

WECC

TOP-001-4 Transmission Operations

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Audits

Introduction

- Changes to TOP-001-3 were mandated by FERC in Order 817 to address some specific gaps noted by FERC:
- 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
- Similar changes required for the RC in IRO-002

Reliability Basis

The changes in the TOP-001 standard increase System Reliability by closing gaps in requirements which could allow single component failures to disable visibility or to omit monitoring of some facilities that have important impacts on Reliability.

Standard Timelines

- TOP-001-4 Approved by Letter Order on 4/17/17
- Effective Date (Compliance Required) on 7/1/2018.
- Besides minor change to update terminology from SPS to RAS Change affects R10
- And adds R20, R21, R23 and R24

What is wrong with the use of term “Facilities”?

R10. Each Transmission Operator shall perform the following as necessary for determining System Operating Limit (SOL) exceedances within its Transmission Operator Area:

10.1. Within its Transmission Operator Area, monitor Facilities and the status of Special Protection Systems, and

10.2. Outside its Transmission Operator Area, obtain and utilize status, voltages, and flow data for Facilities and the status of Special Protection Systems.

Path 6. West of Hatwai

| Location: | Eastern Washington | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-------------|--------------------|---|--------|---|------|---|----------|---------------------------------------|-----------|---------------------------------|------|---|----------------|--------------------------------------|------------|---------------------------------|------|---|----------|---|------|
| Definition: | <p>Sum of the flows on the following line sections:</p> <table border="0"> <thead> <tr> <th><u>Line</u></th> <th><u>Metered End</u></th> </tr> </thead> <tbody> <tr> <td>Hatwai (BPA)-Lower Granite (BPA) 500 kV</td> <td>Hatwai</td> </tr> <tr> <td>Bell (BPA)-Coulee (USBR) 230-kV lines 3&5</td> <td>Bell</td> </tr> <tr> <td>Westside (AVA)- Grand Coulee (BPA) 230 kV</td> <td>Westside</td> </tr> <tr> <td>Dry Creek (AVA) 230 kV – Talbot (PAC)</td> <td>Dry Creek</td> </tr> <tr> <td>Bell (BPA)-Creston (BPA) 115 kV</td> <td>Bell</td> </tr> <tr> <td>N. Lewiston (AVA)-Tucannon River (BPA) 115 kV</td> <td>North Lewiston</td> </tr> <tr> <td>Harrington (AVA)-Odessa (AVA) 115 kV</td> <td>Harrington</td> </tr> <tr> <td>Lind (AVA)-Roxboro (AVA) 115 kV</td> <td>Lind</td> </tr> <tr> <td>Dry Gulch (AVA) 115/69-kV (PAC) transformer</td> <td>115 kV ★</td> </tr> <tr> <td>Bell (BPA) – Grand Coulee (USBR) 500 kV</td> <td>Bell</td> </tr> </tbody> </table> | <u>Line</u> | <u>Metered End</u> | Hatwai (BPA)-Lower Granite (BPA) 500 kV | Hatwai | Bell (BPA)-Coulee (USBR) 230-kV lines 3&5 | Bell | Westside (AVA)- Grand Coulee (BPA) 230 kV | Westside | Dry Creek (AVA) 230 kV – Talbot (PAC) | Dry Creek | Bell (BPA)-Creston (BPA) 115 kV | Bell | N. Lewiston (AVA)-Tucannon River (BPA) 115 kV | North Lewiston | Harrington (AVA)-Odessa (AVA) 115 kV | Harrington | Lind (AVA)-Roxboro (AVA) 115 kV | Lind | Dry Gulch (AVA) 115/69-kV (PAC) transformer | 115 kV ★ | Bell (BPA) – Grand Coulee (USBR) 500 kV | Bell |
| <u>Line</u> | <u>Metered End</u> | | | | | | | | | | | | | | | | | | | | | | |
| Hatwai (BPA)-Lower Granite (BPA) 500 kV | Hatwai | | | | | | | | | | | | | | | | | | | | | | |
| Bell (BPA)-Coulee (USBR) 230-kV lines 3&5 | Bell | | | | | | | | | | | | | | | | | | | | | | |
| Westside (AVA)- Grand Coulee (BPA) 230 kV | Westside | | | | | | | | | | | | | | | | | | | | | | |
| Dry Creek (AVA) 230 kV – Talbot (PAC) | Dry Creek | | | | | | | | | | | | | | | | | | | | | | |
| Bell (BPA)-Creston (BPA) 115 kV | Bell | | | | | | | | | | | | | | | | | | | | | | |
| N. Lewiston (AVA)-Tucannon River (BPA) 115 kV | North Lewiston | | | | | | | | | | | | | | | | | | | | | | |
| Harrington (AVA)-Odessa (AVA) 115 kV | Harrington | | | | | | | | | | | | | | | | | | | | | | |
| Lind (AVA)-Roxboro (AVA) 115 kV | Lind | | | | | | | | | | | | | | | | | | | | | | |
| Dry Gulch (AVA) 115/69-kV (PAC) transformer | 115 kV ★ | | | | | | | | | | | | | | | | | | | | | | |
| Bell (BPA) – Grand Coulee (USBR) 500 kV | Bell | | | | | | | | | | | | | | | | | | | | | | |
| Transfer Limit: | <p>East-to-West: 4277 MW West-to-East: Not defined <u>Current SOL Transfer Limits:</u> 4250 MW Year Round</p> | | | | | | | | | | | | | | | | | | | | | | |

Path 81. Southern Nevada Transmission Interface

Definition:

Sum of flows on the following lines:

| Line | Measuring Point |
|--------------------------------------|-----------------|
| Harry Allen - Mead 500 kV | Mead |
| Arden – Mead 230 kV | Mead |
| Equestrian – Mead 230 kV # 1 & # 2 | Mead |
| Greenway – Mead 230 kV | Mead |
| Henderson – BC Tap – Mead 230 kV | Mead |
| Henderson – Mead 230 kV | Mead |
| ★ Equestrian – Mead 69 kV #1 & #2 | Mead |
| ★ Lakes Las Vegas – Mead 69 kV | Mead |
| ★ Mead – Searchlight 69 kV | Mead |
| Faulkner – McCullough 230 kV | McCullough |
| McCullough – Nevada Solar One 230 kV | McCullough |
| McCullough – Tolson 230 kV | McCullough |
| Laughlin – Mohave 500 kV #1 & #2 | Mohave |
| Eldorado – Magnolia 230 kV | Eldorado |
| Eldorado – Nevada Solar One 230 kV | Eldorado |
| Northwest – Desert View 230 kV | Desert View |
| Indian Springs - Mercury 138 kV | Mercury |
| Amargosa – Sandy 138 kV | Sandy |

New R10 with Non-BES Facilities

R10. Each Transmission Operator shall perform the following for determining System Operating Limit (SOL) exceedances within its Transmission Operator Area:

10.1. Monitor Facilities within its Transmission Operator Area;

10.2. Monitor the status of Remedial Action Schemes within its Transmission Operator Area;

10.3. Monitor non-BES facilities **within** its TOP Area identified as necessary by the Transmission Operator;

10.4. Obtain and utilize status, voltages, and flow data for Facilities outside its Transmission Operator Area identified as necessary by the Transmission Operator;

10.5. Obtain and utilize the status of Remedial Action Schemes outside its Transmission Operator Area identified as necessary by the Transmission Operator;
and

10.6. Obtain and utilize status, voltages, and flow data for non-BES facilities **outside** its TOP Area identified as necessary by the TOP.

Data Exchange Capability

- Each TOP (R19) and BA (R20) shall have data exchange capabilities with the entities it has identified it needs data from...
- What was wrong with these requirements as they existed?

Concept of Redundancy



Concept of Redundancy

- Duplicate devices that are used for backup purposes.
- Redundancy protects against the internal failure of any single component.
- Should consider the “plug and switch test”
- Turning off power or unplugging any single component will not prevent the redundant backup system from operating.
- Note that “automatic transfer” to the backup is not specifically required for redundancy

Concept of “Diversely Routed”



Concept of “Diversely Routed”

- The practice of routing circuits along different physical paths.
- The physical separation of components and the circuits between them protects against external damage causing failure of both redundant systems.
- Should consider the “hammer or saw test”
- Physical damage of any component or circuit should not disable both primary and backup systems.
- Again “Automatic switching” is not required to satisfy diverse routing.

The New Requirements “paraphrased”

- Each TOP (R20) and each BA (R23) shall have data exchange capabilities, with redundant and diversely routed data exchange infrastructure within the TOP’s or BA’s primary Control Center, for the exchange of Real-time data with... External Entities RC, BA’s TOP’s it has identified it needs data from...
- Real-time monitoring (TOP and BA)
- Real-time Assessments (TOP)
- Real time analysis (BA)

What Infrastructure is in Scope?

- Intracompany Data Exchange? No
- Merchant or Revenue Data? No
- Voice Communications Capability? No*
- Backup Control Centers? No
- Primary Control Centers? Yes
- RTU data from Switchyard to Control Center? No
- Data Centers? Yes*

Control Centers

NERC Glossary 7/1/2016

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.

Category 1h Reportable Events

Which are flags for data exchange failure?

Loss of monitoring or control at a Control Center such that it significantly affects the entity's ability to make operating decisions for 30 continuous minutes or more. Some examples that should be considered for EA reporting include but are not limited to the following:

- i. Loss of operator ability to remotely monitor or control BES elements.

- iii. Unavailability of ICCP links, which reduces BES visibility

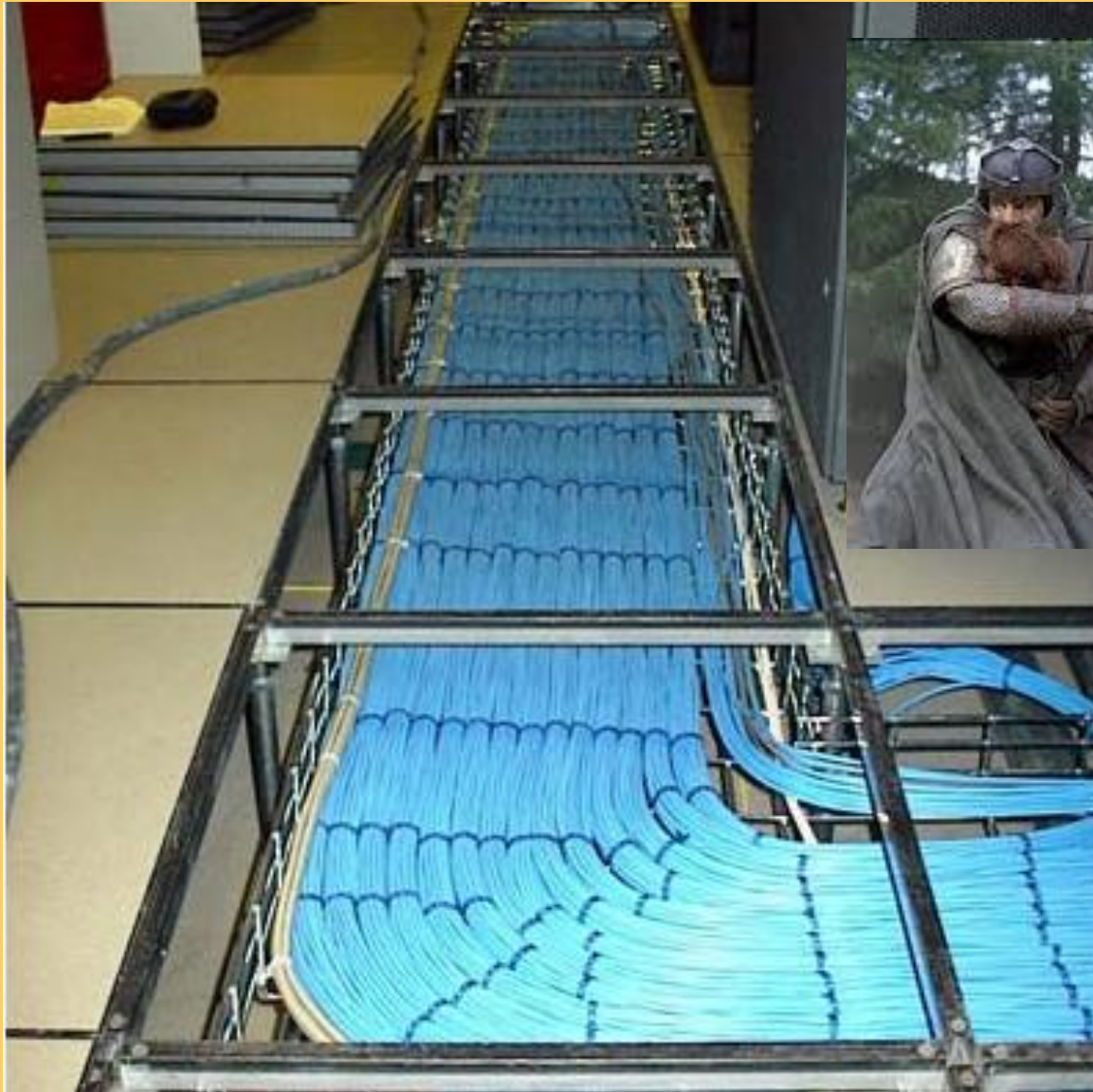
Examples of Components in Scope?

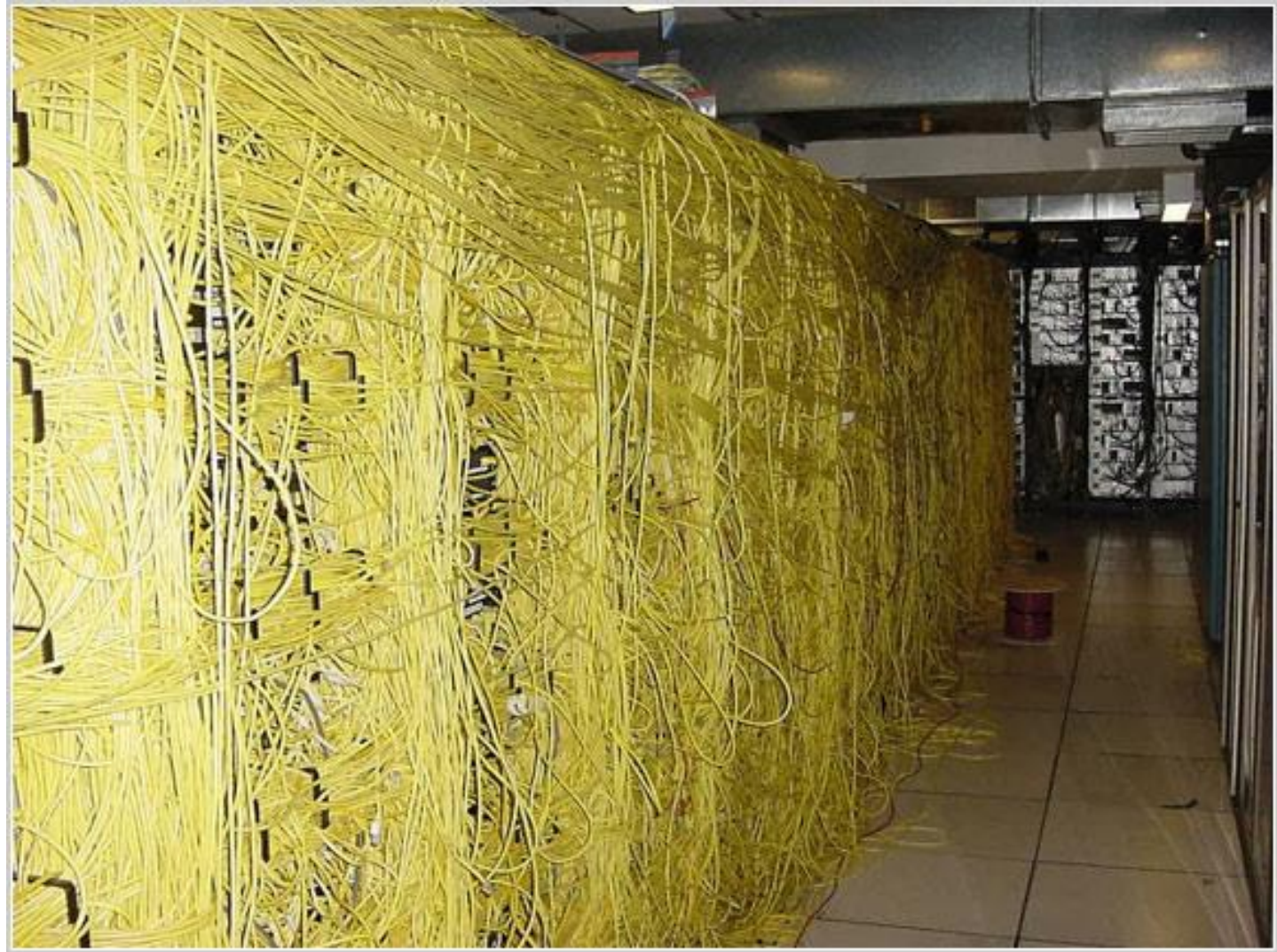
Components in the primary Control Center used for the exchange of system operating data

- Switches
- Routers
- Servers
- Power supplies
- Network cabling
- Communication paths between these components









Limits of Requirements

- Requirements apply “within the primary control center”
- Backup control centers are not addressed by these requirements.
- Since Control Centers may include associated Data Centers, redundancy and diversity must be satisfied within each with the objective of preventing any single point of failure.

Likely Audit Approach

- R20 and 23 are infrastructure requirements
- Diagrams and descriptions of the components required for data exchange capability.
- Diagrams and descriptions of the locations of the components and power supplies.
- Physical tour of the facilities.

Objective of Testing

- “Redundancy” implies there is an additional functional capability that is NOT normally in use.
- The testing required is simply to ensure this capability can be depended upon if needed.

Testing Requirements R21 and R24

- Each TOP (R21) and BA (R24) shall test its primary Control Center data exchange capabilities specified in Requirement R20 or R23 for redundant functionality at least once every 90 calendar days.
- If the test is unsuccessful, the TOP or BA shall initiate action within two hours to restore redundant functionality.

Testing Recommendations

- Type of testing is really up to entity but best practice is to test the entire redundant system. Standard is much more lenient
- Failovers are OK but may only test certain components.
- Have dated records of test performance.
- Have records of test results (pass/fail).
- For failures have dated and timed records of restoration actions.

Questions and Contacts



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