



City Promotes Economic Development with High-Reliability Electric Power

S&C Featured Solution: S&C’s Power Systems Solutions

Location: Danville, Virginia

Customer Challenge

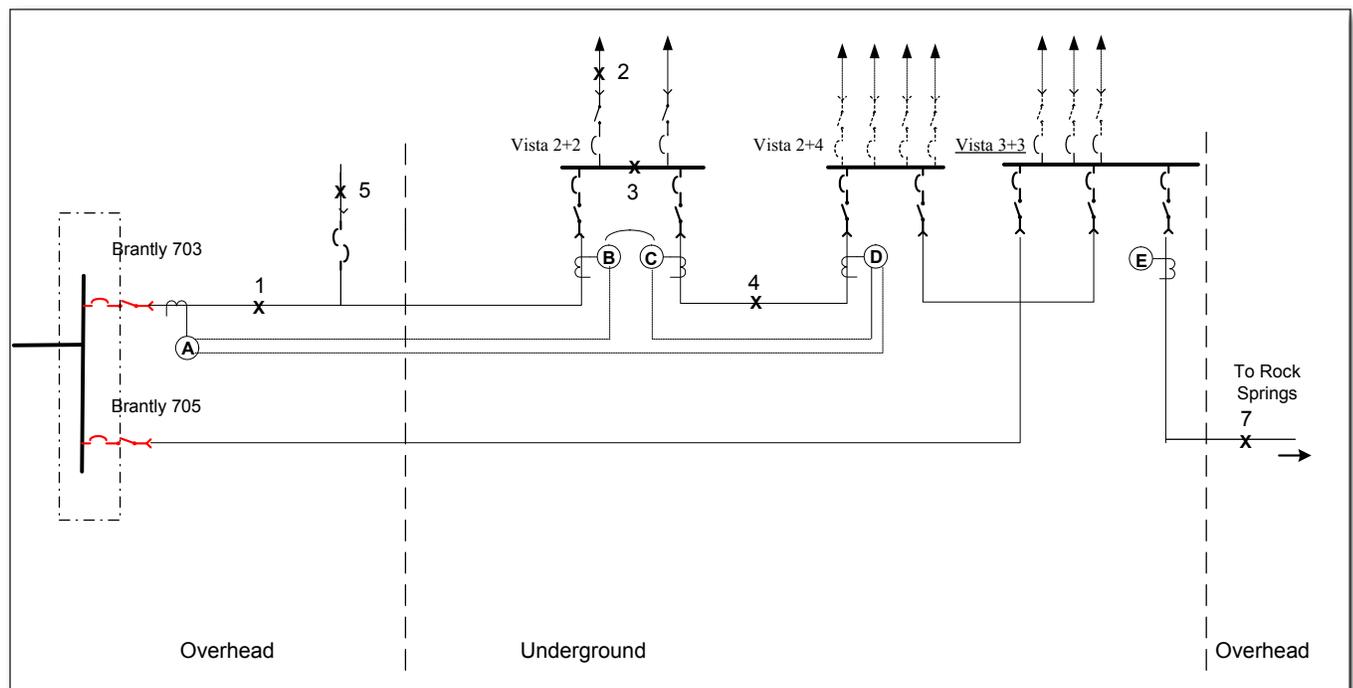
The importance of reliable, high-quality electric power is increasingly being recognized by utility customers. It fosters economic development and enhances the attractiveness of a service area to “new technology” businesses.

For these reasons, the City of Danville, Virginia, sought a high-reliability distribution system to serve a new 330-acre high-technology Cyber Park anchored by the Institute for Advanced Learning and Research and the Regional Center for Applied Technology and Training. Danville had just started an aggressive economic development initiative and understood the advantages of promoting a unique set of utility services to differentiate the Cyber Park from other regional parks. Dependable switchgear would be needed, as well as engineering and installation support services. Danville Power & Light (DP&L), owned and operated by the City of Danville, serves approximately 42,000 customers in a 500-square-mile service territory covering portions of a three-county area.

S&C Solution

DP&L found the unique system protection and control provided by S&C’s High-Speed Fault-Clearing System—featuring S&C Vista® Underground Distribution Switchgear with microprocessor-based relay controls—to be particularly well suited for their application. The engineers, designers, and field service technicians of S&C’s Power Systems Solutions division designed, customized, and tested the control scheme, assisted in the installation, performed field checkout, and managed the switchgear development and testing to provide a fully functional protection system.

The main distribution feeder backbone—from the Brantly substation, through the Cyber Park and back to the Brantly substation—forms a closed loop at 12.47 kV. The first feeder segment at each end of the loop runs overhead. The underground feeder through the Cyber Park is divided into segments by Vista Switchgear. For additional redundancy, future plans include provision of alternate feeder from the Rock Springs substation.





High-speed fault detection, along with fast response by the Vista switchgear fault interrupters, provides rapid fault clearing on the main feeder...faults are isolated before the resulting voltage disturbance can upset the loads. Any segment of the main feeder can be isolated without interrupting power to the loads.

The fault detection employed on the main feeder backbone uses directional overcurrent elements in Permissive Overreaching Transfer Trip (POTT) and Directional Comparison Blocking (DCB) schemes. Multiplexed fiber-optic communication between the relays at either end of a feeder segment is used to confirm fault location and only the interrupters necessary to isolate a fault are tripped. Power to the loads is maintained on unfaulted segments. A total fault clearing time of 6 cycles (0.100 seconds) or less is attained, so critical loads remain unaffected. Because faults on the overhead segments may be transient in nature, an automatic reclosing sequence is employed on these segments following fault clearing. Switchgear loads are protected by fault interrupters controlled by the Vista Overcurrent Control.

The microprocessor relays interface to DP&L's SCADA system through the multiplexed communication system. Status points and analogs can be interrogated without an additional remote terminal unit.



Results

A mock-up of the distribution system was assembled and tested in the presence of DP&L engineers at S&C's John R. Conrad Industrial Complex in Chicago.

The Vista switchgear units were connected through multiplexed communication circuits. Spare protective relays were programmed to simulate the substation circuit breakers.

A computer-controlled relay test set was used to inject secondary current and voltage in the protective relays, to simulate faults at various locations throughout the system. All the protective schemes were tested, and operating times were confirmed to be as expected.

Three Vista switchgear units were subsequently installed and startup testing was completed in February 2005. The modular design of the High-Speed Fault-Clearing System readily allows expansion of the protection system and further segmentation of the main feeder if needed to supply additional loads. System expansion is simply a matter of installing additional switchgear at the appropriate location and reconfiguring the communication system to recognize the new gear. In fact, the Institute for Advanced Learning and Research is already expanding its research complex; and two additional industries have the Cyber Park on their short list.

The highly reliable electric power available at the Cyber Park is well appreciated by high-tech businesses who understand the criticality of electric power to their processes. The expertise of S&C's Power Systems Solutions division made development and deployment of the High-Speed Fault-Clearing System possible.