NERC Lessons Learned:

“Back Office EMS Support Tools Impact Real-Time Situational Awareness”

“External Model Data Causing State Estimator to Not Converge”

“Loss of Communication to Multiple SCADA RTUs at a Switching Center”

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Published

- Title
  - *Back Office EMS Support Tools Impact Real-Time Situational Awareness*
- Source of Lesson Learned
  - Reliability*First*
- Date Published
  - June 5, 2018

Problem Statement

- A registered entity identified that half of the contingency lists in the energy management system (EMS) were disabled

- Contingency lists from the real-time environment were modified inadvertently by an engineer performing a back-office study

Details

- After receiving a call from the reliability coordinator (RC), a transmission operator determined that contingency analysis results were incorrect

- Previous EMS snapshots were reviewed to determine when the problem began
  - While investigating, the entity discovered that half of the working contingency lists were disabled

Details

- An operations support engineer accidently opened a window containing the real-time contingency lists while performing a separate study
  - The contingency list was edited in the real-time case while the user was under the impression that it was a study case
  - Since only one user had control of the real-time environment, the EMS system didn’t notify the operator that real-time changes were being made

Corrective Actions

- Re-initialization was performed to enable all contingency lists
- Entity's EMS support staff instructed not to release control of the real-time case in the future
  - Prevents users from making changes to the real-time case without being notified by the system
- Entity trained its operations support staff regarding application separation between study and real-time cases

Lessons Learned

- When implementing changes on EMS applications, monitor other EMS applications to ensure that there aren't unintended changes being made to them
- Train operations support personnel on the risks posed by making setting changes on EMS environments
- Continue to work with RCs and TOs who can verify changes made to the entity's system

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- Title
  - *External Model Data Causing State Estimator to Not Converge*
- Source of Lesson Learned
  - Reliability*First*
- Date Published
  - June 5, 2018

Problem Statement

- Several entities in the ReliabilityFirst (RF) Region have experienced state estimator (SE) outages

- The neighboring entities changed the system topology but the receiving entities didn't update their SE representation

Details

- The SE was unable to solve because the ICCP data didn't match with the older model

- The entities executed the emergency operation procedures and contacted the respective RC and neighboring TOPs to confirm
  - Each entity contacted the respective RC and neighboring TOPs to help determine any overloads or contingencies in the system

Details

- The entity experiencing the issue engaged Operations Support personnel to troubleshoot why the SE didn’t converge
  - Data points can be inaccurate, bad data, or data that is not represented correctly in the external model
  - During the troubleshooting, they need to look for internal and external data points

Corrective Actions

- After determining that data points or external models were incorrect, the entities:
  - Removed bad data points from the model
  - Froze external data and reverted to the last known good solution
  - Discarded any unreasonable data points by placing data bounds and limits
  - Increased the number of measurements in unsolved areas
  - EMS models updated to monitor the impact of events and outages outside of the footprint

Lessons Learned

- Any change to the BES should be communicated to neighboring entities in advance so they can update their EMS models

- External models should display sufficient explicit details regarding system topology

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- Title
  - *Loss of Communication to Multiple SCADA RTUs at a Switching Center*
- Source of Lesson Learned
  - Western Electric Coordinating Council
- Date Published
  - June 5, 2018

Problem Statement

- Grid Operations lost communications with multiple substation remote terminal units (RTU) when a pre-existing configuration error was expressed

- The event had wide reaching impact to control center operations and field personnel

Details

- Communication with a total of 87 RTUs was lost, including 34 Bulk Electric System RTUs
  - The affected substations had operating voltages ranging from 4 kV to 500 kV
  - Substation control and data acquisition functionality were both lost
  - The total event duration was 78 minutes

Details

- Two months prior to this event, a Regional switching center that contained the EMS platform for the area's RTU communication was relocated
  - The power for this EMS platform was routed through an uninterruptible power supply (UPS)

Details

- A transformer that supplied the primary station service power was taken out of service for maintenance
  - A UPS general alarm occurred and was acknowledged by the Regional switching center and the transmission dispatcher
  - A dispatch request was never issued due to distractions with other scheduled switching
  - The UPS ran on battery for approximately 5.5 hours until the proper voltage could not be maintained

Details

- The UPS restart switch was in the factory default manual position and was not switched to the “auto” position when installed
  - In the manual position, the main circuit breaker will trip from a momentary loss of arc power and battery power will be used
  - The auto position will ensure that the main circuit breaker remains closed and the UPS transfers to an alternate power supply

Corrective Actions

- Future installations of similar UPS systems have been flagged
- Mandatory operation response to alarms of this nature have been reinforced
- Switched to auto position to ensure that the main circuit breaker remained closed and the UPS transferred to an alternate power supply

Lessons Learned

- Contact substation operators after a UPS alarm triggers with an unknown cause
- The contractors startup checklist should include all necessary settings, including switch positions
  - Must stay informed on features introduced by new equipment
- More planning when removing an important power source is necessary