TOP should refer to the RC's documented data specification necessary for the RC to perform Operational Planning Analyses, Real-time monitoring and Real-time assessments under IRO-010-2 for any guidance or requirements regarding the provision of SOLs from the TOP. For example, the RC may wish to specify the periodicity and format in which the data should be communicated. The RC may choose to also provide this or any additional guidance within its SOL methodology. If no such information is given, the TOP may provide SOLs as per other terms agreed upon with the RC.

This requirement was previously covered under FAC-014-2 Requirement R5.2 but was moved to a more logical position in the standard, immediately following Requirement R2 for establishing SOLs.

The SDT recognizes that the provision of SOL information from the TOP to the RC may also be addressed via IRO-010-2. However, the proposed requirement may also be utilized for SOL information other than what is utilized for Operational Planning Analysis (OPA), Real-time Assessment (RTA) and Real-time monitoring. In such instances, the timing requirements should be coordinated between the data specification document and the RC's SOL methodology.

Requirement R3 sets a common expectation across industry of the minimum actions any TOP must take when communicating SOLs to their RC. It's important for this requirement to remain within FAC-014-3 to ensure SOLs are communicated from the TOP to the RC in case IRO-010-2 is modified or removed in future revisions to the standards.

Requirement R4

Each Reliability Coordinator shall establish stability limits when an identified instability impacts adjacent Reliability Coordinator Areas or more than one Transmission Operator in its Reliability Coordinator Area in accordance with its SOL methodology.

Rationale R4

Requirement R4 requires that the RC establish stability limits when the limit impacts more than one TOP in its RC Area. This ensures that the RC, who has wide-area responsibility, will establish such stability limits and prevent any gaps in identification and monitoring of stability limits that impacts more than one TOP in its RC Area. TOPs are still required to establish stability limits that are within its TOP area (including Generator Operator areas interconnected to its TOP area). The requirement establishes the end condition, which is the RC being responsible for establishing a stability limit that impacts more than one TOP regardless of whether that stability limit was originally calculated by the RC or one of the impacted TOPs. In the case where the stability limit impacts an adjacent RC or multiple TOPs which may or may not be in the same RC area, the RC establishing the stability limit shall use its own methodology and communicate the limit to the adjacent RC(s)or TOP(s) appropriately in accordance with other NERC standards requiring the communication of SOL and IROL related information (i.e. currently in effect IRO-008-2 Requirement R5, IRO-014-3 Requirements R1.4 and R1.5 and FAC-014-3 Requirement R5.3). Should there be a difference in limits established by each of the adjacent RCs or multiple TOPs; the more conservative of the two limits should be the one used in Operations in accordance with IRO-009-2 Requirement R3 or TOP-001-4 Requirement R18 respectively.

RCs who have asynchronous connections should consider the impact of all possible transfer levels across those connections including when those connections are not available if lost by contingency or forced outage.

Requirement R5

Each Reliability Coordinator shall provide: *[Violation Risk Factor: High] [Time Horizon: Operations Planning, Same-day Operations, Real-Time Operations]*

5.1 Each Planning Coordinator and each Transmission Planner within its Reliability Coordinator Area, the SOLs for its Reliability Coordinator Area (including the subset of SOLs that are IROLs) at least once every twelve calendar months. *[Time Horizon: Operations Planning]*

5.2 Each impacted Planning Coordinator and each impacted Transmission Planner within its Reliability Coordinator Area, the following information for each established stability limit and each established IROL at least once every twelve calendar months: *[Time Horizon: Operations Planning]*

5.2.1 The value of the stability limit or IROL;

5.2.2 Identification of the Facilities that are critical to the derivation of the stability limit or the IROL;

5.2.3 The associated IROL T_v for any IROL;

5.2.4 The associated critical Contingency(ies);

5.2.5 A description of system conditions associated with the stability limit or IROL; and

5.2.6 The type of limitation represented by the stability limit or IROL (*e.g.*, voltage collapse, angular stability).

5.3 Each impacted Transmission Operator within its Reliability Coordinator Area, the value of the stability limits established pursuant to Requirement R4 and each IROL established pursuant to Requirement R1, in an agreed upon time frame necessary for inclusion in the Transmission Operator's Operational Planning Analyses, Real-time monitoring, and Real-time Assessments. *[Time Horizon: Operations Planning, Same-day Operations, Real-Time Operations]*

5.4 Each impacted Transmission Operator within its Reliability Coordinator Area, the information identified in Requirement R5 Parts 5.2.2 – 5.2.6 for each established stability limit and each established IROL, and any updates to that information within an agreed upon time frame necessary for inclusion in the Transmission Operator's Operational Planning Analyses. *[Time Horizon: Operations Planning, Same-day Operations, Real-Time Operations]*

5.5 Each requesting Transmission Operator within its Reliability Coordinator Area, requested SOL information for its Reliability Coordinator Area, on a mutually agreed upon schedule. *[Time Horizon: Operations Planning]*

5.6 Each impacted Generator Owner or Transmission Owner, within its Reliability Coordinator Area, with a list of their Facilities that have been identified as critical to the derivation of an IROL and its associated critical contingencies at least once every twelve calendar months. *[Time Horizon: Operations Planning]*

Rationale R5

Requirement R5 requires the RC to provide SOLs (including the subset that are IROLs) and any updates to those SOLs to Planning Coordinators (PCs), Transmission Planners (TPs) and Transmission Operators (TOPs). This is an improvement over Requirement R5 in FAC-014-2 because it provides additional clarity on when the RC is responsible for performing these tasks. FAC-014-2 Requirement R5 includes the triggering clause for RCs to provide SOLs when entities "provide a written request that includes a schedule for delivery of those limits", while Requirement R5 of FAC-014-3 clearly identifies the RC's responsibilities with or without a request. This also removes confusion associated with FAC-010 in terms of SOLs existing in the planning horizon. All requirements pertaining to SOLs in the planning horizon have thus been removed.

The requirement addresses varying needs in terms of both the content and the frequency at which the information is provided. This requirement also complements existing NERC requirements that provide a construct for communication of SOLs and SOL-related information (e.g. TOP-003-3, IRO-010-2, IRO-014-2) to prevent redundancies in requirements. TOP-to-TOP SOL information communication is addressed in TOP-003-3. RC-to-RC SOL information communication is addressed in IRO-014-2. TOP-to-RC information communication is addressed in Requirement R3 and may be addressed in IRO-010-2.

Requirement R5 Part 5.1 requires the RC to provide the impacted PCs and TPs in its RC Area all SOLs and relevant SOL information at least once every 12 calendar months. This provides the PC and the TP the relevant information necessary for their annual assessments; however nothing precludes the PC and TP from requesting this information more frequently. Nothing prohibits an RC from sharing such information outside of a NERC Reliability Standard for other non-reliability related purposes.

Requirement R5 Part 5.2 requires the RC to provide the impacted PCs and TPs with additional specific information (consistent with FAC-014-2 R5.1.1 - R5.1.4) for stability limits and IROLs at least once every 12 calendar months. It is expected that PCs do not need more frequent updates as most of their assessments (and their respective TPs assessments) are performed on an annual cycle.

In addition, Requirement R5 Part 5.2.5 requires the RC to provide the impacted PCs and TPs with unique system conditions associated with a particular stability limit or IROL as opposed to generic study conditions directed at covering all (or a group of) stability limits which may be included in the RC's SOL methodology as required by, Requirement R4 Part 4.4 in FAC-011-4. For example, where the RC's SOL methodology may describe that stability limits must be verified for "summer peak", "winter peak", "minimum demand" and "shoulder periods", the information provided under , Requirement R5 Part 5.2.5 would identify whether the particular stability limit was present in all or just one of those conditions.

Requirement R5 Part 5.3 requires the RC to provide the impacted TOPs within its RC Area the value of the stability limits established in Requirement R4 and IROLs established in Requirement R1 in the Real-time Operations time horizon. This recognizes that the actual numerical "limit" (whether a new limit or modification of an existing one) may change based on varying system topology and thus those limit values must be provided in a timeframe designed to meet the impacted TOP's needs for their OPA, Real-time monitoring, and RTA. In the case where the stability limit impacts an adjacent RC or multiple TOPs which may or may not be in the same RC area, the RC establishing the stability limit shall use its own methodology and communicate the limit to the adjacent RC(s) or TOP(s) appropriately in accordance with other NERC standards requiring the communication SOL and IROL related information (i.e. currently in effect IRO-008-2 Requirement R5 and IRO-014-Requirements 1.4 and 1.5)). Should there be a difference in limits established by each of the adjacent RCs or multiple TOPs; the more conservative of the two limits should be the one used in Operations in accordance with IRO-009-2 Requirement R3 or TOP-001-4 Requirement R18 respectively.

Requirement R5 Part 5.4 requires the RC to provide the impacted TOPs additional specific information (consistent with FAC-014-2 R5.1.1-5.1.4) for stability limits and IROLs within same-day or Operations Planning time horizon. This additional information is essential for the TOP's OPA; however, it can be communicated within a longer-term agreed upon time frame outside the Real-time Operations time horizon.

Additionally, Requirement R5 Part 5.5 requires that if a TOP requests any SOL information beyond what impacts that TOP, the RC must provide this SOL information as well. For example, in deriving a new SOL that may impact adjacent TOPs, a TOP may need more information from the RC on related SOLs in other TOP areas within the region that could impact their derivation. Requirement R5, Parts 5.3 through 5.5, require that the related information be provided in a mutually agreed upon schedule to ensure the TOP's needs are met (e.g. OPA, RTA, etc.) and the RC's ability to meet those needs are taken into consideration.

Finally, Requirement R5, part 5.6, requires that the RC must provide each impacted Generation Owner or Transmission Owner within its Reliability Coordinator area with a list of Facilities that they can use to satisfy the criteria in Attachment 1 part 2.6 in CIP-002 and 4.1.1.3 in CIP-014. Of the three possible entities, RC, TP and PC listed in CIP-002 and CIP-014 that could deliver this information to the TOs and GOs, the RC is ultimately responsible given they're required to establish IROLs. Thus, the requirement for provision of the list of Facilities identified as critical to the derivation of an IROL and its associated critical contingencies should rest with the RC. The SDT also felt that some known periodicity of information provision, per this requirement, seemed appropriate. After industry comment, an annual periodicity was chosen. This timeframe should allow sufficient analysis to document IROLs that will persist, and need monitoring by the RC and any necessary action by asset owners, per the CIP standards. Those IROL like conditions which may manifest in real time, due to forced outages are not appropriate for consideration until reviewed by the RC to determine if they are to be established as an IROL to prevent the condition from reoccurring, and warrant reporting per the standard.

Requirement R6

Each Planning Coordinator and each Transmission Planner shall implement a documented process to use Facility Ratings, System steady-state voltage limits and stability criteria in its Planning Assessment of Near Term Transmission Planning Horizon that are equally limiting or more limiting than the criteria for Facility Ratings, System Voltage Limits and stability described in its Reliability Coordinator's SOL methodology.

- The Planning Coordinator may use less limiting Facility Ratings, System steady-state voltage limits and stability criteria if it provides a technical rationale to each affected Transmission Planner, Transmission Operator and Reliability Coordinator.
- The Transmission Planner may use less limiting Facility Ratings, System steady-state voltage limits and stability criteria if it provides a technical rationale to each affected Planning Coordinator, Transmission Operator and Reliability Coordinator.

Rationale R6

The purpose of TPL-001 is to "…develop a Bulk Electric System (BES) that will operate reliably over a broad spectrum of System conditions and following a wide range of probable Contingencies." Because the Planning Assessment (including the Corrective Action Plan) is the primary output of TPL-001, planning criteria used in developing the Planning Assessment should support the eventual operation of BES Facilities.

Requirement R6 was drafted to ensure the appropriate use of applicable Facility Ratings, System steady-state voltage limits, and stability performance criteria in operating and planning models. Analysis of these models determine System needs, potential future transmission expansion, and other Corrective Action Plans for reliable System operations. Therefore, it is imperative that the System is planned in such a way to support the successful operation of Facilities when they are placed in service.

Requirement R6 provides a mechanism for the coordination of Facility Ratings, System steady-state voltage limits, and stability performance criteria in planning models to those established in accordance with the RC's SOL methodology. Since the analysis of planning models determines what Facilities are constructed or modified, the application of Facility Ratings, System steady-state voltage limits, and stability performance criteria used in studies that support the development of the Planning Assessment should be equally limiting or more limiting than those established in accordance with the RC's SOL methodology. Otherwise, operators could be unduly limited by constraints that were not identified in preceding planning studies.

The Near-Term Transmission Planning Horizon is specified because assumptions regarding the topology of the transmission system, forecast load and generation, etc. are more certain earlier in the Planning Horizon. Additionally, construction activities or other Corrective Action Plans are more likely to be in the implementation phase or finalized in this period.

Facility Ratings:
Reliability Standard MOD-032 requires the modeling data in a PC area be coordinated between the PC and applicable TP. It is the opinion of the standard drafting team (SDT) that the resulting coordination is the appropriate means for consistency between the PC and TP in ensuring Facility Ratings included in planning models are equally limiting or more limiting than the Facility Ratings established in accordance with the RC's SOL methodology. This is important because Planning Assessments and Corrective Action Plans are developed based on analysis of these models (TPL-001).

The intent of Requirement R6 is not to change, limit, or modify Facility Ratings determined by the equipment owner per FAC-008, nor allow the PCs nor TPs to revise those limits. The intent is to utilize those owner-provided Facility Ratings such that the System is planned to support the reliable operation of that System. This is accomplished by requiring the PC and TP to use the owner-provided Facility Ratings that are equally limiting or more limiting than those established in accordance with the RC's SOL methodology. This is not intended to imply the RC has authority over the PCs and TPs planning a portion of the RC area in the development of the Planning Assessment. It does, however, facilitate communication between planning and operating entities so that analysis of the System by these entities are coordinated.

The SDT recognizes there are instances where it may be appropriate for planning models to have less limiting Facility Ratings than those established in accordance with the RC's SOL methodology. As such, Requirement R6 explicitly allows for exceptions when a technical rationale is provided to

the appropriate entities in accordance with the requirement. The obvious example for such an exception is a facility where the PC / TP has assumed an upgrade which increases the Facility Rating (typically, the thermal limit) of the equipment in question.

Furthermore, it is the SDT's intent to clarify that Facility Ratings that result from variables such as the implementation of future Corrective Action Plans, or the use of ambient temperature assumptions in seasonal planning models that differ from those ambient weather assumptions used in operational analyses and monitoring in real time, may be used. Although they may be less limiting than those in the RC's SOL methodology in certain instances, it is understood that seasonal assumptions and capacity increases due to upgrade are appropriately included in future planning models. These provisions should be included in the documented technical rationale provided to the appropriate entities in accordance with the requirement.

System Steady-State Voltage Limits:
Regarding voltage performance criteria, the intent of this requirement is to supplement Requirement R5 of TPL-001-4 which states, "Each TP and PC 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." When determining the criteria for System steady-state voltage limits in accordance with TPL-001-4 Requirement R5, PCs and TPs are required to implement the process described in FAC-014-3 Requirement R6. Per FAC-014-3, R6, the PC and TP are required to use System steady-state voltage limits that are equally limiting or more limiting than the System Voltage Limits established in accordance with the RC's SOL methodology. This does not give the RC authority over the PCs and TPs, responsible for planning a portion of the RC area, in the development of the Planning Assessment. It does, however, facilitate communication between planning and operating entities so that analysis of the System by these entities are coordinated.

Stability Performance Criteria:
Regarding stability performance criteria, the intent of this requirement is to supplement the performance of stability analysis by the PC and TP per TPL-001. When PCs and TPs perform the relevant stability analyses in accordance with TPL-001, they are required to implement the process in FAC-014-3 Requirement R6. Per FAC-014-3, R6, the PC and TP are required to use stability performance criteria that are equally limiting or more limiting than the criteria established in accordance with the RC's SOL methodology. This does not give the RC authority over the PCs and TPs, responsible for planning a portion of the RC area, in the development of the Planning Assessment. It does, however, facilitate communication between planning and operating entities so that analysis of the System by these entities are coordinated.

Requirement R7

Each Planning Coordinator and each Transmission Planner shall annually communicate the following information for Corrective Action Plans developed to address any instability identified in its Planning

Assessment of the Near-Term Transmission Planning Horizon to each impacted Transmission Operator and Reliability Coordinator. This communication shall include:

7.1 The Corrective Action Plan developed to mitigate the identified instability, including any automatic control or operator-assisted actions (such as Remedial Action Schemes, under voltage load shedding, or any Operating Procedures);

7.2 The type of instability addressed by the Corrective Action Plan (e.g. steady-state and/or transient voltage instability, angular instability including generating unit loss of synchronism and/or unacceptable damping);

7.3 The associated stability criteria violation requiring the Corrective Action Plan (e.g. violation of transient voltage response criteria or damping rate criteria);

7.4 The planning event Contingency(ies) associated with the identified instability requiring the Corrective Action Plan;

7.5 The System conditions and Facilities associated with the identified instability requiring the Corrective Action Plan.

Rationale R7

IRO-017-1 Requirement R3 requires PCs and TPs to provide their Planning Assessments to impacted RCs. However, Requirement R2 Part 2.4 and Requirement R4 in TPL-001-4, which outline the Stability analysis portion of the Planning Assessment and the associated Corrective Action Plan, do not provide for the level of detail prescribed in FAC-014-3 Requirement R7. Therefore, this requirement was drafted to ensure the appropriate details regarding any potential instability identified in the Planning Assessment for the Near-Term Transmission Planning Horizon are provided to impacted RC and TOPs.

The information itemized in FAC-014-3 Requirement R7 is a key consideration for RCs and TOPs in the establishment of SOLs. For example, a study might indicate that System instability was avoided through the implementation of an operational measure, or Remedial Action Scheme (RAS). In this example, if the operational measure or RAS were not employed, the study would indicate instability in response to the associated Contingency. This information is critical for operator awareness of any automatic or manual actions that are required to prevent instability. Without this information, operators may be unaware of these risks and the measures required to address them. Existing FAC-014-2, Requirement R6 requires similar, though less detailed, information is shared by the planning with the RC. The SDT believes FAC-014-3, Requirement R7, improves upon this requirement and provides added clear and concise information to its impacted RCs and TOPs.

In addition, FAC-014-3 Requirement R7 Part 7.4 is useful information which supports FAC-014-3 Requirement R8. The information from Requirement R8 supports a number of other standards which require the PC and TP to provide information regarding instability, Cascading, and uncontrolled separation that adversely impacts the reliability of the BES to the TO and GO.

Requirement R8

Each Planning Coordinator and each Transmission Planner shall annually communicate to each impacted Transmission Owner and Generation Owner a list of their Facilities that comprise the planning event Contingency(ies) that would cause instability, Cascading or uncontrolled separation that adversely impacts the reliability of the BES as identified in its Planning Assessment of the Near-Term Transmission Planning Horizon.

Rationale R8

This requirement was drafted to ensure the appropriate details (i.e. Facilities) regarding potential instability, Cascading, or uncontrolled separation identified in the Stability portion of the Planning Assessment for the Near-Term Transmission Planning Horizon are provided to impacted Transmission and Generation Owners. Impacted Transmission and Generation Owners consist of those entities who have facilities requiring notification and **does not** imply that all Transmission and Generation Owners need notification of whether they have facilities requiring notification or not. This is necessary to ensure Facility owners receive this input to identify the Facilities that, as required by other Reliability Standards, require some level of protection, hardening, or increased vegetative management provisions. This requirement further supports the SDT's proposed changes to other Reliability Standards being updated to account for the retirement of FAC-010.

Furthermore, this requirement addresses the FERC Order No. 777 directive identified in the Standard Authorization Request (SAR) for project 2015-09, requesting a requirement be added for the communication of IROL information to Transmission Owners. This requirement, coupled with Requirement 5.6, provides annual notifications to Facility owners from both operating and planning entities, whereas no such timely notification requirements exist in the standards today.