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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• Title
  – Back Office EMS Support Tools Impact Real-Time Situational Awareness

• Source of Lesson Learned
  – ReliabilityFirst

• 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
• 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
• 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
• 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
• 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
• 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
• 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
• 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.
• 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
• 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)
• 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
• 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