NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Lesson Learned

Loss of State Estimator due to Contradicting Information from Dual ICCP Clusters

Primary Interest Groups

Transmission Owners (TOPs)
Reliability Coordinators (RCs)
Balancing Authorities (BAs)

Problem Statement

The entity encountered an operational problem, causing the state estimator (SE) to become nonconvergent. An evaluation indicated that SE was failing upon opposing device status sent from independent dual ICCP clusters.

Details

The entity encountered an operational problem, causing the SE solution to become invalid. It was discovered that hundreds of external devices periodically switched status and two isolated topology areas were formed due to external devices switching status.

The issue with isolated topology areas was resolved by disabling supervisory control and data acquisition (SCADA) updates for particular external companies and manually forcing external entity devices closed.

The cause of SE issues was determined to be a corrupted database on the backup ICCP cluster.

Order of Events

1. The SE received information that points on the primary ICCP cluster (defined as Site1 in SE) were suspect, and the backup ICCP cluster (defined as Site2 in SE) was chosen. The database on the backup ICCP cluster had incorrect indexes for point statuses and analog values. This caused the state change of hundreds of points and value changes for analogs.
2. The SE received information that the backup ICCP cluster was suspect and again chose the primary ICCP cluster. It was confirmed with the vendor that the primary source will be selected if all sources are suspect. Using the primary source corrected the indexing, resulting in the state change of those same hundreds of points and value changes for those same analogs. The corrupted database (the backup) was corrected by rebooting the backup ICCP cluster and the SE solution became valid.

The entity notified the area RC that the SE and real-time contingency analysis (RTCA) were down and requested that the RC monitor contingencies until the SE and RTCA could be restored. During this event, there was no problem with the outbound ICCP data.

The entity utilized the backup capability, real-time line outage distribution factor (RTLODF), to perform their real-time assessment during this period of time.

The energy management system (EMS) SCADA functionality (control and indication) was not affected by this event and no transmission facilities were impacted.

Corrective Actions

The two ICCP clusters each have three servers in them. This provides the ability to update the database of one cluster while maintaining complete failover capability in the other cluster.

After an investigation, it was determined that the database in the backup cluster had become corrupted and the point indexes were shifted. It has not been determined how this occurred. A reboot of the backup cluster corrected the problem.

Lessons Learned

- In the event of corruption of incoming SCADA data, entities should develop and practice plans for disabling one or more external company data feeds.
- To minimize the possibility of database corruption or other problems during model updates, servers should be rebooted before any changes are implemented under the vendor's recommendations. Explore the possibilities for comparing and verifying model and database attributes between servers.
- A dashboard should be developed to quickly show the values from all SCADA sources and the SE for each piece of incoming data. Searching for data points in need of attention can be made easier if data quality issues or differences between sources are highlighted by color.
- The paging and call out procedures should be reviewed to determine if support staff are notified within an appropriate time frame.
- Collaboration tools (chat sessions, conference bridges, email, etc.) should be reviewed and tested to determine if modifications are needed while staff may be working in disparate locations.

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