

Root Cause Analysis

Incident: Loss Of Utility Power

Site Location: SDTC

Name of Customer: SDTC Clients

| | | | |
|---------------------------------|------------------------|----------------------------|---|
| Ticket #: | 807115 | Services Affected: | All Electro-Mechanical and Most Infrastructure Support Systems. |
| Start: | 14:03 (Loss of UPS) | Subs Affected: | N/A |
| End: | 14:19 (Power Restored) | Post Incident Date: | 6/22/2011 |
| Power Outage Duration: | 16 minutes | Document Number: | 2 |
| Network Outage Duration: | N/A | | |

Prepared by: Ken Carter

End User Impact: All client IT hardware and all applications lost power / production.

RCA Update 06 28 11

SDGE Outage RCA Update: SDGE states that the cause of the outage that occurred on 06 22 11 was due to a protection relay that "hung" in the trip position at the sub-station feed to all circuits supporting the SDTC. They further stated that this was an anomaly that was experienced during routine sub-station maintenance and does not normally occur. An additional meeting is scheduled with SDGE in two weeks to follow up and review wave-form analysis results and discuss providing customer's prior notification of scheduled sub-station and circuit maintenance activities that could potentially impact production at our mission critical facilities.

Transfer Control Relay Dedicated UPS System RCA Update: Subsequent forensic analysis of the UPS system supporting the logic control relays has disproven the initial suspected failure of the UPS system to function as designed. The UPS system supported the control relays until batteries failed, approximately 15 minutes after the outage occurred.

OCPD Lock-out and CT Primary Side Fuses Blown RCA Update: The utility and emergency breaker functionality is controlled by the control transformers (CT's) feeding the transfer control relays; the sensing for the relays is on the line side feed to the control transformers but the on the load side of the fusing for the CT's themselves. All (4) CT fuses supporting both emergency buss CT's were blown due to an over-current situation. As a consequence of the blown fuses, the control relays were not able to sense that the generator was at requisite voltage and frequency and able to accept load; therefore the breakers were not commanded to close. The fuses on the load (utility side) Of the CT's did not blow at any time, proof that a utility over-current situation did not occur.

The engine generator functioned as designed and without issue; this indicates that the fuses had to have seen an over-current situation prior to the event of June 22nd. This pre-existing discrepancy, however, remained unknown until the actual utility outage occurred on June 22nd due to the technique whereby normal monthly generator transfer tests are conducted. A review and cross-reference of the error logs and histories of the engine generator coupled with the transfer control logic relays provides the strongest argument that the actual over-current situation that caused the fuses from the generator to the CT's to blow was a documented line fault from a temporary engine generator feeding the buss in October, 2009.

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Monthly transfer testing is conducted by rotating a "Transfer Test" Selector Switch, that bypasses the normal "loss of utility" transfer sequence (that relies on a loss of utility power for 10 seconds to initiate a generator start signal) and allowing an open transitioned transfer by starting the generator, opening the utility breakers and closing the generator breakers, all with utility power still available. As a consequence of the testing protocol, an actual discrepancy in the system would not have been noticed until either (1) semi-annual PM of the switchgear was conducted (scheduled for July, 2011) or an actual loss of utility (which occurred).

To remediate the consequential error of the testing protocol, we are installing a set of LED's that remain illuminated provided the fuses are in place and closed; additionally we are providing a test lamp on the LED's and the LEDs will be mounted on the front of the switchgear and monitored as part of daily rounds of the facility.

These steps coupled with the already programmed semi-annual maintenance to the switchgear and further augmented with semi-annual "open utility feed" transfer testing will remediate the issue with the CT fuses and monitoring thereof.

The power distribution system design in place at the SDTC is consistent and in most cases exceeds industry standards for implementation in "like" environments supporting the level of mission critical load in the facility; there is no indication that any modification of the system, other than those minor improvements referenced earlier for monitoring of fusing, is required.

Detailed Actions/Next Steps (all questions and actions required to close this post incident)

| Action | Description | Status | Owner | Due Date | Date Closed |
|--------|--|-----------|-------|----------|-------------|
| 1.0 | Re-locate Transfer / Logic Control Relays (SEL 351) to Powerware 9390 UPS System | Pending | CI | 07 09 11 | |
| 2.0 | Determine cause for OCPD lock-out and CT primary side fuses blown. | Completed | CI | 06 28 11 | 06 28 11 |

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