Reliability, safety, efficiency: the advantages of advanced distribution network operation with Spectrum Power™ DNA

Today’s grids are characterized by fundamental load flow changes due to increased distributed generation (e.g. wind and PV), higher network volatility and increased pressure for higher reliability of supply. The advent of smart meters has led to significant improvements in observability. The Spectrum Power™ Distribution Network Applications (DNA) suite is the essential component to mastering the new challenges in distribution grids. It increases the reliability and efficiency of control center operation and field activities, minimizes downtime, and increases work safety.

The DNA suite has been integrated into the Spectrum Power™ Distribution Management System (DMS). Its Service-Oriented Architecture (SOA) simplifies IT integration using Enterprise Service Bus (ESB) middleware.

Information available from distribution automation and automated metering is used by the DNA suite, which is designed to meet current as well as evolving industry standards and to satisfy regulatory requirements: the DNA suite is an essential component of any smart distribution grid solution.

Product benefits at a glance

- Improved monitoring and control of the distribution network with an accurate real-time network status
- Real-time assessment of network status for instant identification of equipment overloads, voltage limit violations, losses, loops, parallels, and other abnormal operating conditions
- Ability to evaluate and optimally select network control actions from a wide variety of “what-if” scenarios
- Improved real-time secure operation of the distribution network in open loop mode or in closed loop mode with fully automated implementation via SCADA
- Improved fault location process, including coordination with field crews, and accelerated restoration of service
- Improved field crew safety and reduced service interruptions

Estimate, analyze, automate

Network analysis applications are used to determine and assess the state of the distribution network and to automate fault location, fault isolation, and service restoration.

Distribution system state estimation provides improved results, detects measurement errors, and reports any real-time operational limit violations. A mathematically robust tool for the real-time estimation of the distribution network status using all available measurement results and load data profiles.

Distribution system power flow analyzes the status of the distribution network elements to detect potential equipment loading and voltage limit violations. An efficient and intelligent tool for the evaluation of alternatives and strategies for determining the real-time network status, as well as for studying planned configurations under different load conditions in the distribution system.
Fault location quickly identifies the most probable location of electrical faults in the distribution network. It evaluates real-time data received from the feeder breaker, reclosers, fault relays, and indicators.

Fault isolation and service restoration determines switching actions which enable the operator to efficiently isolate faulty areas of the network and restore service to customers on non-faulted feeder sections – even before repair work begins.

Distribution security analysis determines the impact of faults as well as planned outages in terms of the security of the distribution network. It simulates single, multiple, and cascading or conditional equipment outages including those caused by distributed generators.

Short-circuit calculation calculates fault currents in the distribution network to determine potential operating conditions and network configurations that may exceed circuit breaker ratings. It can also be used to verify circuit breaker capacity and protection settings.

Study and optimize

Network optimization and planning applications are used to optimize system operation while avoiding potential system limit violations, as well as to restore security in the presence of operational limit violations, and to plan optimal capacitor placement for a secure voltage profile.

Optimal voltage and reactive power control provides recommendations for the control of transformer tap changers and switchable shunt reactive devices (typically capacitors) in order to keep distribution feeder equipment loading and voltages within defined limits. Optimization options include the minimization of power losses, demand or reactive power, and the maximization of revenue. The application can be used in either automatic closed-loop mode or user-interactive open-loop mode for global or local optimization.

Optimal feeder reconfiguration determines switching plans and options for feeder reconfiguration accounting for equipment loading limits, voltage limits, and feeder losses. It can supply multiple prioritized plans to the operator and is particularly effective in large area restoration.

Minimize loss, maximize revenue

- Availability of all applications in real-time and study mode
- Field-proven application suite used with many distribution networks of all sizes
- Improved distribution transformer load model
- Automated fault isolation and service restoration based on automated device controls
- Optimization of voltage profile, network losses, and network configuration
- Interactive and automated creation of switching plans to support work and restoration activities
- Easy integration with outage management and distribution SCADA systems
- Architecture and model-building tools that support enterprise integration with a geographic information system
- Support of temporary operational network changes such as jumpers, cuts, and grounds
- Support of multiple simultaneous studies

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