Intelligent control center technology – Spectrum Power™

The Smart Grid – Constant Energy in a World of Constant Change

www.siemens.com/spectrum-power
Welcome to the future of energy infrastructure ...

We live in a world of constant change — In our dynamic and global economy, companies and customers are communicating in new ways. Markets and politics, industries and consumer behavior are all in the process of adapting to new realities. Globalization and urbanization, demographic and climate change are some of the megatrends we will have to find answers to. In a world where most of the population lives in urban areas, sustainable technologies for metropolitan centers and urban infrastructures are becoming more and more important. Siemens is providing some of those answers: answers for infrastructure and cities.

... where energy meets intelligence ...

Managing the power challenge
Energy management in the age of Smart Grid is becoming exceedingly more complex and challenging. Networks are expanding at a much faster pace than even a few years ago and demand a high degree of individual control and monitoring. With the integration of renewable and distributed energy, varying grid capacities and oftentimes weakened infrastructure, there are many different aspects to be taken into account.

Siemens Spectrum Power™ links power systems of any size and volume/extent into an easily and centrally controlled grid/energy network, enabling a reliable overview and fast assessments. Information can be accessed remotely anytime, anywhere — making it the perfect tool for flexible and efficient network control.

Power system operators need a solution that ensures a high level of energy reliability and the lowering of costs, fast fault detection based on smart meter information, network-wide volt/VAr optimization and blackout prevention measures, on-time delivery, controlled budget, expert risk management, and sustainable, environmentally friendly products and solutions.

In short, they will need the technology, intelligence and adaptability that define Siemens Spectrum Power™.

Siemens Spectrum Power™ helps power network managers make the right decision at the right moment. It allows for faster and situationally adapted reactions to changing demands and boosts the overall efficiency of systems.

The future of energy management is here. Siemens Spectrum Power™.

Spectrum Power™: Designed to ensure:

- secure integration of more and more renewable generation
- high network stability and prevention of blackouts
- optimal asset utilization with minimal network load and losses
- shorter outage restoration times
- increased reliability of supply and reduced operational costs
A suite solution …

Whether for transmission, distribution, and generation companies, or for multi-utilities, independent system operators, or industrial and infrastructure companies; grid control systems from Siemens meet extremely diverse demands.

The systems range from the smallest all-in-one solutions right up to multi-server systems that include a vast set of local and remote user interfaces. In each case, the solution is tailored to the client’s requirements, drawing on the modular range of tried-and-tested products and services.

Long-standing experience – comprehensive portfolio

Spectrum Power™ is the product of many decades of experience, and the over 3,000 grid control systems installed worldwide by Siemens in that time pay testament to its success. Almost as impressive is the wide range of requirements fulfilled by these systems.

Full service – full control

Siemens will train client personnel – either on-site or at dedicated educational centers. In addition, a global service network – including remote diagnosis and remote access – ensures optimum systems availability.

Global presence – local expertise

A whole multitude of factors need to be considered when designing a grid control system. This is why – thanks to its presence in more than 90 countries – Siemens ensures that the specific, local requirements of each project are known and perfectly understood. Customers from all over the world can depend not only on the company’s expertise, but also on a broad range of services that ensures reliable grid operation around the clock.

Innovation leader – loyal partner

Investing in an advanced network control system means increasing long-term competitiveness and profitability. With its fast and secure innovation cycles, Siemens is constantly in line with new technologies and market needs. That’s why Siemens remains a reliable partner throughout the entire life cycle of the system. This covers everything from professional consulting on projects of any size to the configuration, installation and commissioning of the system and its individual components.

The benefits of unsurpassed experience

• Leading the way in energy automation
• 160 years of experience in power engineering
• Support in over 90 countries
• Over 1,600 network control systems currently installed worldwide
• Vertical integration through standardization (IEC, CIM)
• Powerful products, applications and solutions with clear-cut migration and innovation strategies

Intelligent life cycle management ensures secure innovation
As the name implies, Spectrum Power™ covers all aspects of energy management. Drawing on its unique and comprehensive range of solutions based on proven and innovative components, Siemens is able to configure the network control system as a tailored solution.

Spectrum Power™ provides basic components for SCADA, communications, and data modeling for control and monitoring systems. Application suites can be added to optimize network and generation management for all areas of energy management.

In addition to its functional flexibility, the hardware can be configured for small- and large-scale systems. An all-in-one system, for example, can be gradually expanded at any time — all the way up to a redundant multi-server system. Redundant configurations deliver the highest level of reliability, ensuring dependable network management around the clock. Spectrum Power™ naturally uses the latest and most powerful hardware on the market, combined with best-in-class operating systems, such as Linux and Microsoft Windows.

... for safe investments and reliable operation

The data in any network control system needs to be retained, regardless of how technologies and platforms may develop in the future. That’s why the Spectrum Power™ product family relies on internationally valid standards — from data modeling compliant with CIM to communications standards such as IEC 101 and 104, DNP, ICCP and OPC. Due to these open interfaces, all existing data can be seamlessly migrated to Spectrum Power™ as needed, ensuring the system is ready for the powerful technologies of the future — while protecting existing investments.

... for IT interoperability

Thanks to its service-oriented architecture (SOA), Spectrum Power™ is able to make use of other IT systems within the power system — which in turn can access the services of the network control system. Standardized process, interface and messaging specifications based on IEC 61968 and IEC 61970 standards ensure trouble-free data exchange between the systems. Spectrum Power™ thus becomes an integral part of the heterogeneous IT systems landscape and the operational processes — optimizing both the power supply and communications.

... for cyber security

A major goal of Spectrum Power™ is to provide features and services that maximize customers’ security while complying with all relevant regulatory regimes. With its Spectrum Power™ Security Service, Siemens Energy Automation (EA) tracks security bulletins published by third-party vendors and other industry sources, installs and tests available security fixes on the current release of Spectrum Power™ systems and components, and communicates all results and known issues to its customers.

Recognizing that cyber security requires an ongoing commitment, Siemens provides a comprehensive patch management service including patch notification, basic patch testing, and optional custom services such as extended testing and on-site installation. In addition, Siemens provides a range of security consulting services, on-site security evaluations, and training. A global service network is available to assist Spectrum Power™ owners through secure remote diagnosis and problem resolution.

... for reduced costs and higher network availability

Spectrum Power™ contributes to a reduction in both maintenance and operating costs, ensuring an economically efficient network. This is achieved by way of an improved assessment of the network status and an optimized utilization of resources.

Better management enables planned maintenance to be performed with a minimum of downtime. Similarly, unplanned disturbances and outages are quickly remedied by applications for fast fault localization and isolation. Moreover, the automation of switching sequences helps restore power as quickly as possible. Finally, a simulation mode allows the impact of planned actions on the network to be analyzed without affecting real-time operations.

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Spectrum Power™: Open and scalable for multiple needs

Service-oriented architecture (SOA) and a powerful set of applications: supports you today and scales for the uncertainties of tomorrow.

**Enterprise Service Bus**
- Base functionality: data model, UI, SCADA, archive
- Systematic outage management for faster and more secure restoration
- Distribution load flow calculation, grid optimization and what-if studies
- Energy resources and production planning: load forecasting for generation and grid operation planning
- Generation control for more economical and reliable operation
- Real-time and day-ahead energy market management

**Spectrum Power High-Speed Bus**
- Communication with substation RTU/SAS and other control centers
- Transmission load flow calculation, grid optimization and what-if studies
- Management of infeeds, switchable loads and storages for minimum cost (power, gas, water)

**Applications**
- CFE Communication Front End
- CMS Crew Management System
- DNA Distribution Network Applications
- DSA Dynamic Stability Analysis
- ELC ECOM Communication Protocol
- EMM Energy Market Management
- FA Forecasting Applications
- GIS Geographical Information System
- HIS Historical Information System
- ICCP Inter-Control-Center Communication Protocol
- IMM Information Model Manager
- LME Load Management Electricity
- LMG Load Management Gas
- LMW Load Management Water
- MERO Multi-Energy Resource Optimization
- OPF Optimal Power Flow
- PA Power Applications
- RO Resource Optimization
- SA Scheduling Applications
- TCS Trouble Call System
- TNA Transmission Network Applications
- TS Training Simulator
Smart Grid challenges and Spectrum Power™ solutions

Transmission grid operators
- have to cope with fundamental load flow changes due to energy market liberalization
- are under pressure to overstretch existing equipment
- have to integrate an increasing share of intermittent energy sources

Spectrum Power™
- provides ready-to-implement measures to prevent or remedy dangerous situations
- ensures reliable supply, efficient use of generation resources and reduced transmission losses
- Load frequency control for balancing generation and demand in real time
- Reserve monitoring for the efficient management of reserve contributions (e.g. secondary reserve)
- reduces the risk of blackouts with QuickStab, SIGUARD®, PDP, and SIGUARD® DSA. These provide current and anticipatory monitoring of power system stability

Distribution grid operators
- have to cope with fundamental load flow changes due to increased distributed generation (e.g. wind, PV)
- have to adapt to significant changes in observability due to the advent of smart meters
- face increasing pressure for higher reliability of supply despite higher network volatility

Spectrum Power™
- is best in class in both SCADA and OMS outage management
- ensures higher system reliability and shorter restoration times after unplanned outages
- offers optimal asset utilization with minimal network load and losses
- allows secure integration of more and more renewables
- reduces the investment costs for the integration of distributed energy resources
- provides intuitive awareness of complex grid situations down to the LV grid

Multi-utilities
- face increasing uncertainties due to energy market liberalization
- have to deal with increasing pressure towards sustainability and value orientation in line with environmental/climate protection
- need to guarantee the reliable and safe supply of power, gas, heating/cooling and water

Spectrum Power™
- offers reliable forecast and after-the-fact analysis applications for multiple commodities including leakage detection and reservoir management
- ensures optimal use of dispatchable loads and smart management of renewable generation
- minimizes operational costs while increasing supply stability and quality
- efficiently enables the merging of multiple legacy control centers into a single unified platform

Power producers and traders
- are challenged by the growing complexity of generating bids on futures and spot markets
- encounter more and more players due to the rise of renewable energy
- have to increase profitability on energy markets

Spectrum Power™ JROS (Joint Resource Optimization & Scheduler)
- facilitates faster decisions on energy exchanges and for bilateral trading
- covers all aspects of plant and contract range optimization
- optimizes generation schedules to be implemented through SCADA and automatic generation control modules
- is prepared for stochastic optimization to cope with increased renewable power generation
- includes unit commitment, hydrothermal coordination, and medium-term optimization of power trading
- boosts profitability on the energy markets through cost savings in generation and precise information for trading

Industry & infrastructure
- are under pressure to always meet the demand for energy
- have to ensure reliable supply around the clock
- face mounting cost pressure

Spectrum Power™
- ensures a secure power supply for airports, industrial estates, and industries such as mining, pulp & paper, oil & gas, chemicals and steel, guaranteeing maximum production output
- features standardized, robust, secure, easy-to-use technology fully prepared for future developments
- includes smart data engineering for reduced TCO
- allows existing energy contracts to be optimally exploited through switchable load and power generation
- includes an open architecture and standard interfaces such as OPC for complete access to the world of industrial automation

Rail operators
- must find answers for the transportation of a rapidly growing population in and between modern cities
- have to guarantee the smooth and reliable operation of traction power supply and station facilities
- are facing increasing economic pressure

Spectrum Power™
- provides for increased stability and quality of energy supply and maximum security, safety, and quality standards
- includes intelligent interlocking and switching procedure management with process element disposal locking
- features network model & state estimator, closed-loop optimization of load distribution and reactive power flow, and helps rail operators prepare their systems to withstand contingencies
- assures minimized operational and contractual costs

Energy market operators
- need to balance highly complex and diverse interests
- have to organize reliable energy supply and low energy prices for the public
- have to optimize investments and increase operational efficiency for market players
- must coordinate grid security while providing highly available market operations

Spectrum Power™ Energy Market Management (EMM)
- incorporates the latest market-clearing technology in a set of modular, high-performance components and engines
- helps lower market prices, optimize business processes and heighten grid reliability
- includes the market-clearing engine based on the Security Constrained Unit Commitment software and can be used in multiple structures such as day-ahead or real-time market