

Technical Rationale for Reliability Standard TOP-001-6

April 2021

TOP-001-6 – Transmission Operations

Rationale

Rationale text from the development of TOP-001-3 in Project 2014-03 and TOP-001-4 in Project 2016-01 follows. Additional information can be found on the [Project 2014-03](#) and [Project 2016-01](#) pages.

Rationale for Requirement R3:

The phrase ‘cannot be physically implemented’ means that a Transmission Operator may request something to be done that is not physically possible due to its lack of knowledge of the system involved.

Rationale for Requirement R10:

New proposed Requirement R10 is derived from approved IRO-003-2, Requirement R1, adapted to the Transmission Operator Area. This new requirement is in response to NOPR paragraph 60 concerning monitoring capabilities for the Transmission Operator. New Requirement R11 covers the Balancing Authorities. Monitoring of external systems can be accomplished via data links.

The revised requirement addresses directives for Transmission Operator (TOP) monitoring of some non-Bulk Electric System (BES) facilities as necessary for determining System Operating Limit (SOL) exceedances (FERC Order No. 817 Para 35-36). The proposed requirement corresponds with approved IRO-002-4 Requirement R4 (proposed IRO-002-5 Requirement R5), which specifies the Reliability Coordinator's (RC) monitoring responsibilities for determining SOL exceedances.

The intent of the requirement is to ensure that all facilities (i.e., BES and non-BES) that can adversely impact reliability of the BES are monitored. As used in TOP and IRO Reliability Standards, monitoring involves observing operating status and operating values in Real-time for awareness of system conditions. The facilities that are necessary for determining SOL exceedances should be either designated as part of the BES, or otherwise be incorporated into monitoring when identified by planning and operating studies such as the Operational Planning Analysis (OPA) required by TOP-002-4 Requirement R1 and IRO-008-2 Requirement R1. The SDT recognizes that not all non-BES facilities that a TOP considers necessary for its monitoring needs will need to be included in the BES.

The non-BES facilities that the TOP is required to monitor are only those that are necessary for the TOP to determine SOL exceedances within its Transmission Operator Area. TOPs perform various analyses and

studies as part of their functional obligations that could lead to identification of non-BES facilities that should be monitored for determining SOL exceedances. Examples include:

- OPA;
- Real-time Assessments (RTA);
- Analysis performed by the TOP as part of BES Exception processing for including a facility in the BES; and
- Analysis which may be specified in the RC's outage coordination process that leads the TOP to identify a non-BES facility that should be temporarily monitored for determining SOL exceedances.

TOP-003-3 Requirement R1 specifies that the TOP shall develop a data specification which includes data and information needed by the TOP to support its OPAs, Real-time monitoring, and RTAs. This includes non-BES data and external network data as deemed necessary by the TOP.

The format of the proposed requirement has been changed from the approved standard to more clearly indicate which monitoring activities are required to be performed.

Rationale for Requirement R13:

The new Requirement R13 is in response to NOPR paragraphs 55 and 60 concerning Real-time analysis responsibilities for Transmission Operators and is copied from approved IRO-008-1, Requirement R2. The Transmission Operator's Operating Plan will describe how to perform the Real-time Assessment. The Operating Plan should contain instructions as to how to perform Operational Planning Analysis and Real-time Assessment with detailed instructions and timing requirements as to how to adapt to conditions where processes, procedures, and automated software systems are not available (if used). This could include instructions such as an indication that no actions may be required if system conditions have not changed significantly and that previous Contingency analysis or Real-time Assessments may be used in such a situation.

Rationale for Requirement R14:

The original Requirement R8 was deleted and original Requirements R9 and R11 were revised in order to respond to NOPR paragraph 42 which raised the issue of handling all SOLs and not just a sub-set of SOLs. The SDT has developed a white paper on SOL exceedances that explains its intent on what needs to be contained in such an Operating Plan. These Operating Plans are developed and documented in advance of Real-time and may be developed from Operational Planning Assessments required per proposed TOP-002-4 or other assessments. Operating Plans could be augmented by temporary operating guides which outline prevention/mitigation plans for specific situations which are identified day-to-day in an Operational Planning Assessment or a Real-time Assessment. The intent is to have a plan and philosophy that can be followed by an operator.

FAC-011-4 R6 clarifies when an SOL exceedance is occurring and as such likely increases the number of SOL exceedances for some TOPs. This increased number of SOL exceedances could create an administrative burden on System Operators for entities that rely on operator logs as the primary form of

evidence for compliance. This would be an unintended consequence of interaction between the new FAC-011-4 R6 and TOP-001-4 Requirement 14, which states, “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.” This is because TOP-001-4 Requirement 14 treats all SOL exceedances equally and does not differentiate among them based on duration or risk to the BES.

Concerns were raised by drafting team members and observers as to the effect on Real-Time System Operators being required to log initiation of the Operating Plan for every SOL exceedance per TOP-001-4 R14, especially those which were considered short duration, low risk SOL exceedances that were actually successfully mitigated within a short-term time frame. This could distract System Operators to focus on compliance documentation during times when they should be fully committed to implementing the Operating Plan and mitigating the SOL exceedance.

The revised TOP-001-6 M14 addresses this concern by identifying examples of “other evidence” that can be utilized to support compliance which require less human intervention for capturing. Examples allowing TOPs to use other types of evidence such as system logs/records showing the SOL exceedance successfully mitigated in conjunction with Operating Plans is important because it clarifies that validation of successful SOL mitigation is the primary interest and focus of evidence. Successful SOL mitigation coupled with Operating Plans that have been prepared for utilization in the event of an SOL exceedance can demonstrate that the TOP initiated and implemented its Operating Plan. For example, providing outputs of State Estimator and/or Real-Time Contingency Analysis (with start time and end time of SOL exceedances) in conjunction with Operating Plans that outline roles and responsibilities between TOP and its RC in eliminating SOL exceedances, would document resolution of the SOL exceedance as well as the Operating Plan in use for the resolution. These should be sufficient evidence for Requirement R14 while reducing or eliminating the administrative burden on System Operators to manually generate compliance evidence via logging or recording actions.

These Operating Plans may be strengthened with clarifying information such as automatically switched or scheduled switching operating strategies/processes that describe how automatic control actions correct SOL exceedances, which can prevent unnecessary collection of evidence. Use of operating policies as a part of Operating Plan may include specific control actions (such as taking a transmission line out of service or disconnecting a generator for a low risk high voltage SOL exceedance) on post-contingent basis, and may be utilized if it was included into operating protocols and confirmed in real-time. Other records, such as binding constraint logs, could document the actions taken to alleviate certain thermal SOL exceedances through the role of redispatch algorithms that generate revised dispatch setpoints for generators to alleviate the constraint.

Finally, further evidence may include some of the operating protocols shared between a TOP and RC as part of the Operating Plan; they may support instances where the TOP and RC agree to each take certain predetermined actions and or share information. For example, if an RC had to initiate manual redispatch with a Generator Operator when a TOP initiated binding constraint was insufficient (e.g. not fast enough), the TOP may utilize RC-provided logs as evidence of compliance if the RC and TOP have agreed to share such information. Additionally, use of these joint operating protocols as evidence recognizes situations

and operating conditions when the RC initiates and implements an Operating Plan on behalf of TOP, per these joint operating protocols. In these situations, pre-specified actions taken by the TOP and RC and agreed upon in their joint operating protocols could allow the RC's binding constraint logs to be used by the TOP as evidence of compliance.

Rationale for Requirement R15:

Clarity of what is determined to be an SOL exceedance in new revision FAC-011-4 may increase, in some instances, the number of SOL exceedances and thus the communications that are required consistent with TOP-001-4 Requirement R15 (as well as IRO-008-2 Requirement R5 and R6) which states, "Each Transmission Operator shall inform its Reliability Coordinator of actions taken to return the System to within limits when a SOL has been exceeded."

Concerns were raised as to the effect on System Operators being required to communicate every SOL exceedance, especially those which were considered short duration, low risk, SOL exceedances (e.g. less than 15 min, 30 min). This could be a significant increase for entities that historically performed RTAs more frequent than the required 30 minutes. Proposed FAC-011-4 R7 addresses this concern by requiring the RC to 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, with what priority. This will ensure consistency within an RC's area between the RC and its TOPs.

The use of the terminology "in accordance with its SOL methodology, aligns the notification requirements of TOP-001-5 R15 with the communication requirements identified in FAC-011-4 Requirement R7 around communication of SOL exceedances. For example, the SOL methodology could state that an RC and TOP sharing with each other real time monitoring and RTCA output information could provide clear communication and indications of when SOL exceedances appear and are mitigated in real time, meeting the requirements of the standard. This communication could range from simply RC and TOP sharing via ICCP output from the real time monitoring and RTCA output to operator to operator communications.

Rationale for Requirements R16 and R17:

In response to IERP Report recommendation 3 on authority.

Rationale for Requirement R18:

Moved from approved IRO-005-3.1a, Requirement R10. Transmission Service Provider, Distribution Provider, Load-Serving Entity, Generator Operator, and Purchasing-Selling Entity are deleted as those entities will receive instructions on limits from the responsible entities cited in the requirement. Note – Derived limits replaced by SOLs for clarity and specificity. SOLs include voltage, Stability, and thermal limits and are thus the most limiting factor.

Rationale for Requirements R19 and R20 (R19, R20, R22, and R23 in TOP-001-4):

[Note: Requirement R19 proposed for retirement under Project 2018-03 Standards Efficiency Review Retirements.]

The proposed changes address directives for redundancy and diverse routing of data exchange capabilities (FERC Order No. 817 Para 47).

Redundant and diversely routed data exchange capabilities consist of data exchange infrastructure components (e.g., switches, routers, servers, power supplies, and network cabling and communication paths between these components in the primary Control Center for the exchange of system operating data) that will provide continued functionality despite failure or malfunction of an individual component within the Transmission Operator's (TOP) primary Control Center. Redundant and diversely routed data exchange capabilities preclude single points of failure in primary Control Center data exchange infrastructure from halting the flow of Real-time data. Requirement R20 does not require automatic or instantaneous fail-over of data exchange capabilities. Redundancy and diverse routing may be achieved in various ways depending on the arrangement of the infrastructure or hardware within the TOP's primary Control Center.

The reliability objective of redundancy is to provide for continued data exchange functionality during outages, maintenance, or testing of data exchange infrastructure. For periods of planned or unplanned outages of individual data exchange components, the proposed requirements do not require additional redundant data exchange infrastructure components solely to provide for redundancy.

Infrastructure that is not within the TOP's primary Control Center is not addressed by the proposed requirement.

Rationale for Requirement R21:

The proposed requirement addresses directives for testing of data exchange capabilities used in primary Control Centers (FERC Order No. 817 Para 51).

A test for redundant functionality demonstrates that data exchange capabilities will continue to operate despite the malfunction or failure of an individual component (e.g., switches, routers, servers, power supplies, and network cabling and communication paths between these components in the primary Control Center for the exchange of system operating data). An entity's testing practices should, over time, examine the various failure modes of its data exchange capabilities. When an actual event successfully exercises the redundant functionality, it can be considered a test for the purposes of the proposed requirement.

Rationale for Requirements R22 and R23:

[Note: Requirement R22 proposed for retirement under Project 2018-03 Standards Efficiency Review Retirements]

The proposed changes address directives for redundancy and diverse routing of data exchange capabilities (FERC Order No. 817 Para 47).

Redundant and diversely routed data exchange capabilities consist of data exchange infrastructure components (e.g., switches, routers, servers, power supplies, and network cabling and communication

paths between these components in the primary Control Center for the exchange of system operating data) that will provide continued functionality despite failure or malfunction of an individual component within the Balancing Authority's (BA) primary Control Center. Redundant and diversely routed data exchange capabilities preclude single points of failure in primary Control Center data exchange infrastructure from halting the flow of Real-time data. Requirement R23 does not require automatic or instantaneous fail-over of data exchange capabilities. Redundancy and diverse routing may be achieved in various ways depending on the arrangement of the infrastructure or hardware within the BA's primary Control Center.

The reliability objective of redundancy is to provide for continued data exchange functionality during outages, maintenance, or testing of data exchange infrastructure. For periods of planned or unplanned outages of individual data exchange components, the proposed requirements do not require additional redundant data exchange infrastructure components solely to provide for redundancy.

Infrastructure that is not within the BA's primary Control Center is not addressed by the proposed requirement.

Rationale for Requirement R24:

The proposed requirement addresses directives for testing of data exchange capabilities used in primary Control Centers (FERC Order No. 817 Para 51).

A test for redundant functionality demonstrates that data exchange capabilities will continue to operate despite the malfunction or failure of an individual component (e.g., switches, routers, servers, power supplies, and network cabling and communication paths between these components in the primary Control Center for the exchange of system operating data). An entity's testing practices should, over time, examine the various failure modes of its data exchange capabilities. When an actual event successfully exercises the redundant functionality, it can be considered a test for the purposes of the proposed requirement.

Rationale for R25:

Requirement R25 was added to align the Real-time Assessments, Real-time Monitoring, and Operational Planning Analysis activities with the RC's SOL methodology. This will ensure that methods and frameworks that surround what is required in the SOL methodology are utilized during these activities (e.g. contingencies utilized, stability criteria, performance framework, etc.) in determining SOL exceedances.