IEC 61850 Protection and Control Solutions

Panama City, Panama

Testing of New Control Enclosure Relays

Modern Substation Engineering

As the demand for power continues to grow throughout the world, our substations must be modified or upgraded to account for these system changes. Panama has been experiencing this growth, similar to many other countries, and as a result recently installed four (4) 115kV capacitor banks at one of its major substations. These capacitors were set up to maintain local voltage levels, and systematically support increased power demand.

Because of the critical nature of this substation a very robust protection and control scheme was required which included primary and secondary relaying. Both the primary and secondary relays were to have identical control functionality, similar protection and alarm functions, and the ability to communicate with the local HMI and the remote National Dispatch Center's SCADA system. Should failure of the primary relay occur, the secondary relay would be able to maintain protection of the feeder, provide control operations for the circuit breaker, and communicate with the local HMI and SCADA systems.

"The goal of every project is to provide a solution that meets the customer's needs and exceeds their expectations."

Wunderlich-Malec Engineering, Inc.
Portsmouth, NH

Answers for infrastructure & cities.

New Control Enclosure at Panama Substation

New 115kV Capacitor Bank at Substation

Control Enclosure in construction at the modern Wunderlich-Malec Facility Winslow, ME

Challenges for Wunderlich-Malec Engineering, Inc.

Due to the level of complexity of the protection and control scheme and quantity of alarms from the substation circuit breakers, several I/O status states were required at each relay location.

A traditional solution would be to hard wire each of the states required, for example breaker status, into an input (I/O) at each of these relays. This input could then be mapped and programmed into the functionality of the relay as required. This would require several auxiliary relays, possibly adding additional relays, and the installation of a substantial amount of hard wiring between panels.

The main goal of this project was to ensure that the primary and secondary relays had nearly identical functionality, and if the primary relay were to fail all critical alarms, control functionality and protection could be maintained by the secondary relay only. Control of the substation is normally performed from the remote SCADA; therefore transfer of protection & control to the secondary relay must be automatic and seamless, while alerting the remote SCADA of the primary relay failure.

Our solution

By incorporating the use of IEC 61850 protocol GOOSE messaging and Siemens SIPROTEC 5 relaying, I/O status states (including breaker interlocking and trip commands) could be communicated between relays without the added costs and labor associated with installing auxiliary relaying and cabling to each relay. Breaker status, alarms, and control permissive states were communicated to the SCADA system over Ethernet using IEC 61850 MMS mapping.

Benefits for Wunderlich-Malec Engineering, Inc.

During startup and commissioning the customer requested modifications to the previously approved interlocking as well as the protection and control scheme. These changes were made by modifying logic within each relay, and were then verified during testing.

If IEC 61850 protocol was not used, hard wiring changes and additional auxiliary relays would have been required adding weeks to the schedule while increasing startup costs.

If modifications to the protection and control schemes are required due to substation upgrades in the future, changes can be accomplished and tested prior to any required shutdowns. This results in significantly reducing potential outage time, and minimizing the work performed in energized control panels.

"The SIPROTEC 5 relays provided by Siemens helped us achieve the best possible solution for our customer, and allowed for a much more efficient testing and commissioning process to meet everyone's needs."

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