The Pentagon
Washington, DC
Mission Critical Chilled Water System

Headquarters of the Department of Defense, the Pentagon is one of the world's largest office buildings. The Mission Critical Chilled Water System (MCCWS) serves critical areas within the Pentagon, such as the National Military Command Center (NMCC).

The Pentagon was in need of a robust and failsafe control system to monitor for chilled water system failures, isolate failed areas, initiate back-up chillers and route chilled water to critical areas. The chilled water system consists of the main utilities plant, a back-up chiller plant and dedicated emergency chillers within the critical areas. Isolation, chiller operation and load shedding are controlled by the MCCWS.

Our solution consists of an industrial grade Rockwell Automation ControlLogix PLC system and FactoryTalk SE SCADA system. The solution is designed to provide both redundant and fail-safe operation. Redundant CPU racks are utilized at the central PLC. Remote IO panels, located throughout the critical areas, are connected via redundant fiber optic ControlNet repeaters. A ring topology is utilized to tolerate a break between any two remote IO panels. In addition to the redundant, fault-tolerant architecture, failsafe operation was implemented within the remote IO configuration and equipment control to provide chilled water to critical areas in the event of a control system failure at any remote IO panel or at the CPU panel.

The control system monitors temperature, pressure and differential pressure at various junctures within the chilled water system. A rise in chilled water temperature will trigger back-up systems to come on line to provide additional cooling capacity or in the event of a prolonged temperature rise, shed certain non-critical loads. Differential pressure is monitored to detect pipe breaks and other catastrophic failures in the mechanical systems. In such cases, the critical areas are isolated and fed from the first available good source until such a time that the chiller plants are deemed safe and can be reconnected to the system.

The systems are configured and monitored from a central SCADA server located within the mission critical area. The SCADA consists of a server and multiple view clients. A P&ID graphic of the system is implemented on large screen plasma displays for monitoring of system states and alarms by facility and emergency response personnel.

Hallam-ICS was involved in this project from beginning to end. We provided technical and process guidance to the Pentagon Renovation & Construction Program (PENREN) team to finalize the system designs. We engineered, built and installed the control system components and completed the system integration and testing on-site. Hallam-ICS also assisted in the execution of a system-wide functional performance test, completed in conjunction with PENREN and their commissioning agents.