

Advanced Technologies Employed at Utilities Today.

Most electric utilities employ a Supervisory Control and Data Acquisition (“SCADA”) computer system on their looped electric facilities. Looped electric facilities usually operate above 25 kV. On occasion, some electric utilities employ a SCADA system on voltages below 25 kV.

The SCADA system is a communication tool whereby real-time measurements are sent from substations to a System Control Center and control signals are sent from the System Control Center to the substations. This system allows Operators to know the power flow through and voltage at high voltage substations and electric lines as well as control certain electric facilities like circuit breakers. Operators can open or close circuit breakers remotely from the System Control Center.

Many SCADA systems have complementary or supplemental computer software packages that Operators can use to anticipate operational situations that may arise if electric demand, for instance, increases or a high voltage electric facility, like a line or transformer, were to fail. These supplemental computer software programs are often called advanced applications. One advanced application is State Estimation. The advanced applications software can use the real time SCADA information to predict what the power flow and voltage is at certain locations on the power grid even though no telemetry information from the field is available. Another advanced application is an on-line power flow. Again, using real time SCADA information, Operators and Engineers can run simulations of hypothetical situations that could occur to better understand what operating issues may occur and determine a plan to operate out of an undesirable situation if one should occur.

The SCADA system can also be used to more efficiently and more optimally operate electric devices on the electric system like switchable capacitor banks. Consumers Energy has implemented a program where certain capacitor banks located on low voltage distribution circuit feeders are switch on and off by the reactive power flow on the high voltage electric line feeding the low voltage distribution line. This results in less operations of load tap changing devices, like voltage regulators, in the electric system (thereby decreasing equipment wear and tear and lower maintenance costs) and provides for a flatter voltage profile on distribution circuits. It also reduces electric system losses and provides for more reactive power reserve available on the electric system.

On April 1, 2005, the Midwest ISO implemented its energy market. Since that date, all generating plants within the MISO footprint have been dispatched as one system by the MISO. In theory, dispatching all generating units as a collective set of resources should minimize the cost of generation for the entire MISO footprint while ensuring transmission constraints do not occur.

At large customer locations, some utilities employ power quality recording devices to monitor service at the power of interconnection between a customer and utility. These devices not only help explain what may have happened on the utility system or the customer’s system when the customer experienced a disruption, but they can also help predict the eminent failure or poor operation of an electrical device before failure of the device occurs.

Power quality improvement devices are available on the market to help customers “ride through” customer and utility electric system disturbances. Uninterruptible power supplies, harmonic filters, and a combination of capacitors and inductors installed on customer equipment are a few examples. Bay City Power Train, a General Motors manufacturing complex in Bay City, Michigan, has installed a Dynamic Voltage Restorer to help the plant operate through voltage sags or disturbances that may occur on the electric service to the plant.

Relay technology has dramatically changed in recent years to the digital age. As a result, much more detailed electric system monitoring information is now available via digital relays that are beginning to be installed throughout utility electric systems. As a result, fault locations (the location where a problem on the electric system has occurred – like a tree falling into a line) can be successfully calculated by Operators and Engineers to aid in the deployment of field personnel to a location very close to the problem area. Without the ability to calculate the location of the fault (or short circuit) on a line, field personnel have to inspect the line (sometimes walking it from one end to the other) to find the problem.

Communications technology has improved in recent years. As a result, more economic means to automatically sectionalize distribution circuits are now available on the market. Consumers Energy has deployed S&C Electric's IntelliTeam switches and controls at a few locations on its low voltage distribution system that will automatically reconfigure the low voltage distribution system during a failure and restore customers to service on parts of the distribution circuit not directly effected by the equipment failure.