G&W Electric

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CASE STUDY

Cal Poly Pomona

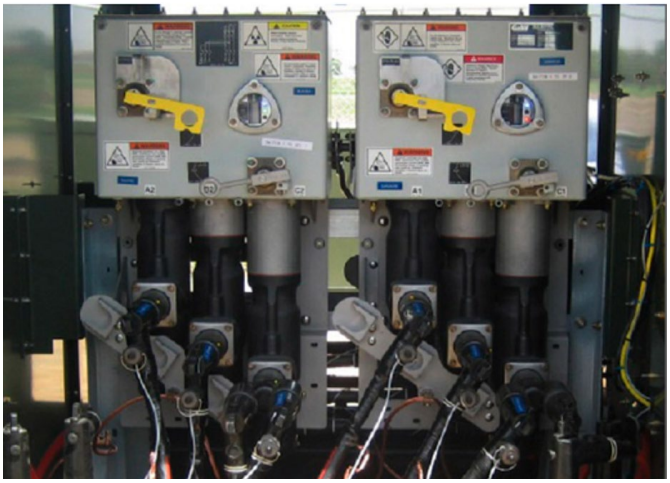
G&W Electric's Campus Grid Modernization Solution

Cal Poly Pomona is a state university located in Pomona, California, spanning 1400 acres and enrolling 30,000 students. The university required a complete modernization of its campus-wide electrical distribution system.

This process required major milestones such as system engineering and testing, factory acceptance testing, training for operators and documentation with the goal of eliminating any issues during the initial commissioning of the solution for a seamless transition for the university.

The opportunity: Modernizing campus power distribution for research and residential needs

The university campus is home to several research departments performing tests that require premium power but can handle short power outages if they are sustained by local uninterruptable power supply (UPS). This created a need to upgrade to modern conductors, more reliable automated switchgear and a central monitoring Human Machine Interface (HMI) solution. state of repair.



The challenge: Ensuring reliability in a complex campus network

The university's power infrastructure required the following capabilities to increase reliability:

- The ability to automatically switch between utility sources.
- The ability to quickly isolate any fault on the three campus loops and restore power to all loads.

The ability to be alerted to system events, retrieve event data, monitor switch position and feeder topology, and control the gear remotely ahead of planned outages.

The reliability of the campus's electrical loads was of paramount importance. In the event of a fault in the loop, the system needed to prevent the entire campus from experiencing prolonged outages—as the time it takes for the maintenance crew to locate, isolate and fix the issue is usually considerable. To enhance efficiency, the system needed to allow for central monitoring and control of the switchgear, as well as provide access to event reports, particularly in cases where a transformer load tap trips.

This was a complex project involving the integration of multiple systems, and all of them needed to be commissioned efficiently during construction to maintain the campus's schedule. G&W Electric set out to replace all aging padmount switchgear on the distribution system with a new automation system that would deliver a continuous supply of power to all campus facilities. The central monitoring and HMI system also needed the ability to be expanded easily to handle any plans of the university for the future.

The solution: G&W Electric's comprehensive approach to power distribution

G&W Electric was able to provide a comprehensive solution to address the university's complex requirements through the integration of LaZer® Power Grid Automation, solid dielectric insulated switchgear and Hitachi relays.

The existing metal-clad breakers at the university substation underwent relay upgrades, enabling communication and control to the LaZer Automation System Campus HMI system. G&W Electric provided logic and networking to ensure the relays controlling the metal-clad breakers could accomplish a Main-Tie-Main restoration scheme in the event of a loss of utility power.

Communication between relays, using the open and non-proprietary IEC61850 GOOSE messaging protocol, ensures confirmation of unhealthy power isolation and closing of the tie breaker to restore power to the remaining campus. Additionally, all breakers and relays from the existing metal-clad switchgear were integrated into the LaZer Automation System Campus HMI software for remote monitoring and control via DNP3 protocol. G&W Electric partnered with Survalent to create the LaZer Automation System and HMI software package that is focused on providing campuses centralized monitoring, control, and Fault Location Isolation and Service Restoration (FLISR) to increase reliability.

The new system featured three distribution loops originating from the substation, consisting of 27 G&W Electric Trident® solid dielectric insulated padmounted switchgear units.

These were equipped with Hitachi relays, current and voltage sensors, magnetic actuated switches capable of isolating faults in 3-4 cycles and communication equipment for real-time monitoring and control. The magnetic actuated switches ensure faults are isolated and power is restored to all loads within approximately 20 cycles.

Factory Acceptance Test (FAT)

Prior to implementation, CalPoly was able to work with G&W Electric to participate in a Factory Acceptance Test (FAT) of the LaZer automation solution. During the FAT, all switchgear points were mapped, tested and documented to minimize commissioning time, cost and errors. This is a significant benefit in having a single vendor involved in integrating the system on-site.

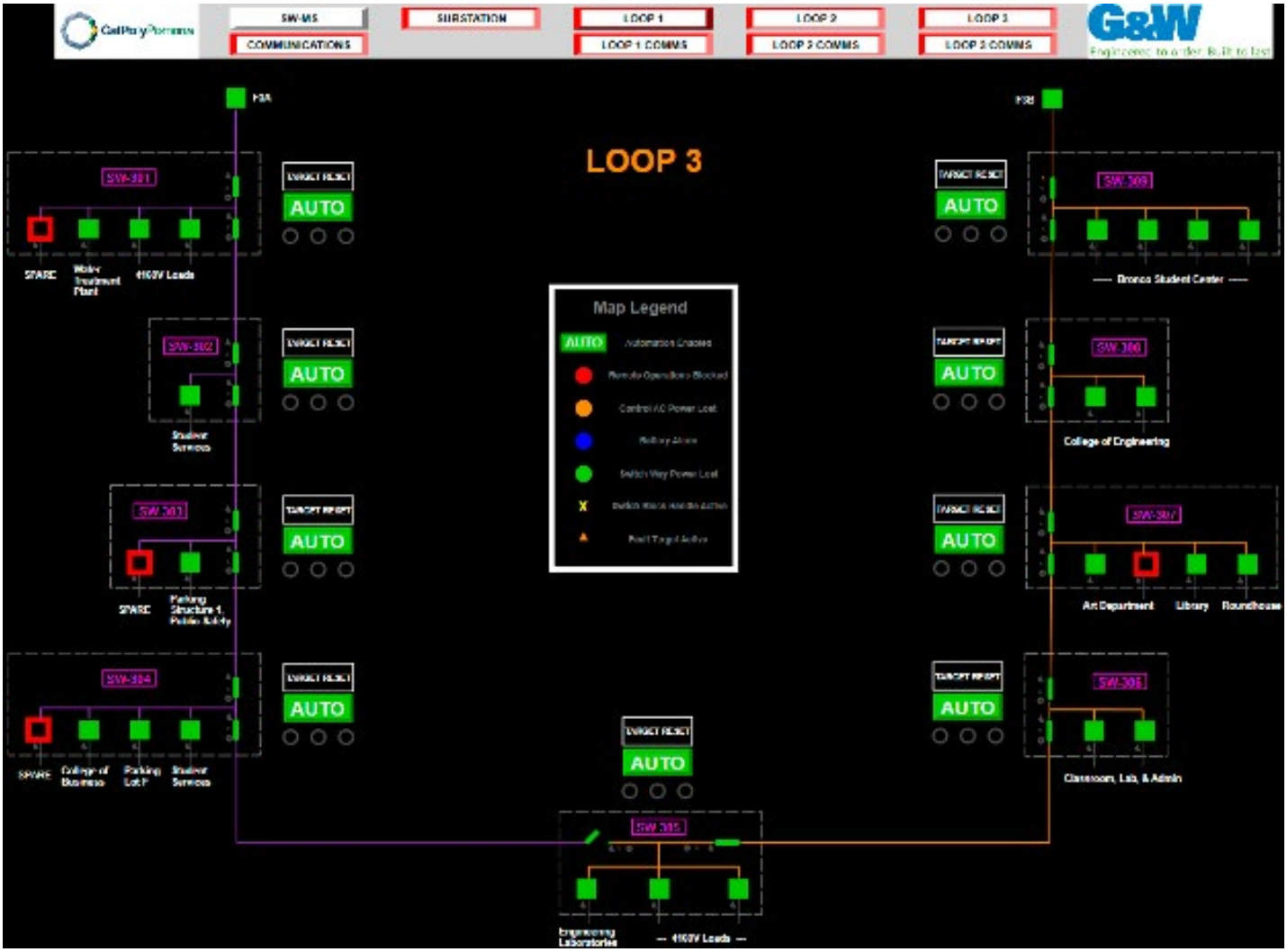
The FAT was beneficial in evaluating the complete system functionality, trying to “break” it, as well as implementing enhancements to the automation schemes.

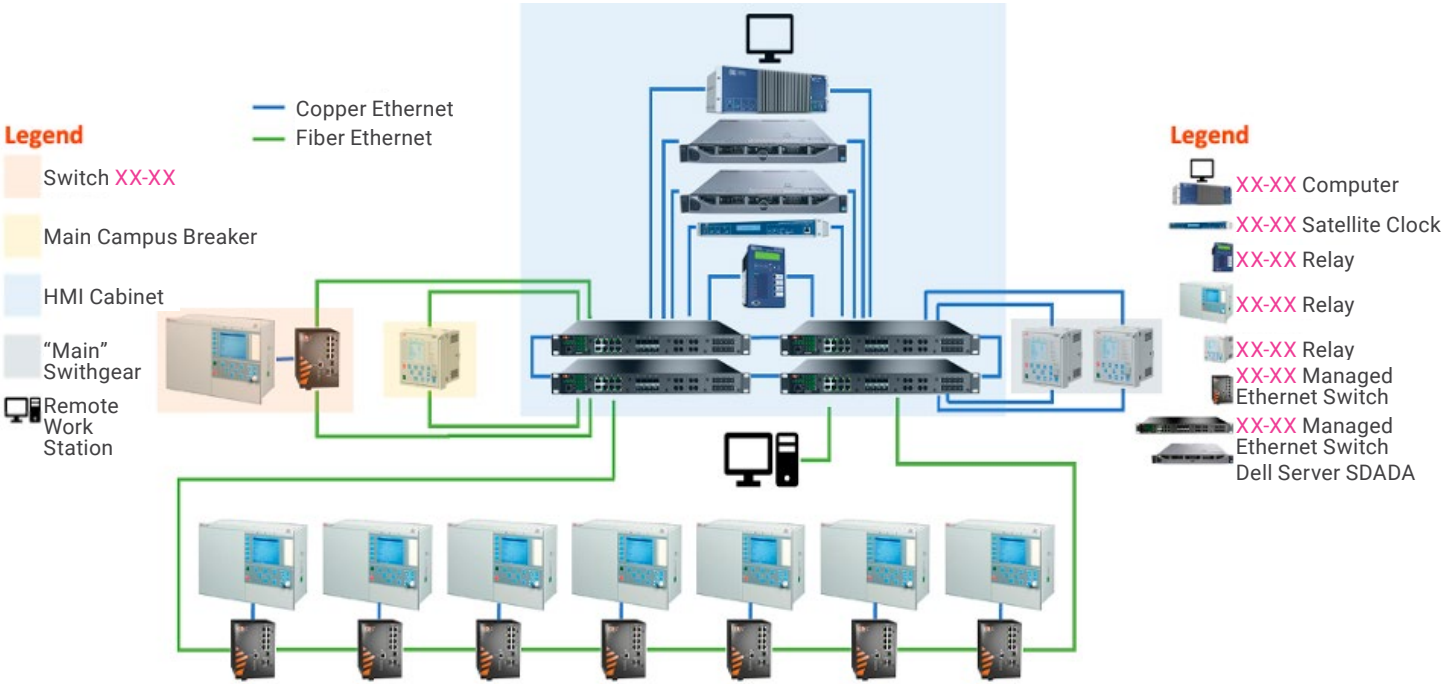
Enhanced power monitoring and control: HMI workstation and communication network design

G&W Electric also designed and built HMI workstation cabinets, to be installed both at the substation and in the facilities department offices. These stations include redundant servers that are continually synchronized for zero downtime. Managed ethernet switches from iS5 direct communication traffic and secure the network.

Key features of the communication network design

- Communication between the Trident padmounted switchgear and workstations is maintained via a fiber optic ring.
- Redundant ethernet switches and communication paths
ensure constant connectivity and immediate alerts if a path
is compromised.
- Multiple users were configured for access to the software to either monitor only, to monitor and control, or to make modifications.
- Multiple screens were customized to the utility's needs and operator preference to view information as efficiently as possible.





Fault Location, Isolation, and Service Restoration:

The system can be toggled between automatic mode—enabling for LOV or FLISR operations—or manual mode. Individual switchgear can also be removed from the automatic restoration scheme during maintenance work. In the event of a fault, only the switch closest to the fault trips, while blocking signals via IEC61850 GOOSE messages are sent toward the source, ensuring that as few loads as possible experience an outage.

The isolation and restoration scheme then identifies the faulted line segment and sends a command to the corresponding switchgear to fully isolate the faulted segment. Last, if the alternative power source is healthy, the open point switch on the loop is sent a close command to restore power to all loads on the loop.

The results: A turnkey project with smooth and efficient implementation

The turnkey project was completed on time and successfully commissioned and tested on site. The entire FLISR logic and the operation of the loops, as well as the HMI workstations, were fully tested at the factory before shipment. This approach significantly reduced commissioning time, as any hardware or configuration issues were resolved prior to on-site delivery, allowing the commissioning team to focus on network communication and connection points.

Campus facilities staff were provided with training on all aspects of the system, including the Trident switchgear, relays, communication and Survalent software. Utilizing one vendor for the entire scope enabled the training to cover how the different hardware work together and how to troubleshoot across them. Additional comprehensive system training was provided to a larger audience during site acceptance testing and commissioning.

Fortunately, the campus has not experienced a fault or utility outage to date since the system was commissioned. The facility staff has found great value in monitoring the topology of their system, including if switches are open or closed as opposed to their previous hand-written documentation process.

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