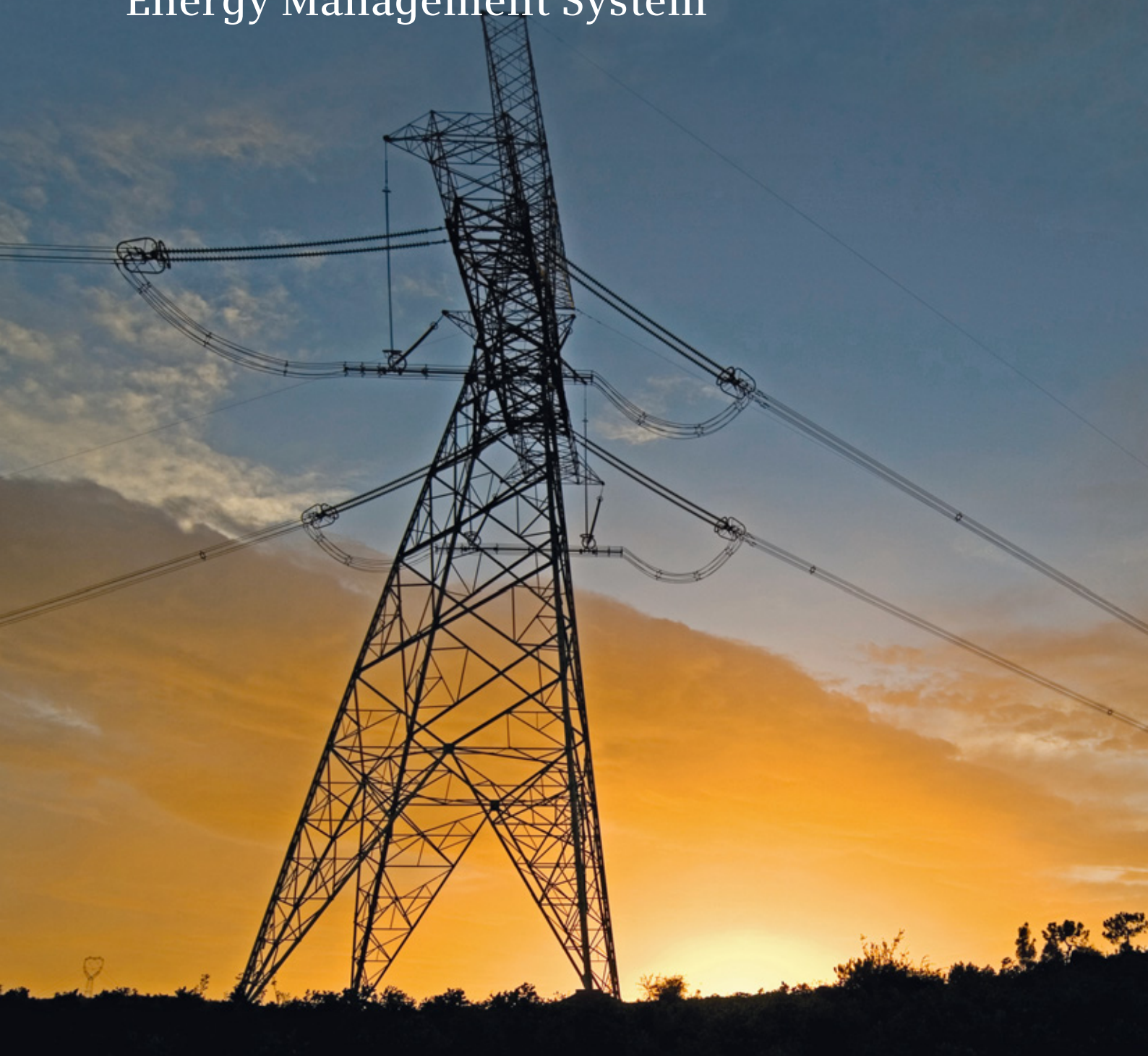


Spectrum Power 4 – Energy Management System



Answers for energy.

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Spectrum Power 4 energy management systems

Spectrum Power™ 4 reflects years of energy management experience

Over the last 30 years, we have been improving and supplying computer assisted SCADA, and EMS systems all over the world. And we have an installed customer base of over 3,000 control centers worldwide. Spectrum Power 4 is the result of our accumulated knowledge and experience in your business environment over more than three decades.

We know we've contributed to the success of our customers' businesses. We understand that such success requires us to supply you with more than just a platform of hardware and software for your network control system but instead a whole solution comprising:

- Engineering
- Configuration
- Integration into your existing IT and business environment/processes
- Training
- Maintenance
- Long-term system support through use of ever-green concepts



Siemens is a highly diverse and efficient organization that effectively executes all aspects of a project solution. In today's ever changing world, in which the energy markets and trading aspects are in liberalization flux, we provide you with our experience and drive to assist you and your business to adjust to and thrive in the new market regulations. You can rely on our support – anytime, anyplace, anywhere.

Your benefit

- Increased reliability of supply
- Improved efficiency in a deregulated energy market
- Easy adaptation in a changing environment
- Highly economical platform
- Reliable system operation
- Cost-efficient use of resources

Advantages

- Maximum reliability and system availability
- Open interfaces to the IT world
- Intuitive graphic user interface
- Clear concise operator guidance
- Readily expandable and modifiable
- Equipment-oriented data model
- Trouble-free online database amendments
- Latest field-tested algorithms
- Integral diagnostic aids
- Comprehensive customer support and long-term partnerships

EMS architecture for today and for the future

less of size or functionality requirement, a Spectrum Power 4 can expand or adapt readily to any changes. Spectrum Power 4 provides cutting-edge technology for your future needs.

Reliable, efficient network management guaranteed by state-of-the-art software

From database management to network applications, Spectrum Power 4 provides state-of-the-art functionality. Integrated in the data processing environment of your company, it will support all of your business processes.

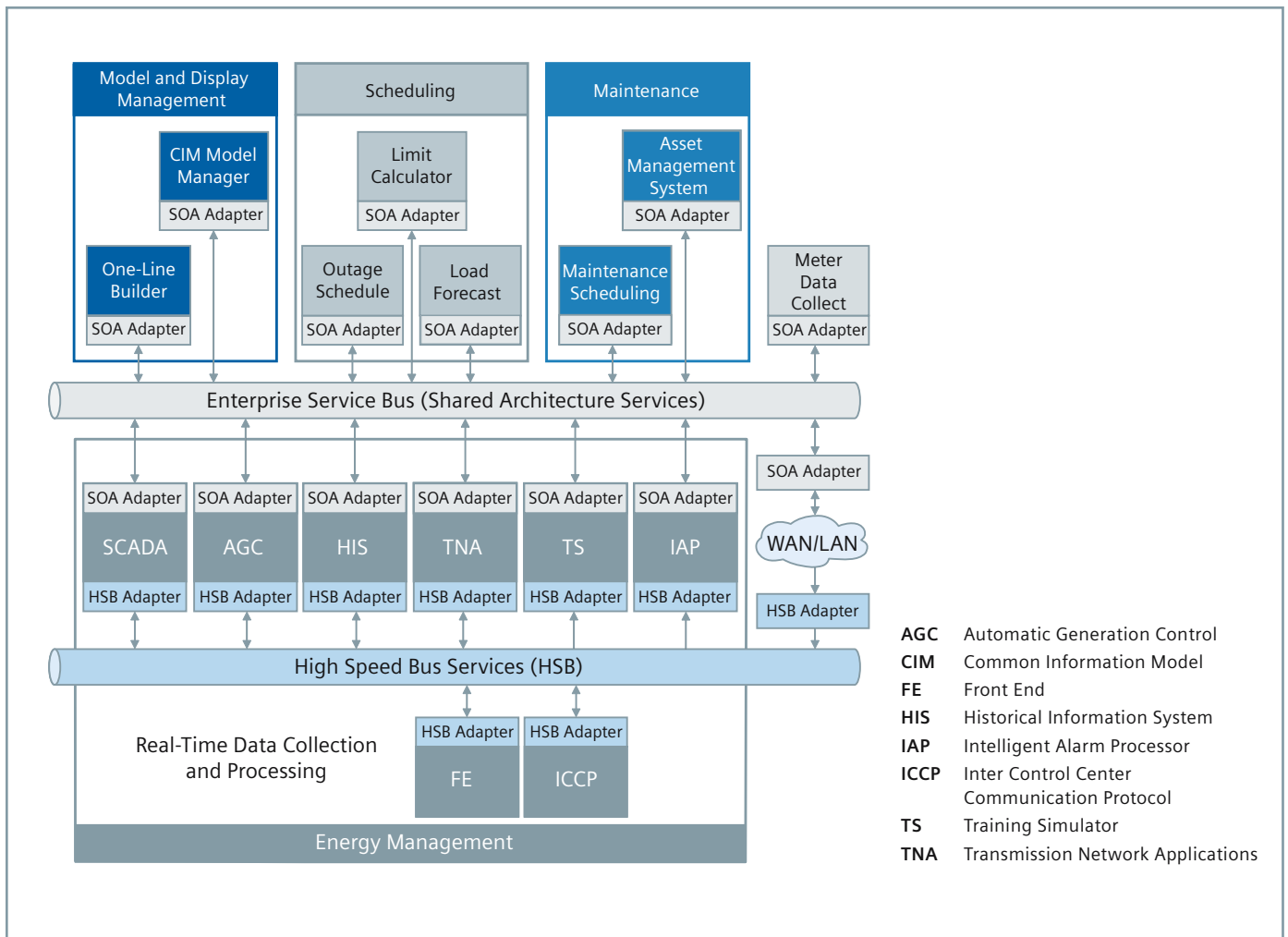
The latest algorithms

Spectrum Power 4 ensures maximum reliability and efficiency under all operating conditions. It is equipped with the latest software for network analysis, generation control and scheduling. We have a wealth of experience providing reliable technology.

Take advantage of all the most significant technical trends. Spectrum Power 4 makes use of all of them, whether it's the growing efficiency of workstations and servers, the ever more complex IT integration and network environment, relational databases or standardized interfaces.

Scalable, flexible and expandable

The architecture of Spectrum Power 4 can be scaled up or down to suit any size or configuration of a network control system – and with all possible combinations of application programs. Regard-



Service Oriented Architecture (SOA): Integration of the network control system in the enterprise service environment

For years, we've been a leading supplier of EMS systems, and the applications we've provided have been highly successful in systems of every conceivable size and complexity.

Fast, robust and accurate state estimation

Conventional state estimation is not sufficiently robust enough for many transmission systems. Although orthogonal transformation techniques have met the need for a highly rugged design, they have been too slow. Until now, that is. With the Orthogonal State Estimator in Spectrum Power 4 Siemens has made a technical breakthrough – it is both fast and robust.

User-friendly power-flow optimization

A core function of network management is the optimal power flow. In the case of Spectrum Power 4, it is fully integrated in the control system, providing a clear, practical interface. It also permits largely automated operational sequences and, at the same time, detailed analytical facilities for the specialist.

In addition, the optimal power flow of Spectrum Power 4 provides the following advantages:

- Minimized transmission losses
- Improved V/VAr
- Reduced reactive power transmission
- Faster correction
- Cost-effective elimination of transmission overloads

Multi-site operation of control centers

With the multi-site operation capability of Spectrum Power 4, you are provided with a powerful tool for optimizing operation management. It is possible to transfer network management partially or wholly from one control center to another. Such a capability provides for greater reliability of the system (emergency strategies) and makes a considerable contribution to cost reduction. The multi-site control centers can be configured from two or more control centers and permit a very flexible and dynamic system. In the event of communication failures, each system continues

to work autonomously; after recovery of the communication link, the data is automatically updated.

The Spectrum Power 4 Multi-site Operation of Control Centers concept provides the following benefits:

- Cooperative control of a power system via multiple control centers
- Configuration and operation of redundant network control centers for splitting tasks or as backup for emergency situations
- Support for hierarchical or equally ranked control centre network configurations
- Centralized maintenance of a uniform data model for all control centers of the network

Spectrum Power 4 meets all criteria

Each Spectrum Power 4 system is designed with focus on efficiency and reliability. It is carefully configured with the optimum number of interlinked workstations and servers.

Efficient

By distributing the functions (which can be very computer power intensive), to several efficient servers, optimum reaction times are achieved for every system load.

Reliable

Servers with time-critical functions are supported by an appropriate backup computer (hot standby), while additional servers protect the less critical functions. This set-up ensures that all function and system availability requirements are met.

Open for communication

The Spectrum Power 4 acquires process data via the telecontrol interface and the communication server. The data acquisition servers are linked to the remote terminal units. Meanwhile, the communication servers ensure data exchange with other interconnected energy companies' networked control centers. They employ protocols such as UCA/ICCP or ELCOM-90.

Straightforward configuration

A user can individually configure the graphic user interface as most suitable to the business working environment. Based on X-Windows and Java, this user interface runs on any hardware platform from multi-screen consoles to laptops and supports multiple-window displays, full pan and zoom functions. It also provides outstanding display call-up times.

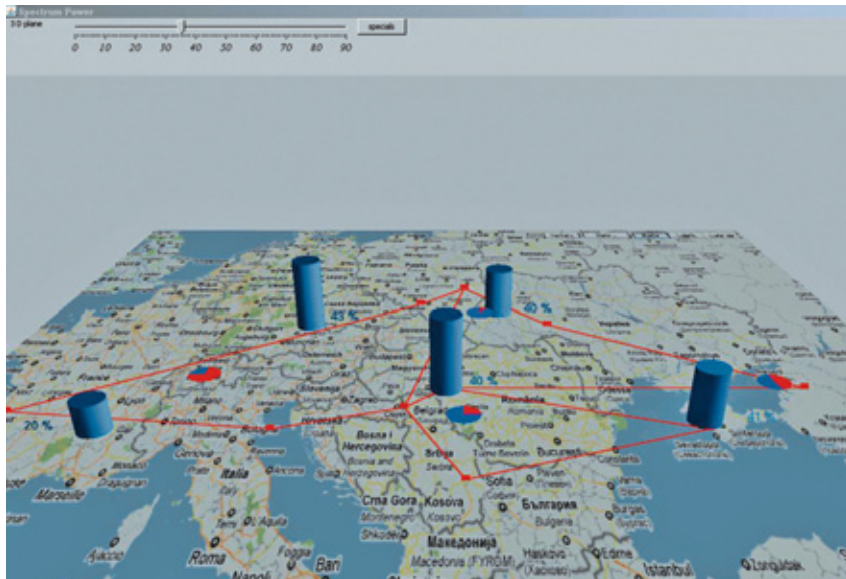
Future-orientated

The distributed Spectrum Power 4 systems are based on standards, such as POSIX-compliant UNIX, Ethernet, TCP/IP and SQL2.

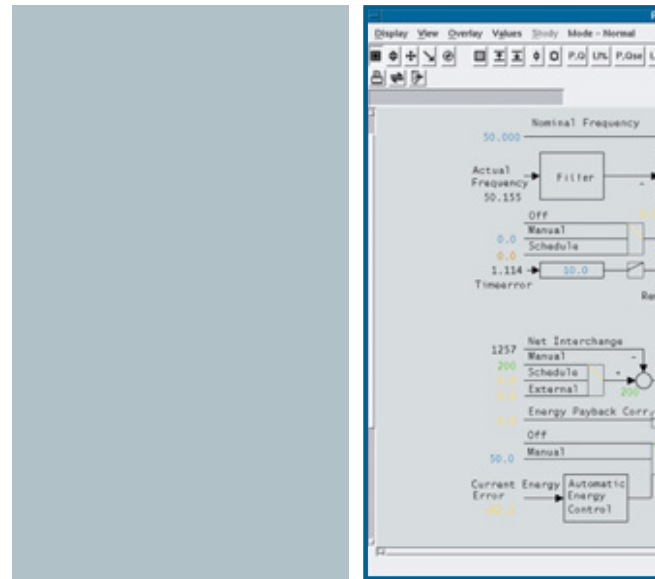
Spectrum Power 4 adheres to the architectural paradigms of a Software Oriented Architecture (SOA). The main advantages of this architecture are:

- Easy and seamless integration into an existing IT landscape
- Easy change of the integrated solution

That is to say – the investments in software and hardware retain their utility and value well into the future.



Example for visualization capabilities with 3D graphic elements in network diagrams



Automatic generation control

Application and technical highlights at a glance

Basic system configuration

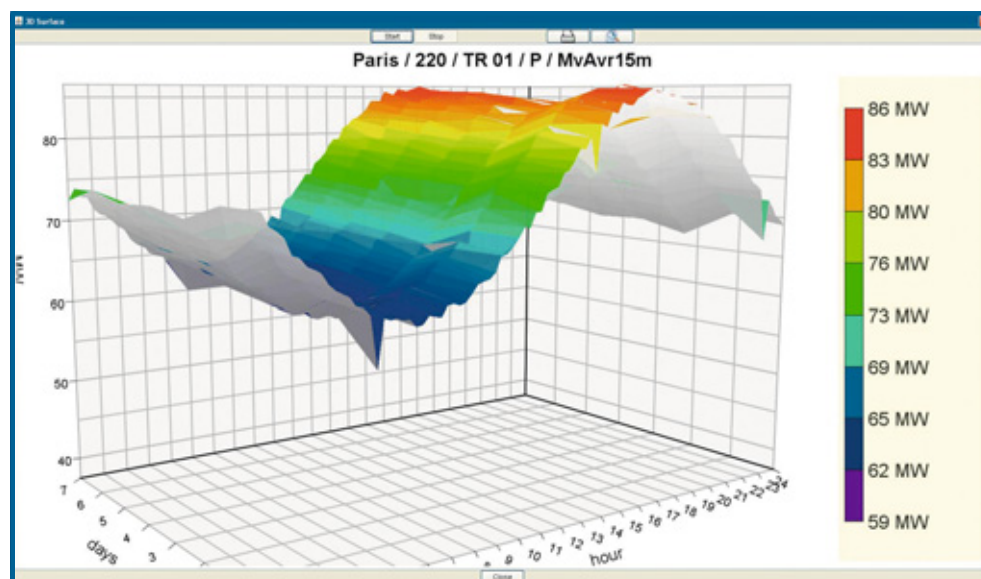
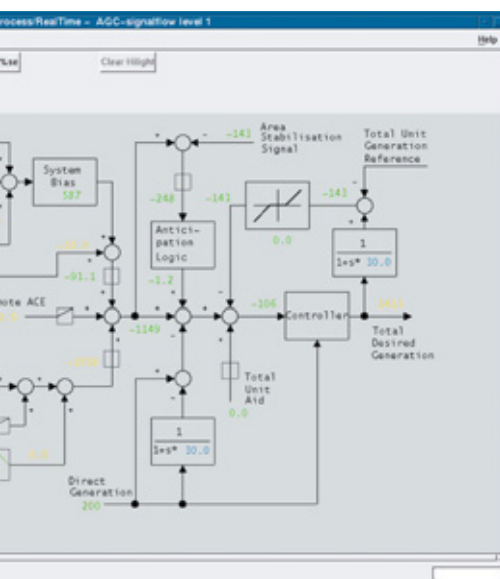
- Modular software
- Distributed system architecture
- Real-time, high-efficiency database
- Higher-level programming languages
- Unlimited number of monitors, remote terminal units and data points

Graphic environment

- World maps with decluttering function
- Windows with pan, zoom and scroll functions
- Object drag-and-drop
- Real-time curve display
- Dynamic network coloring
- X-windows system
- Enhanced Power System Visualization by state-of-the-art Java and JOGL technology providing features such as
 - Line flow pie charts
 - Animated flows
 - 3D curve analysis
 - 3D contingency severity overview
 - Configurable dashboard etc.

SCADA

- Control and monitoring
- Switching sequences
- Data acquisition
- Alarm/event processing
- Sequence of events
- Network topology processor
- Curve display
- Report/list creation
- Unit and rotating load shedding
- Energy accounting
- Disturbance data collection
- Archives and schedules
- Data transmission between control centers (UCA/ICCP, ELCOM-90)



Weekly transformer-loading curve 3D graphic

Historical information service

- Data collection and storage, both periodic and non-periodic (spontaneous)
- Scalable to process large (Terabyte) volumes of data
- Integrated data reduction and compression features
- Manual update of values in the online archive
- Short, medium, and long-term archive
- Audit trail for logging of value modifications
- Web-based user interface

Network analysis

- Network status processor
- State estimator
- Bus scheduler
- Contingency analysis
- Dispatcher power-flow calculation
- Short-circuit calculation
- Penalty factor calculation
- Optimal power flow
- Voltage/VAr scheduling
- Real-time stability analysis
- Outage management

Generation control

- Load frequency control
- Reserve monitor
- Economic dispatch
- Interchange transaction scheduler
- Interchange transaction evaluation A
- Production cost monitoring

Load forecast

- Short-term load forecast (optional: using neural networks)

Training simulator

- Network simulator
- Training system
- Tutor function
- Identical functionality and user interface of EMS

IT integration

- Connection to ESB
- Optional SOA adapters
- Data import/export
- CIM compliant data model export
- Interfaces to office environment
- Web-access clients

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