Type SDFA distribution feeder-automation system

System description

The Siemens type SDFA feeder automation system acts as an extension to your substation. The system performs the functions of fault detection, isolation and restoration (FDIR).

The type SDFA-DC system uses an open standard for communications among all the intelligent devices within the loop. Through high-speed, peer-to-peer communications over Ethernet, the system is capable of providing extensive decentralized automation.

The Siemens Smart Grid intelligent devices provide fault detection, isolation and restoration logic in a group of reclosers, switches, or a combination of both, within a loop. The protective relay has a powerful programmable logic controller (PLC) and an IEC 61850 communication processor providing the required logic and flexibility for the specific application. The Ethernet backbone can be linked over a twisted pair, fiber or an Internet protocol (IP)-based radio system, broadband over powerline (BPL) or digital subscriber line (DSL).

Structure

Each loop can be constructed using Siemens type SDR reclosers, Bridges Electric® type Vector® switches or a combination of both. The Siemens type SDR recloser or Bridges Electric type Vector switch is equipped with a Siemens protective relay that contains the necessary logic to interface with the grid and establish proper control. The intelligent device is wired to the current and voltage sensors, or voltage transformers (VTs) and current transformers (CTs), to monitor the flow of power.

An entire distribution system can be configured using this system. The self-healing logic resides in the individual intelligent electric device (IED) groups located in the feeder loops. Detailed operational data is then conveyed back to a SCADA or substation that allows the control of circuit ties to further heal the distribution grid.
Effective automation requires that control reside as deep inside the grid as possible. There must also be oversight that will allow higher level control of the grid. The individual self-healing loop breaks the grid into manageable segments and allows the utility to further define the healing process logic for its distribution system.

Each loop can be set to operate in a completely automated state, in a remote manual mode via SCADA or Siemens type SICAM PAS, or in manual mode for users in the field (via password protected user override). Remote mode is an override that allows the operation center to perform closing and opening operations to reconfigure the grid. The loop can contain at least 20 switching devices within one group of devices or loop.

There is no need for a master-slave arrangement since IEC 61850 uses peer-to-peer communications. This means real-time control, a fast-healing grid, fault location information processed in seconds and new patented differential equations using peer-to-peer communications between switching points. Since the devices all communicate in a peer-to-peer manner, Siemens has been able to eliminate some of the necessary input devices that would normally be required in a loop-automation system.

System design
The system is designed to work using independent automated device groups. The IEDs located at each device are associated with a Bridges Electric® type Vector® switch or Siemens type SDR recloser and include current and voltage sensors to provide the necessary input of data used to determine logic sequences. This information is then made available to each of the other intelligent devices, over the communications channel located within that particular loop, and therefore, back to the substation(s) and up to SCADA.

Features:
- Intelligent-loop topology
- Ethernet backbone with peer-to-peer communications over a variety of platforms (fiber, IP-based radio, etc.)
- Open standard and not a proprietary system (IEC 61850)
- Automatic fault detection, isolation and restoration to normal (FDIR)
- Multiple management locations
- Real-time SCADA information
- Graphical display via human-machine interface (HMI)
- Programmable restoration logic
- Intelligent high-speed fault detection
- Auto-feeder return to normal restoration
- Remote setting changes to allow grid flexibility
- Complete loop fault recording for class A violations
- Monitor ANSI class A violations
- Load data trending reports available
- Integration into RTU and substation automation (SSA) systems
- Flexible system allows for expansion via “cut and paste” system

For more information, please contact your local Siemens representative.