



PJM EMS OUTAGE

May 28 2010

Root Cause Overview

- An overview presentation of PJM's root cause investigation findings regarding its EMS outage of May 28, 2010.



Description of the Event

05/27/2010

- Routine data point deletion to remove unused data points is planned on 05/27/2010. Final testing of plan completed.

05/28/2010

- Data points deleted in PJM PRD EMS system. Seconds after the database job completes, both PJM's COM servers fail at 15:03 on 05/28/2010.
- Emergency Service Restoration effort starts at 15:15.
- COM servers restored, however there are ongoing issues with the state estimator from 15:24 through 17:07
- Dispatch tries to failover to PJM's Backup EMS system at 16:20. One-button failover does not work.
- Support teams at Dispatch start manually fixing breaker values at 16:48.
- Refresh of breaker status requested on Midwest ISO ICCP link at 16:59.
- All functions return to normal state at 17:07.



Summary of Impacts

Summary of impacts at PJM:

1. At 15:35 Dispatch stopped running off of Unit Dispatch System (UDS) and reverted to manual control. An RCIS message was sent. The All call message instructed all companies to monitor the system.
2. At 17:38 Dispatch resumed using UDS.
3. Throughout the event the PJM monitored the system through SCADA, its Transmission Owners, and other back-up tools and protocols.

Summary of impacts as related to PJM by Midwest ISO:

1. On May 28, 2010, at 1424 (EST) a burst of breaker status changes were received from the PJM ICCP indicating that multiple 765, 500, 345, and 138 kV circuit breakers were open causing significant topology changes in Midwest ISO State Estimator. The Midwest ISO discussed the issue with PJM who indicated that the PJM EMS was down. The Midwest ISO began closing breakers manually in its SCADA system.
2. At 1445 (EST), the Midwest ISO declared an SSL-1 Yellow alert due to inaccurate topology and intermittent solutions of questionable quality. Thereafter, the breaker status from the PJM ICCP started to come in closed and eventually returned the topology to its correct state.
3. At 1555 (EST), the Midwest ISO declared an SSL-0 Green alert due to the Midwest ISO State Estimator solving consistently.
4. Throughout the event the Midwest ISO monitored the system through SCADA and other back-up tools



Root Cause

The Engineering Support engineer who ran the scripts to analyze the data points used the wrong script.

When Engineering Support ran these scripts to perform their analysis it did not contain the correct list of conditions to check for and, as a result, an analog point was deleted which was referenced in an internal SCADA calculation. A database job submitted to remove this point in the Production Control Test (PCT) and Production (PRD) environments was activated and deleted the point in question. An unrelated process in the EMS triggered a calculation which required the deleted point. The calculation which referenced the deleted point failed, which caused the EMS COM servers listed in this event to fail.



Contributing Factors

1. Non-significant EMS Database work does not require the level of approval and communication that are present in PJM's Change Management processes.
2. Cleanup work such as deleting some classes of data points is not regularly scheduled and conducted in the EMS by Engineering Support.
3. The EMS Networking and Engineering Support groups did not notice that the Midwest ICCP link integrity scan was turned off.
4. The default data that is loaded into the COM servers from the ADM servers following a dual COM outage contains incorrect operating values.
5. The process to failover EMS operation to PJM's backup control center in the event of a dual COM server failure needs further enhancement.



Recommendations and Next Steps

- A. Engineering Support needs to improve their process and scripts that are used to delete EMS data points. The script and the conditions it checks for should be regularly reviewed for proper operation.
- B. PJM should investigate whether it needs to enhance the rigor in its EMS database change processes.
- C. PJM should improve notifications of routine work between Engineering Support, ITOC, and Dispatch.
- D. Improve monitoring and alerting processes for COM Outages. Such alerting would make PCT run issues more evident.



Recommendations and Next Steps

- E. The ITOC will develop processes to address a dual COM failure that causes the ICCP links to be recycled.
- F. EMS Networking will perform a review of all ICCP link integrity scan configuration settings on a regular basis.
- G. EMS Networking will contact Siemens to see if there is an enhancement to establish that breakers will not display as an open status after a double COM box failure.
- H. EMS Networking will extend the BUCC failover process in the event of a dual COM failure.
- I. EMS Networking will verify that the failover process changes are reviewed by the Business Continuity Planning department in order to ensure that changes to this process enhance compliance to NERC CIP and other BCP requirements.

- For particular questions please call or e-mail
 - Patrick Brown 610-666-4597
brownp@pjm.com
 - Tom Bowe 610-666-4776,
bowet@pjm.com