SIEMENS
Ingenuity for life

Spectrum Power™

Advanced Distribution Applications

Situational awareness and optimization of distribution network resources

Realize the power of advanced distribution network operation with Spectrum Power™ Distribution Network Applications (DNA)

Essential for reliability, safety, and efficiency

Today's grids are characterized by fundamental load flow changes due to increased Distributed Energy Resources (DER), higher network volatility along with increased expectations for reliability. Operators are facing challenges including unclear, fluctuating direction of load flow and more frequent critical voltage violations. There is a growing risk of consumer equipment malfunctions or even damage. At the same time, the danger of overloads on lines, transformers, etc. is growing, potentially resulting in grid failure.

Spectrum Power™ DNA is an essential component for mastering the new challenges in distribution grids. It **increases situational awareness, provides enhanced decision support and automation** for control center operations, driving increased reliability and efficiency.

Voltage and capacity management including visualization

Spectrum Power™ DNA is a flexible and effective solution for distribution grids. It controls and optimizes network assets – including switching devices to transformer tap changers and capacitor banks to controllable loads and generators, including battery storage.

Spectrum Power™ DNA displays the current load flow directions and calculated load values as well as voltage range violations and overload situations. This also includes integrated analysis and archiving functions, allowing automatic result validation and comparison as well as reports and facilitation of meaningful short-term and long-term views.

Product benefits at a glance

- **Improved monitoring and control** of the distribution network with an accurate real-time network status
- **Load flow values and directions** are reliably monitored
- **Real-time assessment of network status** for instant identification of equipment overloads, voltage limit violations, losses, loops, parallels, and other abnormal operating conditions
- **Prediction of future network state** based on planned switching and forecasted loading, including parallel and looped flows
- **Evaluate and optimally select network control actions** within a study mode
- **Proactively prevent violations** by initiating balancing measures, maintaining grid stability and protecting equipment
- **Distribution losses can be effectively reduced**
- An **optional automatic mode** allows transformer tap changers, capacitor banks, loads and generators, including battery storage, to be controlled without operator intervention
- **Advanced fault location** process, including coordination with field crews, and accelerated restoration of service
- **Improved real-time secure operation** of the distribution network in open-loop mode or in closed-loop mode with fully-automated implementation via SCADA

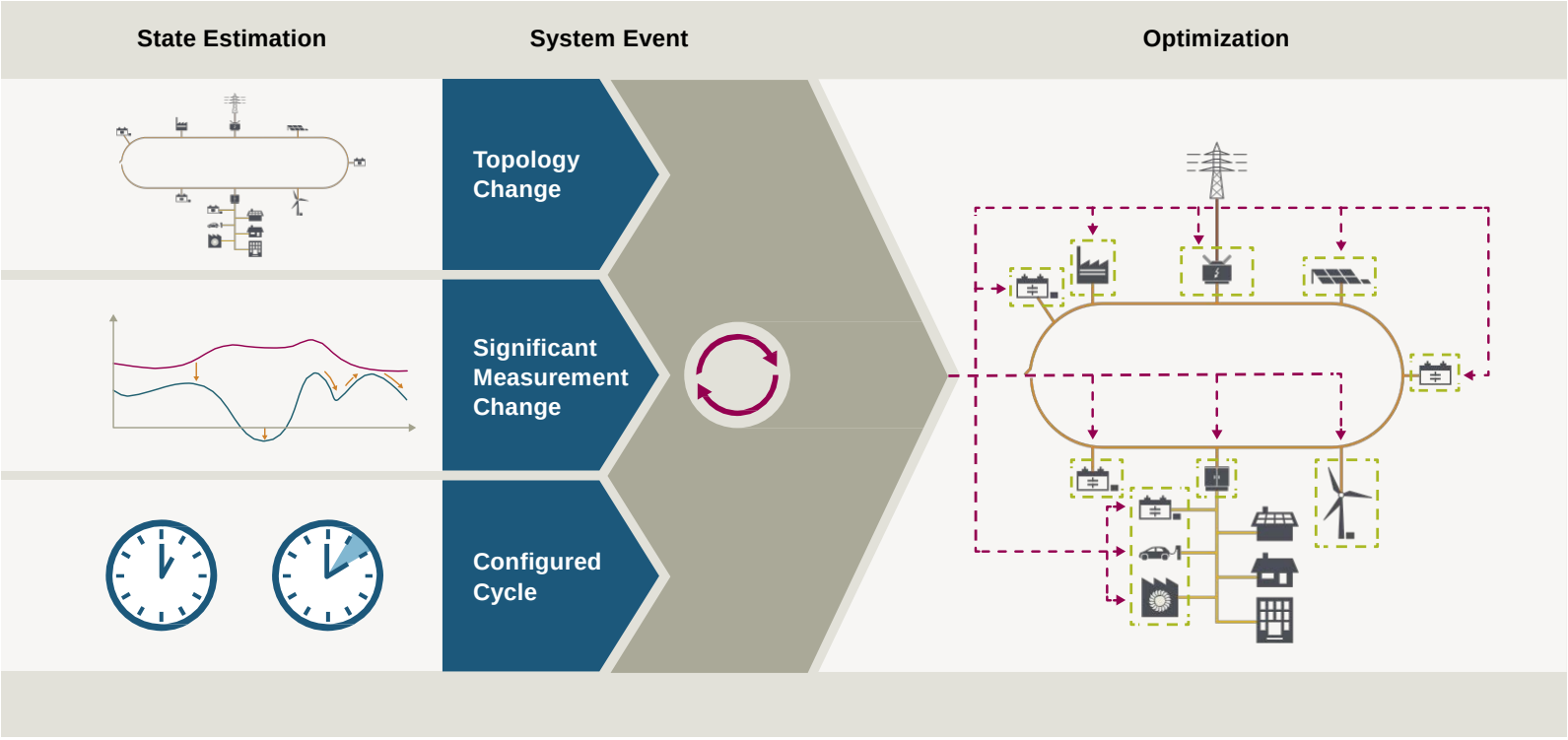

Figure 1: Voltage, reactive and active power optimization

Estimate, analyze, and automate

Distribution system state estimation and power flow provides complete network status results, detects measurement errors, and reports any real-time and potential operational limit violations. Information available from distribution automation and AMI is used, and with the widespread adoption of smart meters, drives significant improvements in observability and forecasting. The result is a mathematically-robust tool for the real-time estimation of the distribution network status using all available measurement results and load models. It is also an efficient and intelligent tool for the evaluation of alternatives and strategies 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 breakers, reclosers, fault relays, and indicators. In conjunction, **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.

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

Study and optimize

Optimal voltage, reactive and active power control provide 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.

Proven success

- Field-proven application suite used with many distribution networks of all sizes
- Automated fault isolation and service restoration based on remote device controls
- Optimization of voltage profile, network losses, and network configuration
- Interactive and automated creation of switching plans to support work and restoration activities
- Support of temporary operational network changes such as jumpers, cuts, and grounds

Siemens Industry, Inc.
10900 Wayzata Boulevard, Suite 400
Minnetonka, MN 55305
1-800-347-6659
smartgrid.energy@siemens.com