

Lessons Learned

Loss of Substation Data Circuits to SCADA

Primary Interest Groups:

Transmission Owners (TOs)
Transmission Operators (TOPs)
Balancing Authorities (BAs)
Reliability Coordinators (RCs).

Problem Statement:

While initiating a transfer of SCADA (Supervisory Control And Data Acquisition) from the company's alternate control center (ACC) to primary control center (PCC), an interruption of vendor-provided substation data circuits occurred that resulted in a temporary and partial loss of SCADA operating and monitoring capability for more than 30 minutes.

Details:

Data communication services are provided to a majority of the company's substations by a telecommunications service provider (referred to in this document as the TelCo). The remaining portion of substations use the company's internal network for data communications.

During a scheduled transfer of its SCADA from the ACC to the PCC, the company experienced a loss of all TelCo-provided remote substation data circuits for more than 30 minutes. The transfer was scheduled to begin during the late evening hours following a day of network maintenance (firewall upgrades), which required the successful transfer of SCADA from the PCC to the ACC.

Once the maintenance work had been completed, the company directed the TelCo to transfer all data circuits back to the PCC. Within minutes of the transfer process, it became evident that the reconnection phase of the process had failed. This resulted in a loss of operating and monitoring functionality for more than 30 minutes for the majority of the company's substations.

In accordance with its procedures, the company notified its RC and initiated callouts to staff key Bulk Electric System (BES) substations while continuing to monitor ties through all inter-control center communications protocol connections with neighboring TOPs. The TelCo, in turn, began investigating and trouble-shooting the event.

As a result of its investigation, the TelCo determined that it had experienced a major network outage that impacted its ability to test and map circuits during the reconnection process. The outage occurred just after the TelCo's test center had unmapped the Company data circuits from the alternate recovery path (ACC disconnect) and before they could be mapped to the primary path (PCC reconnect). This left all data circuits out of service. Furthermore, the investigation identified multiple hardware failures within the TelCo's network.

Approximately eight hours after the event first occurred, the TelCo reported that all network issues had been resolved and the affected data circuits had been restored.

Corrective Actions:

The company recommends these actions to address the issues that led to this event:

- Schedule future SCADA data circuit transfers during daytime hours on business days. This would facilitate and enhance response times in staffing BES substations. During daytime hours, substation technicians and electricians are typically available at work sites and do not have to report to work from home as would be the case for incidents occurring during nighttime hours. Accordingly, pertinent operating procedures to reflect the scheduling of SCADA data circuit transfers during the morning hours will need to be revised. This action would provide an additional internal control to ensure that SCADA data circuit transfers are appropriately scheduled.
- In collaboration with the TelCo, develop a script used to disconnect and reconnect SCADA data circuits that splits the process into several blocks. A block would have to be run and completed (disconnected and reconnected) before initiating another. This would significantly mitigate the risk of an outage to all of the TelCo-provided SCADA data circuits.

Lessons Learned:

- Events occurring during the nighttime hours present unique challenges due to the limited immediate availability of key personnel. By planning and scheduling maintenance activities that require critical steps (i.e., the transfer of SCADA data circuits from primary to alternate control centers and vice versa) during the daytime hours on business days, response times in staffing BES facilities to regain operational control can be significantly reduced.
- The transfer of SCADA circuits from one control center to another is a critical operation. Close collaboration with communication vendors who own and/or operate the circuits is essential in determining ways to manage and mitigate the risk of an event leading to the total disruption of data communications to substations.
- Additional considerations:
 - Consider redesigning communications systems such that the most critical BES substations communicate simultaneously with entirely separate physical paths (and possibly separate vendors) to both control centers, eliminating the need for any TelCo communication transfer activities.
 - When failing over, procedures should be in place that verify the soon-to-be active server/circuit has all critical components functioning.

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