NERC Lessons Learned

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Loss of SCADA/EMS Monitoring and Control – GPS Clock Failure

Overview

Manual intervention was required stemming from the replacement of a failed Global Positioning System (GPS) clock led to a loss of supervisory control and data acquisition (SCADA) and energy management system (EMS) monitoring and control due to an incorrect configuration of the network time protocol (NTP).

Details

- Pre-Event: A failed GPS clock in the SCADA/EMS network was not replaced, creating a single point of failure.
- Day 1-2: A “NODE OFFLINE” alarm led to troubleshooting and confirmation of the GPS clock failure, with plans to replace it.
- Day 3: The failed GPS clock was replaced, causing logging issues and time discrepancies across workstations.
- Day 4: Forcing the servers to use the new GPS clock led to loss of monitoring and control connections; it was later found that the clock was 1,024 weeks behind. The clock was disconnected, servers reconfigured, and functionality restored.

Corrective Actions

- SCADA/EMS servers use each other and network switches as trusted time sources.
- New NTP design includes four new GPS clocks for four-node synchronization and onboard oscillators for maintaining time during GPS signal failures.
- Until the new design is implemented, main SCADA/EMS server times are manually verified periodically to ensure synchronization.

Lessons Learned

- Understanding Impact: Incorrect NTP in SCADA/EMS can cause data errors, communication issues, and increase cyber security risks.
- Verification Procedures: Implement procedures to verify both DATE and TIME when NTP time sources are modified, changed, or replaced.
- Dependency Testing: Conduct dependency testing on NTP design to eliminate single points of failure.
- Staff Training: Provide training for real-time staff on SCADA/EMS loss-of-service procedures to handle clock failure events effectively.

Reference

- Loss of SCADA/EMS Monitoring and Control – GPS Clock Failure

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