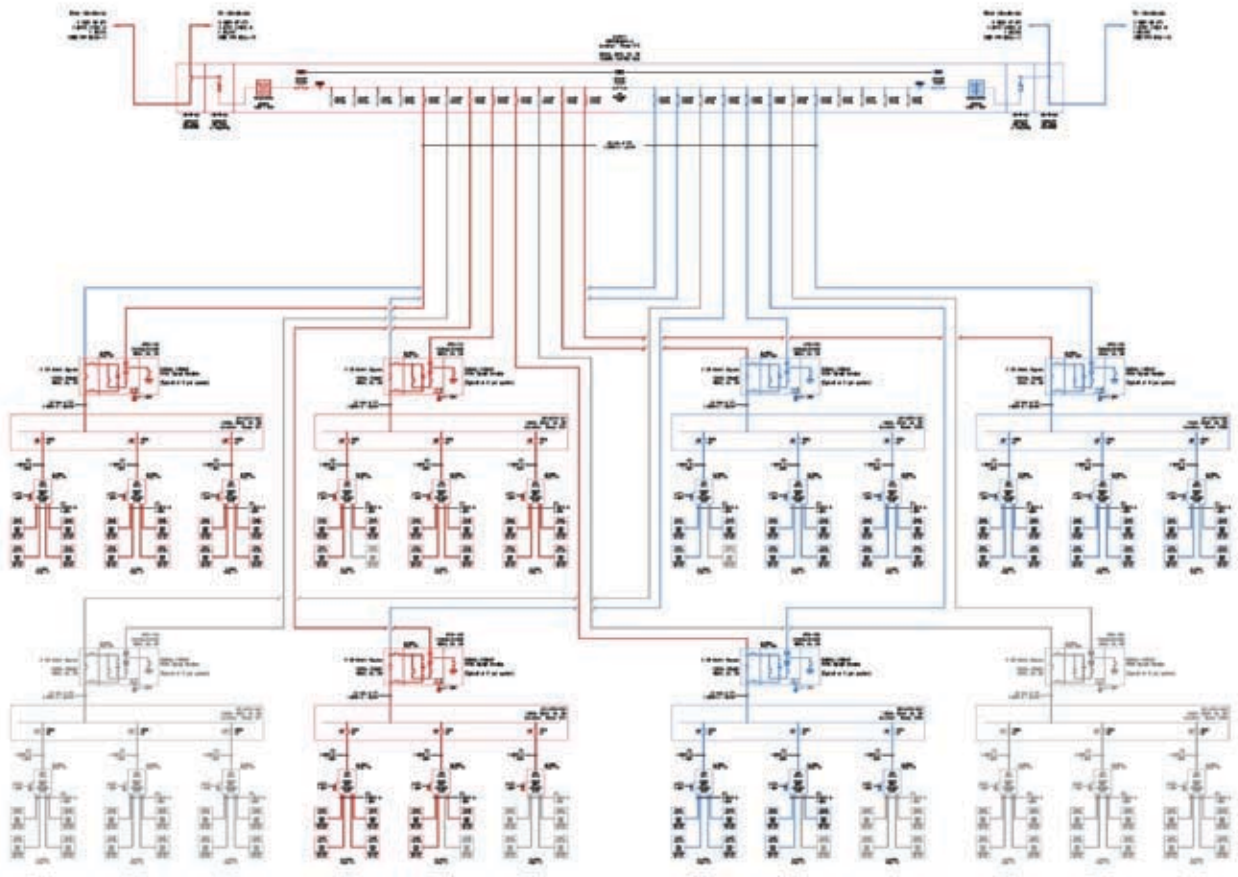
S&C Provides Detailed Analysis of Large Data Center Network



Background

The owner of a large data center in the Midwestern U.S. recently turned to S&C's Power Systems Services to provide a short-circuit analysis, overcurrent protective device coordination study, and arc-flash analysis on the electrical distribution system for a new data center they were constructing.

The short-circuit analysis was desired to determine if there were any protective devices that would not properly interrupt the maximum available fault current. The coordination study was desired to ensure proper coordination of all protective devices on the system. And the arc-flash analysis was desired to maintain compliance with industry standards, and determine the appropriate level of personal protective equipment for operating personnel.

S&C's Consulting and Analytical Services

After collecting the necessary equipment and physical layout information—including all field modifications made to date—S&C carefully modeled the power system.

S&C then calculated the fault current levels on the entire network at all low-voltage circuit breaker and fuse locations, and verified that the interrupting capabilities of all protective devices were sufficient to interrupt the maximum available fault current.

S&C proceeded with the coordination analysis, using the time-current characteristics of the fuses to select settings for the low-voltage circuit breakers that would coordinate with upstream protective devices.

That's when a major miscoordination issue was discovered . . .

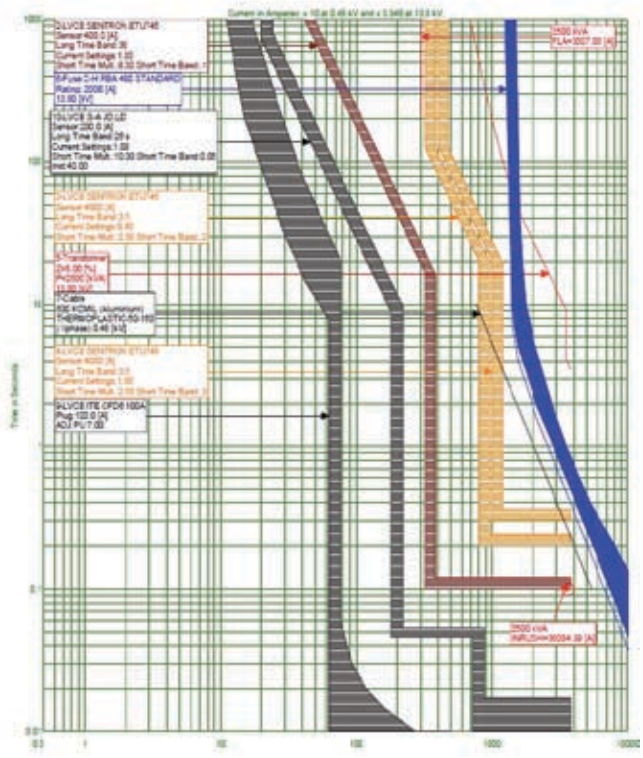
Several unspecified sub-distribution panels, served by the two main distribution panels, had been added in the field to power local 480-volt loads. The main distribution panels were furnished with non-adjustable, thermal-magnetic circuit breakers which S&C determined would not coordinate up to the available fault current. S&C informed the customer that changes would need to be implemented.

After extensive negotiations, the electrical design firm for the project agreed that the breakers in both distribution panels would be replaced. S&C worked with the design firm and the low-voltage breaker manufacturer to develop a solution. A number of factors had to be considered, including adequate space for installing the new breakers in the distribution panels.

Downstream breakers would be replaced with current-limiting breakers and upstream breakers would be replaced with adjustable solid-state breakers. Coordination would be achieved by limiting the maximum instantaneous peak current to a value less than the peak current that could be seen at the fault point.

Upon completion of the coordination analysis, S&C performed the arc-flash analysis. This analysis specified incident energy levels and requisite protective clothing levels at all buses on the data center's network, based on the calculated fault current levels determined in the short-circuit analysis.

All of S&C's studies, as well as single-line electrical system diagrams, were developed using the latest versions of several commercially available software programs.



Results

The revised settings resolved the miscoordination between the distribution panels. The customer was very satisfied with S&C's consulting and analytical services.