

APPLICATION GUIDE- AG258

ADVANCED MEDIUM VOLTAGE SWITCHGEAR AND GENERATOR CONTROL SYSTEM

Products: SAI AGC-4 Generator, Main, & Tie Controls, Siemens GM-SG Medium Voltage Switchgear, SAI 19" Touchscreen HMIs, Schneider Powerlogic PM5300 meters, GE RX3I PLCs, and SEL 700G, 751A, 587Z, & 387 relays.

Issue: The U.S. Army Corp of Engineers (USACE) was assigned the critical task of designing and constructing a series of electric barriers in the Chicago River to prevent the migration of invasive species into the Great Lakes. These electric barriers would be powered and controlled by a medium voltage switchgear and control system that would power and operate the barriers via a specific and detailed sequence of operations defined by the USACE. The application called for five 4.16kV switchgear lineups. Each lineup included (2) utility service entrance and distribution switchgears, (2) generator main switchgears, and (1) load bank switchgear assembly. The utility main switchgears each had ties that allowed for connection to both generators, as well as to the alternate utility switchgears. Each generator switchgear had provisions to feed each utility lineup, as well as a separate bus dedicated for load banking. The USACE preferred that the switchgear utilize the Siemens type 3AH3 circuit breaker.

The application called for emergency backup in the event of a failure of a single utility source by utilizing both generators paralleled to provide backup power, and automatic return to a restored utility source after a user specified period of time and stability. It also called for offloading of a generator in the event a single engine could carry the full load based on real time load monitoring.



In order to maximize the life cycle of the generators, which generator to offload was to be based on total run time. In the event of a dual utility failure, the system would choose which bus to support based on the real time loading at time of the source failures, so as to ensure that the heaviest loaded bus would be prioritized. In addition to these automatic sequences of operation, a number of manual modes were required, which would allow the operator to select the source and load configurations, with all protections still enabled.



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Solution: SAI designed the base switchgear assemblies to include the preferred Siemens vacuum circuit breakers and Siemens GM-SG switchgear, and included utility service entrance and CT/metering sections for integration with the equipment. A complete control scheme was developed, utilizing SAI AGC controllers for generator paralleling & control, and for real time monitoring. The scheme included PLC coordination for all sequences of operation, transferring of loads and breaker transfer pairs, and an HMI utilizing the SAI 19" touch screen interface to allow for ease of monitoring and operation by the facilities manager. At SAI's facility, the Siemens GM-SG base structures were integrated with the SAI designed and built doors and controls, and the completed switchgear assemblies were then interconnected with the breaker controls and current/voltage transformers.

SAI then conducted comprehensive factory acceptance testing under the supervision of the consulting engineer of record and the USACE representatives. At the site, SAI's field service engineering team performed full start-up verification testing and operation, integration with the Building Management System vendor to test all communications outputs to the building management system, and then performed operational testing for level 5 commissioning of the system. SAI also provided full classroom and operational training with the facility engineering team at the conclusion of the system integration.



Result: The system is functioning as expected. The second phase of the project was subsequently designed, built, shipped, and successfully commissioned as well.

