

# **TOP-001-4 for Transmission Operators**

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# Background

- **Effective July 1, 2018**
- **Replaces currently effective TOP-001-3**
- **Modified to address reliability concerns identified by FERC in Order 817**
  - Monitoring non-Bulk Electric System facilities
  - Redundancy and diverse routing of data exchange capabilities
  - Testing of the alternate or less frequently used data exchange capability

- **Monitoring non-Bulk Electric System Facilities**
  - R10. Each Transmission Operator shall perform the following for determining System Operating Limit (SOL) exceedances within its Transmission Operator Area:
    - Part 10.3. Monitor non-BES facilities within its Transmission Operator Area identified as necessary by the Transmission Operator.
    - Part 10.6. Obtain and utilize status, voltages, and flow data for non-BES facilities outside its Transmission Operator Area identified as necessary by the Transmission Operator.
  - **Transmission Operator Area** - The collection of Transmission assets over which the Transmission Operator is responsible for operating.

# TOP-001-4 Changes

- **Rationale for R10:**

- As used in TOP and IRO Reliability Standards, monitoring involves observing operating status and operating values in Real-time for awareness of system conditions.
- Non-BES facilities that TOP is required to monitor are only those necessary for TOP to determine SOL exceedances within its Transmission Operator Area.
- TOP-003-3 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.

# Non-BES Facilities

- **Non-BES Facilities include, but not limited to:**
  - Radial systems (including Load)
  - 69 kV Transmission Facilities
  - Generation Facilities connected at 69 kV
  - Generation resources connected at 69 kV or higher with:
    - Gross individual nameplate rating less than 20 MVA; and
    - Gross plant/Facility aggregate nameplate rating less than 75 MVA

# Audit Approach

- **TOP-001-4 Part 10.3, Part 10.6**
  - What are the non-BES Facilities and data identified as necessary for determining SOL exceedances?
  - How did the TOP determine the non-BES Facilities and data identified as necessary for determining SOL exceedances?
  - Is there evidence to demonstrate the entity is monitoring and obtaining data for these non-BES Facilities?

# Audit Evidence: TOP-001-4 Part 10.3, Part 10.6

- **Including, but not limited to:**
  - Process, analysis, or explanation for how the TOP identified the necessary non-BES Facilities and data.
  - Identification of non-BES Facilities for which monitoring or data is necessary to determine SOL exceedances within TOP Area.
    - Identification may be general or Facility specific
    - Identification should occur prior to July 1, 2018
  - Evidence the TOP is monitoring and obtaining data for the identified non-BES Facilities.
    - Data and alarm configurations
    - EMS one-line diagrams
    - Demonstration during System Operator interviews

- **Redundancy and Diverse Routing of Data Exchange Capabilities**
  - R20. Each Transmission Operator shall have data exchange capabilities, with redundant and diversely routed data exchange infrastructure within the Transmission Operator's primary Control Center, for the exchange of Real-time data with its Reliability Coordinator, Balancing Authority, and the entities it has identified it needs data from in order for it to perform its Real-time monitoring and Real-time Assessments.



- **Rationale for R20:**

- 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.
- 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.
  - Note: Per NERC definition of Control Center, associated data centers are considered part of the primary Control Center.

- **Redundancy and Diverse Routing of Data Exchange Capabilities**
  - **Control Center** – One or more facilities hosting operating personnel that monitor and control the Bulk Electric System (BES) in real-time to perform the reliability tasks, ***including their associated data centers***, of: 1) a Reliability Coordinator, 2) a Balancing Authority, 3) a Transmission Operator for transmission Facilities at two or more locations, or 4) a Generator Operator for generation Facilities at two or more locations.
  - SDT Comments – “*The proposed requirement cannot be circumvented by moving data exchange infrastructure to a data center because the definition of Control Center includes ‘associated data centers’.*”

- **Redundancy and Diverse Routing of Data Exchange Capabilities**

- SDT Comments – *“The requirements provide entities with flexibility in designing an architecture that precludes single points of failure in the primary Control Center from halting the flow of real-time data to the operator.”*
- SDT Comments – *“requirements for redundant and diversely routed data exchange capabilities apply to infrastructure within the primary Control Center such as 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.”*

# Diverse Routing and Redundancy

- **Avoid Single Points of Failure**
  - Cables in a shared conduit or cable tray
  - Conduits or cable trays in close proximity
  - Shared components within communication paths
  - Components within the same rack

# Audit Approach

- **TOP-001-4 R20**

- Who are the entities the TOP has identified it needs data from in order to perform Real-time monitoring and Real-time Assessments?
- What data exchange capabilities does the TOP use to exchange data with the Reliability Coordinator, Balancing Authority, and other entities from which the TOP needs data?
- How did the entity determine the data exchange capabilities have redundant and diversely routed infrastructure within the primary Control Center?

- **Including, but not limited to:**

- Identification of the entities from which Real-time data is needed to perform Real-time monitoring and Real-time Assessments.
  - Detailed TOP-003-3 data specification may identify these entities
- Identification of data exchange capabilities with:
  - Reliability Coordinator
  - Balancing Authority
  - Other entities from which the TOP needs data in order to perform Real-time monitoring and Real-time assessments
- Evidence to demonstrate each identified data exchange capability has redundant and diversely routed infrastructure within the primary Control Center.
  - Evidence should demonstrate compliance as of July 1, 2018
  - Network/topology diagrams
  - Single point of failure analysis
  - Control Center and associated data center walkthroughs

- **Testing of the Alternate or Less Frequently Used Data Exchange Capability**
  - R21. Each Transmission Operator shall test its primary Control Center data exchange capabilities specified in Requirement R20 for redundant functionality at least once every 90 calendar days. If the test is unsuccessful, the Transmission Operator shall initiate action within two hours to restore redundant functionality.

- **Rationale for Requirement R21:**

- 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.



# Audit Approach

- **TOP-001-4 R21**

- What data exchange capabilities does the TOP use to exchange data with the entities it has identified it needs data from in order to perform its Real-time monitoring and Real-time Assessment?
- Has the TOP performed a test of each primary Control Center data exchange capability for redundant functionality at least once every 90 calendar days?
  - How do the tests exercise redundant functionality of the data exchange capabilities?
  - Do the tests, over time, examine various failure modes of the data exchange capabilities?
- Were any of the tests performed unsuccessful?
  - If yes, did the TOP initiate action within two hours to restore redundant functionality?

# Audit Evidence: TOP-001-4 R21

- **Including, but not limited to:**
  - Identification of data exchange capabilities with:
    - Reliability Coordinator
    - Balancing Authority
    - Other entities from which the entity needs data in order to perform Real-time monitoring and Real-time Assessments
  - Dated test records for each data exchange capability
    - Test records should identify results of each test
    - Logs should be available to support test records
    - Entities should be prepared to explain how each test exercises the redundant functionality of the data exchange capabilities
  - Evidence of corrective action taken for any failed tests
    - Time identification required due to two-hour specification in R21

# Questions?

