



Protection and Coordination Studies: Mine Really Digs Quick Response by Power Systems Solutions

S&C Featured Solution: S&C's Power Systems Solutions Division

Location: Wyoming

Customer Challenge

A Wyoming coal mine recently experienced coordination problems when wind storms produced temporary faults between overhead conductors on its 69-kV sub-transmission system. The mining company's main reclosing circuit breaker was out of service, and a fused bypass switch was placed in series with the upstream utility fuse. Line-to-line faults occurring on the mining company's overhead lines would cause the operation of both the bypass fuse and the utility fuse, resulting in an outage to the entire mine and an adjacent coal gasification facility. This required the utility and mining company to dispatch crews to go out and replace fuses that operated whenever faults occurred on the mining company's system. In addition to the cost of replacement fuses and installation labor, the mine downtime was beginning to escalate. A quick solution was required in order to get the mine back into production.

S&C Solution

An overcurrent protective device coordination study was required. Within one week of the request for assistance, S&C provided the recommended phase- and ground-relay settings for the main circuit breaker as well as recommended a larger-ampere utility fuse, fulfilling the immediate need to improve coordination between the mining company and utility protective devices.

Following delivery of the initial recommendations, a detailed study of the mining company's entire 69-kV system was conducted using CYMTCC for Windows™, a commercially available computer program distributed by S&C. The study included a review of the overcurrent protection for the mine's seven large delta-wye-grounded power transformers and coordination of primary protective devices with upstream devices.

Recognizing the special conditions that exist with these transformers under through-fault conditions, a detailed through-fault protection analysis was conducted.

Results

Results of the study included time-current coordination plots for all overcurrent protective devices, from the mine's power-transformer primary fuse to the utility substation relays. Also included were discussions of the consequences of miscoordination, suggestions for improving coordination, recommended settings, and a system one-line diagram.

Both the utility and mining company made changes to their protective devices. These changes resulted in improved coordination between the utility and the mining company, limiting the extent to which the mining company's processes are affected by temporary faults.

