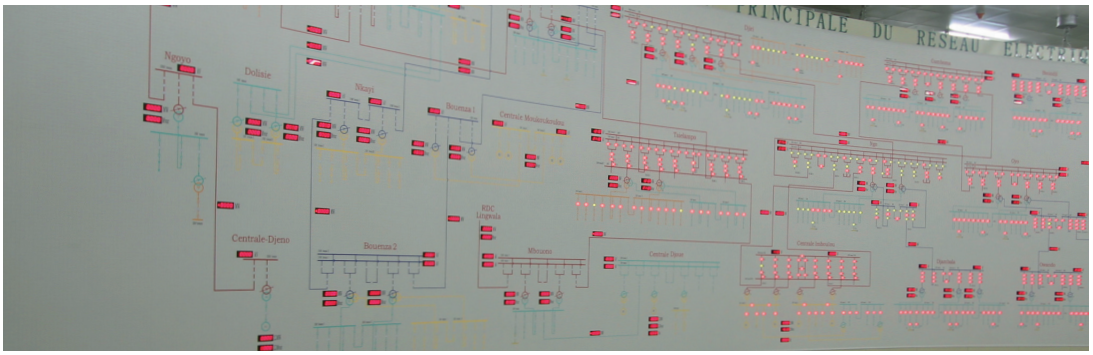
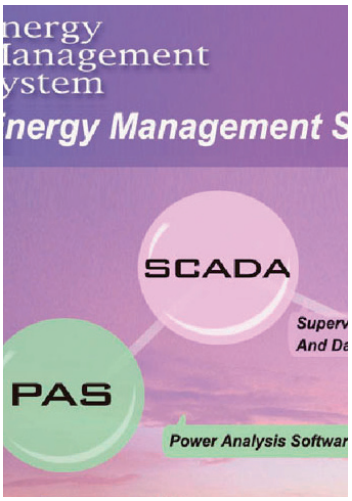
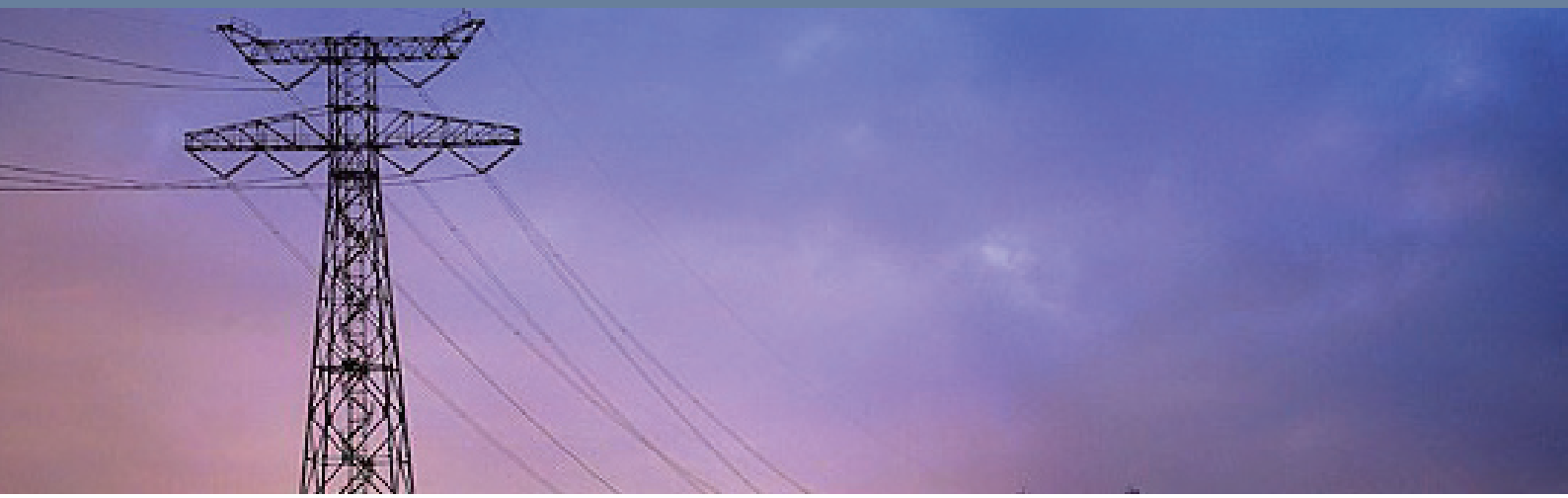
Energy Management System





A Comprehensive Management System to Improve Grid Efficiency and Network Reliability

NR Electric Corporation



Overview

PCS-9000 energy management system (EMS) is a computer-aided tool used by operators of electric utility grids to monitor, control, and optimize the performance of the generation and/or transmission system. It adopts advanced network management, object-oriented database and visualized cross-platform technology. The system operates based on the latest IEC61970 standard, providing a unified application platform for large scale energy management of power enterprises.

The PCS-9000 energy management system includes SCADA, Automatic Generation Control (AGC), Power Advanced Software (PAS), Dispatching Training System (DTS), AVC, WAMS, OMS and WEB applications. It also can be easily integrated with other systems conformed to IEC61970 standard to protect the existing investments and reduce function redundancy.

PCS-9000 contains two parts:

- Unified Application Supporting Platform (ASP)

PCS-9000 unified application supporting platform(ASP) provides powerful and universal services for distributed real-time database management, coordinated man-machine interactive interface, network information transmission, inter-process communication, system management and alarm service etc. It can be transplanted and distributed on various hardware platform structures. Each application function constructed on the basis of PCS-9000 ASP is a building block that can be integrated with other functions or implemented separately.

PCS-9000 Introduction

- Electric power system applications based on ASP

PCS-9000 Energy Management System provides full series power system applications to improve power system management level. Its modular functions can be easily customized to meet the demands of control centers. In addition, the PCS-9000 energy management system is extensible for function upgrade to satisfy user demands in the future.

PCS-9000 system typical configuration scheme is shown in Figure 1. PCS-9000 series products include:

- PCS-9000 Energy Management System
- PCS-9001 Tele-Meter Reading System
- PCS-9002 Distribution Management System
- PCS-9003 Dispatching Operation Management System
- PCS-9009 Fault Recorder Management System
- PCS-9500 HVDC Protection And Control System
- PCS-9501 SVC Monitoring System
- PCS-9005 Damage Relay Management System

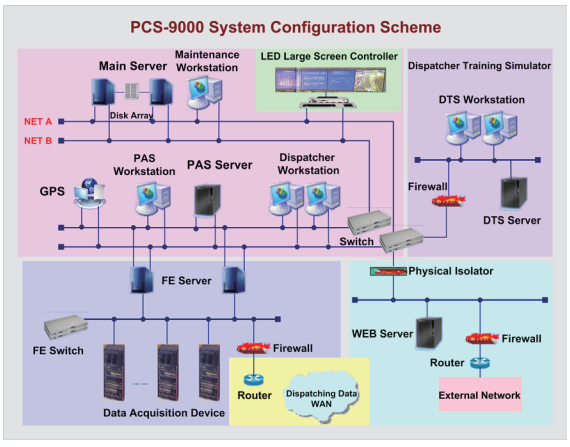


Figure 1. PCS-9000 system configuration scheme

Functions

Supervisory Control and Data Acquisition (SCADA)

- Data processing
- Reserved capacity supervision
- Control and regulation
- Sequence of event
- Data calculation and statistics assessment
- Trend curves
- Post disturbance review
- Event and alarm
- Historical functions
- Blocking and unblocking
- Labeling
- Topological coloring
- Shift takeover management
- Clock synchronization
- SCADA database modeling
- Manual data input
- Network-Oriented function

Automatic Generation Control(AGC)

- Load frequency control
- Economic Dispatch
- LFC performance Monitor
- Reserve Monitor
- Generation scheduling
- Transaction scheduling
- Super short-term load forecasting
- Unit test and sampling
- Unit commitment
- Hydro scheduling & hydro-thermal coordination

PCS-9000
Introduction

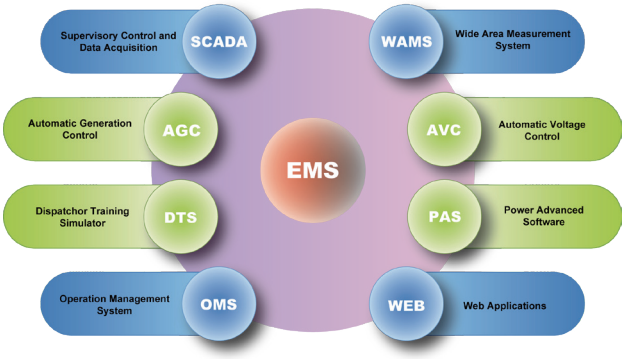


Figure 2. PCS-9000 EMS/SCADA Module

Power Application Software(PAS)

- Network modeling
- Network topology
- State estimation
- Dispatcher power flow
- Short-term load forecasting
- Steady state security analysis
- Short-circuit cCurrent calculation
- Dynamic stability assessment
- Optimal power flow

Dispatcher Training Simulator (DTS)

- Trainer Subsystem
- Power system simulation subsystem
- Control center simulation subsystem

Wide Area Measurement System(WAMS)

- Data acquisition
- Data processing
- Alarm processing
- Data calculation
- Statistic calculation

- Control and regulation
- Network topology analysis
- Network topology dynamic coloring
- Grid operation dynamic supervision
- Auxiliary service analysis
- Power system model and parameter check
- Post-disturbance review and simulation curve check

Features

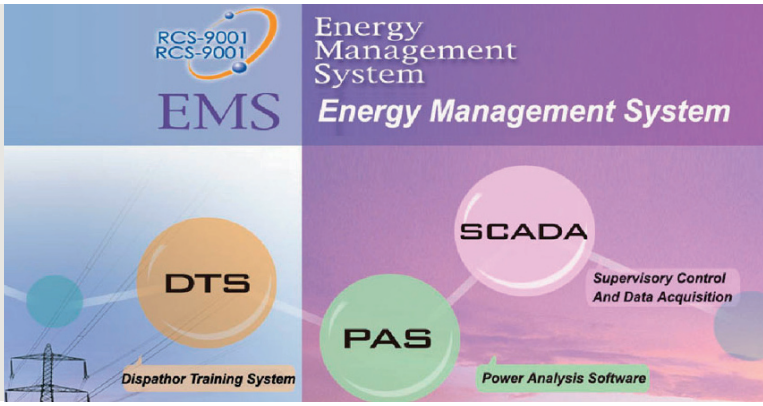
- **Innovative EMS system developed based on IEC61970 standard**
  From unified application supporting platform to all power system applications, the management system is fully complied with IEC61970 standard.

- **Integrated Graphic Modeling Technology Based on IEC61970 CIM Model**
  The Integrative Graphic Modeling Technology based on IEC61970 CIM model enables operators to draw substation diagram and build network model fast.

- **Hybrid Platform System**
  The use of Cross-platform Visualized Technology and operating system transparent middleware provides system with better portability, making it easier to build a hybrid platform system composed of multiple hardware platforms.

- **Easy Expandability and Progressive Upgrading**
  PCS-9000 system frame is easily expandable for its distributed modularization structure with UIB based on P/S. The easy functional and scale expansion capability is necessary for the smooth upgrading of EMS.

Application Supporting Platform (ASP)



Database Platform

Object-oriented Model

- Fully complied with IEC61970 CIM model;
- Strong expandability;
- Capable of constructing complicated data models;
- Modeling tool provides object-oriented modeling mode to generate corresponding static property database section files and dynamic property database section files.

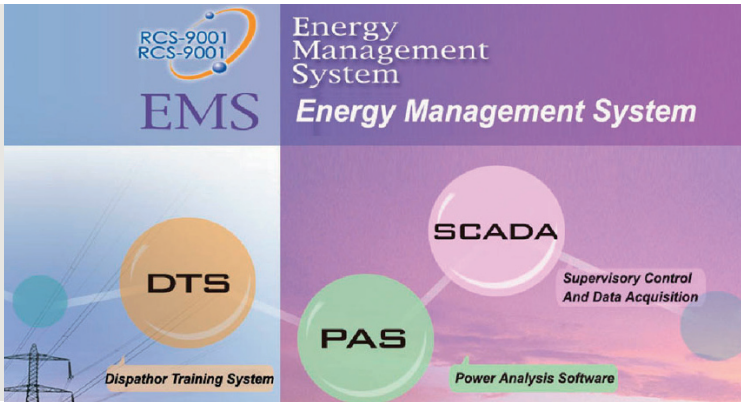
Distributed System Structure

- The database can be distributed at each node of system on request. The perfect consistency strategy ensures the synchronous updating of all copies. The multiple copies of database can avoid single node fault so as to increase system reliability.
- Flexible connection, distribution and multi-copies of database realize system load balance and ensure system performance. The database system adopts advanced connection pool management to realize multiplexing of database connection and significantly reduce system overhead. In case of database server failure, the system will automatically reconnect to the server of less loads according to the connection and distribution strategy. Once local server is restored, the connection will be switched to local server to maintain high data access speed.
- PCS-9000 provides two database connection modes, Client Only and Client/Server, to realize efficient access to local database and transparent remote access;
- Unified management of real-time data and historical data is provided.

System Management

SYSMAN is a multi-site based management platform designed for system remote management. It provides complete solution that allows system administrator and development personnel to manage software/hardware resources, monitor and

Application Supporting Platform (ASP)



analyze system operation status and identify occurred or imminent problems. SYSMAN solution mainly includes two parts: offline configuration management and online management.

- System Configuration Management

System configuration management is designed to manage system logic composition, software and hardware configurations and to define various system configuration items.

- System Online Management

System online management refers to the performed management activities during system online operation. It includes:

- System object management;
- System operation management;
- System security management;
- System clock management;
- System operation analysis and optimization.

Man-Machine System

- Object-oriented analysis and programming language;
- Component technology with powerful man-machine integration functions;
- Management of system graphic files by graphic dictionary;
- Support multi-screen and multi-window management;
- Support LED large screen projection and graphs merging;
- Integrated graphic model database supports component modeling, single line diagrams plotting and element model database maintenance;
- Component model complied with CIM standard;
- Template and guide functions to facilitate draw-up of various graphics;
- Powerful report function to ease report design;
- Component technology is used to realize unified maintenance of local application programs and WEB browsing functions. Graphics and operation modes observed at client are consistent with local files;
- Operation environment and interface style can be individually customized;
- Unified print management and connection interface;
- Clear and fluent voice alarm and prompts;

SCADA

Data Processing

Data processing module is used for data acquisition, database updating and generation of corresponding alarm criteria and events. In normal operation, SCADA acquires system data from front-end applications and communication service, while during post disturbance review(PDR), SCADA collects data from PDR playback manager, and during dispatching training simulation, it receives data from trainer workstation simulation servers.

Reserved Capacity Supervision

Reserved capacity supervision is used to manage the risk of fortuitous faults in power grids (such as loss of the largest unit or largest exchange power). Definitions of class, subclass, levels and corresponding area are provided in grid model for the components that can be put in standby condition.

Control and Regulation

SCADA control and regulation function refers to the remote control of breaker status, change of transformer tape position, switchover of capacitors and regulation of generator outputs. Specific program logic is integrated to avoid mal-operations during control and regulation so as to ensure operation reliability.

Sequence of Event(SOE)

When a fault occurs in the power grid, PCS-9000 SCADA/EMS system acquires general fault signals, CB closing/opening/tripping signals and protection operation signals, etc. After SOE records are received, PCS-9000 arranges these events in time sequence. SOE data information can be displayed on LCD display, printed by printer and stored as history information in history database.

Data Calculation and Statistics Assessment

Considering system real-time performance and its implementation, PCS-9000 provides data calculation functions in each application, including common calculations, general calculations and customized calculations.

Trend Curves

Trend records store relative data change processes in a certain period. The sampling period can be defined as second/minute/hour. The sampling density is 1 second maximum. The trend record is displayed in curve. It is allowed to drag the stored measuring point arbitrarily in substation diagram for superimposition or replacement display in a trend curve display template.

Post Disturbance Review(PDR)

Post disturbance review function records the power system operating conditions in a long period before and after a disturbance to facilitateanalysis, study and reconstruction of system disturbance by dispatchers.

Event and Record

Event is usually caused by status changes of power grid and abnormal conditions (or change of some pre-defined states) of SCADA/EMS system. Grid events and EMS system events can be separately recorded, stored and printed.

SCADA

Historical Functions

PCS-9000 system combines real-time database and commercial history database to provide a unified and general database platform for EMS applications. By using history database mode definition tool, it ensures the consistency between history database and real-time database modes; through general purpose unified access interface, it can realize transparent data access across real-time and history, so as to well merge real-time database with history database.

Blocking and Unblocking

Blocking function is used to prohibit particular data processing, data acquisition, alarm processing and report printout. Blocking and unblocking functions are provided simultaneously with authority control.

Labeling

Labeling function enables users to define label graphs, label names and label usages. Effective label durations can be set in software. The label can be configured or removed from an object on the console. Before a control operation is executed, users are reqiured to check object label.

Topological Coloring

The topological coloring module identifies the system real-time wiring configuration and colors up equipments in different statuses according to the network connection and the status of circuit breakers/switches. The module can figure out the number of topological islands, the equipment composition of topological islands and the equipment is electrified or not according to the real-time status of circuit breakers.

Shift Takeover Management

The multi-dispatcher shift takeover management mechanism is established for PCS-9000 energy management system. Shift takeover contents are recorded and stored in detail.

Clock Synchronization

PCS-9000 SCADA/EMS system provides host-standby GPS clock port to ensure clock synchronization of all equipments in the system.

SCADA Database Modeling

SCADA database modeling provides visual and convenient Graph-Model-Database Integration modeling method, to generate measurement mode, substation model and substation diagram in combination.

Manual Data Input

Manual data input includes database table attribute that can be manually input. Validity check can be applied to all manually input data. Thye input interface includes graph, related interface tools and curve mode etc.

Network-Oriented Function

Network-oriented function includes:

- Automatic bypass substitution;
- Automatic opposite-end substitution;
- Automatic busbar balance factor calculation;
- Dynamic topological coloring;
- De-energized equipment/area;
- Earthing equipment/area;
- Equipment over-limit and alarm;
- Area statistics;
- Electrical energy statistics.

Automatic Generation Control (AGC)

Automatic Generation Control

Automatic Generation Control(AGC) is an advanced modern power grid control built on Energy Management System and generator unit coordination control system to implement closed-loop control. The system modifies generating plan and auxiliary service plan of power market. It adjusts system frequency and tie-line exchange power by controlling the active power of generators to ensure a steady and economical operation of power grid.

Load Frequency Control

Load frequency control function is implemented by data processing module, basic power tracking module, power distribution regulating module and power plant controller module:

- The data processing module is invoked in each AGC execution cycle, receiving and processing analog and state tele-metering data received from SCADA.
- The basic power tracking module determines the basic power of each Power Plant Controller (PLC) involved in automatic generation control.
- The power distribution regulating module determines the regulating power of each PLC according to the current unbalanced regional power.
- The power plant controller module controls the expected output and control deviation of each PLC. It considers the actual dynamic response of PLC, decides if it needs to suppress control signals or reduce the amplitude of control signals through various tests, and finally sends control commands through SCADA.

Economic Dispatch

Economic dispatch function allocates power demands among available on-line thermal and hydro generators based on system actural operation conditions to minimize generation costs.

LFC Performance Monitor

LFC performance monitoring is called in each AGC execution period to evaluate AGC control behavior. It calculates and counts area performance indicators and unit performance indicators, and calculates qualification ratio of frequency, exchange power and ACE at different threshold values and under different conditions.

Reserve Monitor

In reserved monitoring period, standby capacities and response speeds in controlled areas are executed(usually 2 minutes), calculated and supervised. Area standby requirements can be input and modified via the interface, and an alarm is sent when standby is insufficient.

Generation Scheduling

Generation scheduling function is used to arrange generator basic power planning, output reduction planning and fuel consumption planning.

- Unit Basic Power Plan

Generator basic power plan automatically considers generators on-line/off-line state, AGC enabled/disabled conditions, basic power and vibration area of each generator unit in the plant, and distributes the total basic power to each generator unit according to the

Automatic Generation Control (AGC)

capacity. It can be forwarded to power plants for detailed implementation under local control.

- Output Reduction Plan

When the generator unit can not be regulated according to the original upper limit due to maintenance service and other reasons, the output reduction plann will reduce the maximum output in a given time to ensure the safe operation of generator units.

- Real-time Generation Plan

AGC automatically adjusts unit generation plan under load forcasting mode according to the results of super short-term load forcasting. Both AGC units and non-AGC units can be set to load forcasting mode. AGC units can execute new generation plans under AGC control. Generation plans of non-AGC units are modified and automatically issued to power plants, and units execute new generation plan under the control of power plants.

Transaction Scheduling

Transaction scheduling function is used to arrange various transaction contracts to obtain regional network exchange power plan. The type of Interchange Transaction Scheduling is defined off-line in database. Several transaction types can be defined between two identical transaction areas. Exchange plan is manually input by dispatcher or provided by transaction planning software.

Unit Test and Sampling

Unit test and sampling function is used to perform unit commissioning for AGC units. It sends pre-defined control signals to test unit response and supports automatic load increase test and automatic load reduction test. The program automatically records test start time, test end time, test unit output and unit load increase and reduction rate etc.

Super Short-term Load Forecasting

Super-short term load forecasting function operates every 5 minutes to forecast loads in next one hour using linear extrapolation method. It periodically obtains online system loads data from SCADA according to the pre-configured definition and stores the data for inquiry, analysis and assessment. Error analysis is performed anytime during load forecast. All forecasting results and error results are displayed in curve and form.

Unit Commitment

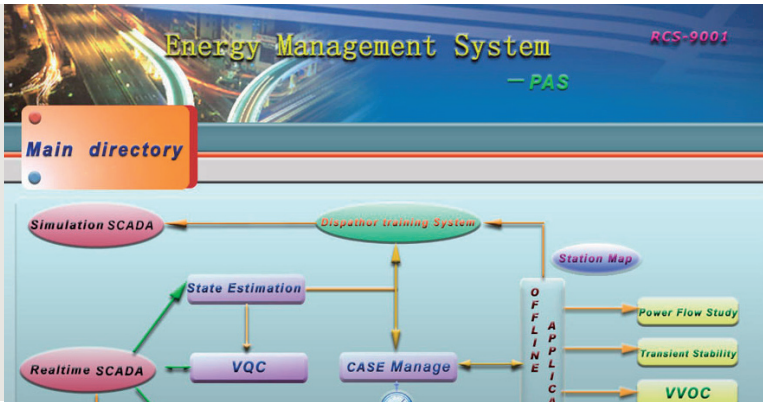
Unit commitment determines the startup/shutdown schedule of generators so as to minimize total operating costs within a specified period. Unit commitment shall consider the constraints such as system loads, reserve, unit capacity and minimum startup/shutdown time.

Hydro Scheduling & Hydro-Thermal Coordination

Hydro Scheduling determines the schedule of hydro generating units to achieve maximum hydro generation efficiency and to ensure the consistency with river flow schedules and constraints.

Hydro-Thermal Coordination is used to determine the schedule of thermal resources, hydro plants and pumped storage plants to minimize the total costs. Under the conditions that system load, water flow, thermal power cost characteristic and unit commitment are known, hydro-thermal coordination can make the hydro thermal power plant schedule to satisfy the constraints of both electricity and water.

Power Application Software (PAS)



Power Application Software

PCS-9000 power application software(PAS) is a power grid modeling analysis tool designed to enhance system safety and economical operation. It analyzes power system operating status, helps dispatchers to understand system operation states and provides basis for making analysis strategy.

The PCS-9000 PAS provides functions including Network Topology, State Estimation, Dispatching Power Flow, Steady State Contingency Analysis, Volt/Var Optimization, Short-term Load Forecasting, Short-circuit Current Calculation and Automatic Volt/Var Control, etc.

Network Modeling

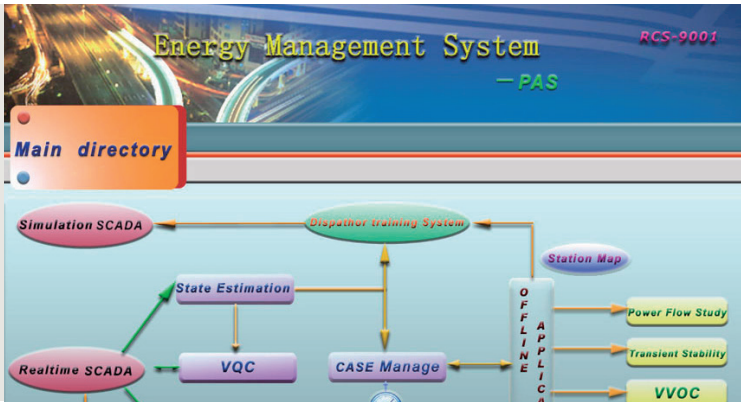
The basic functions of network modeling are to define network model, establish grid model database and define network physical structure for network analysis software. Network Modeling is the foundation of all network analysis applications.

Network Modeling is fully compatible with IEC61970 standard. It adopts CIM based Integrative Graphic Model Library modeling mode which is realized by the combination of Integrative Graphic Model Library drawing pack and database maintenance tools. The established network models are shared by all network analysis applications and training simulation system, and are capable of data exchange with third party systems via CIS data exchange interface. During network database maintenance, all application software can run normally.

Network Topology

Network Topology function identifies system wiring configuration according to interconnection relations of grid electric elements and circuit breakers statuses, and creates network busbar model for analysis application software. It can determine the number of topological islands, the composition of topological islands and their operation conditions, and indicate these items on graphics with different colors. The Network Topology function is a common modular used for all network analysis software and training simulation systems.

Power Application Software (PAS)



State Estimation

State Estimation is used to check tele-signaling and tele-metering of each plant/station to facilitate the maintenance of measuring system. It uses state estimation calculation results to count heavy loads over-limit time, provide real-time supervisory control of power network and issue over-limit time alarms. The calculation results can also be used for further grid analysis.

In state estimation, the grid can be divided into 2 parts: visible part and invisible part. Visible part refers to the measured values of sufficient redundancy in grid, while other parts in the grid are referred as invisible part or external part. Pseudo measurements can be applied to convert the invisible part to visible part to for calculation.

Dispatcher Load Flow

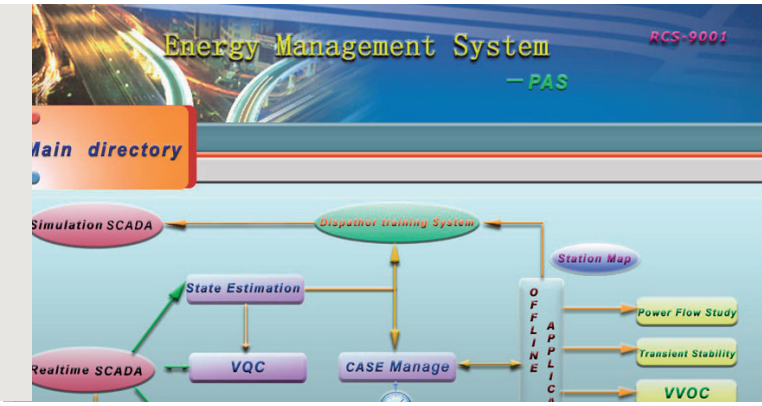
Dispatcher Load Flow(DLF) is a network analysis software which calculates the operation status of whole network according to the given grid structure and operating conditions, including voltage of each bus and power distribution in the network. In addition, it provides statistics of power generation output, total loads and power loss etc. and analyzes the reasonableness of operating mode according to the calculation results.

DLF software provides convenient and flexible interaction platform to implement flow control, mode selection, task status, parameters input and data display of all use man-machine interactive graphics. DLF software provides strict calculation models and many calculation methods. DLF can set a number of generators as buffer and perform multi-balancing unit Load Flow Calculations. DLF can set frequency calculation mode and simulate primary frequency regulation process of grid. DLF can set exchanging power control mode to control tie-line load flow among a number of control zones. DLF can set control mode and control voltage of key equipment point by adjusting the voltages of a number of power generators.

Short Term Load Forecasting

Short-term Load Forecast(SLF) is used to forecast hourly (or half-hourly or every fifteen minutes) future load in one day or one week based on the historical loads

Power Application Software (PAS)



and weather data. SLF can forecast full system loads or regional loads. The results are displayed via full graphic user interface. It also can be called by other application functions, such as Dispatcher Power Flow.

Steady State Security Analysis

After systems have experienced a fault, the steady state security analysis function will provide an operation evaluation to locate the weak operation node. Operators can take this evaluation result as a reference during their operation so as to improve system security and reliability.

Safety analysis studies the effect of fault or combined fault of preset power elements on safe static operation of grid, e.g. line, transformer, generator, load, bus and circuit breaker, etc.. The main functions are to facilitate fault type selection according to dispatcher requirement, quickly determine the harm of various faults on power system, give accurate system operating mode after fault, and display various fault consequences in a visualized and accurate manner. Safety analysis will issue alarms in case of line overload, voltage limit-exceeding, generator power limit-exceeding and other faults, and timely indicate dispatcher of serious faults.

Short-circuit Current Calculation

Short-circuit current calculation is used to simulate and study power system behavior under various fault conditions. Normally, not only single phase fault can be simulated, but also 2-phase and 3-phase faults. Short circuit fault, broken line fault and single and complicated fault can be simulated. By means of short-circuit current calculation, each branch current and bus voltage can be determined to check equipment fault withstand capability and protection settings. For example, the calculated fault current can be used for calculation of circuit breaker rated capacity, and the protection action settings can be determined and protection scheme rationality and coordination etc. can be further analyzed by fault current calculation. Short-circuit current calculation is the foundation of protection settings.

Dynamic Stability Assessment

The Dynamic Stability Assessment (DSA) determines the ability of system to survive contingencies with a safety factor by dynamic behavior analyzing. To ensure that a system remains dynamically secure, preventive or corrective remedial actions are proposed also.

Normally, DSA assesses the transient stability of a power system, or the ability of system to maintain synchronism after a credible contingency. As power systems operate in more and more stressed conditions, another form of angle stability, i.e., small-signal stability in form of sustained or growing oscillations in part or all of the system, may become critically restricting to the system operating limits.

Optimal Power Flow

Optimal power flow is to optimize the static network state through regulating control variables while all economic and secure constraints are satisfied and lead the network to a more safe and economic operation mode.

Automatic Voltage Control (AVC)

Automatic Voltage Control(AVC) is an automatic optimal control of network voltage/reactive power(Volt/Var) that network losses are reduced as much as possible to improve economic operation while ensuring voltage quality, and in the meantime the amount of operating equipments is reduced to the minimum to reduce control costs and fault probability.

PCS-9000 AVC function offers centralized decision and multi-level coordination to achieve automatic optimal voltage control. The system is composed of one AVC master station system installed in provincial dispatching center, several coordination control sub-systems installed in regional power plants and 500kV substations, associated communication systems and data transmission networks. The AVC system installed in provincial dispatching center assigns optimal control goals for each sub-system based on busbar voltage supervision and reactive power optimization calculations. The communication system and the network equipments will deliver the optimal goals to control sub-systems for execution.

Provincial dispatching centers provides the control of busbar voltage and unit reactive power in power plants and substations of 220kV and above levels. The control measures include generator reactive power output regulation, Var compensator enabling/disabling, main transformer tap position regulation in 500kV substations, low voltage capacitor compensator enabling/disabling in 220kV/110kV substations and main taps position regulations via AVC control at regional dispatching center.

Main control functions of AVC control at provincial dispatching center:

- Calibration control of busbar voltage over-limit: once a busbar voltage overlimit is detected in network, the system will provide calculation and analysis to create a control plan and take measures to bring system back to the permissive range.
- Optimal control of reactive power flow: AVC periodically provides optimal control of reactive power flow when busbar voltages at each network pilot node is not over-limit.

Wide Area Measurement System (WAMS)

The Wide Area Measurement System(WAMS) is used to monitor grid operation status, analyze system characteristics, and accurately capture power system dynamic characteristics under fault disturbance, under-frequency power swing and test conditions. It is an effective tool to check power system stability calculation model.

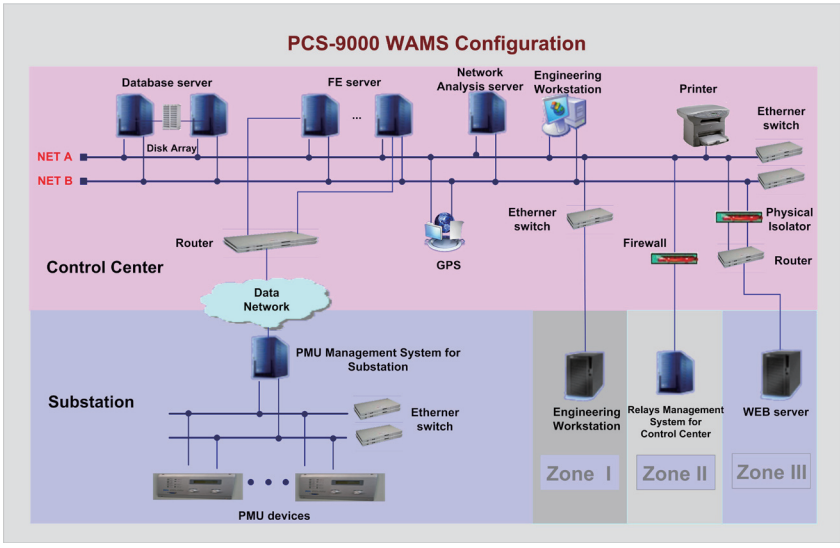
The realtime monitoring of power system dynamic characteristics greatly facilitates power system stability analysis, pre-warning, dispatching, fault analysis, parameter identification and online stability decision-making. WAMS can realize synchronous measurement and rapid transmission, and thus it is suitable for large scale rapid control. It is one of the most potential measures to control regional power exchange, restrain fault area extension and enhance main network operation safety.

Basic Functions

- Data acquisition
- Data processing
- Alarm processing
- Data calculation
- Statistic calculation
- Control and regulation
- Network topology analysis
- Network topology dynamic coloring

Analysis Function

- Grid operation dynamic supervision
- Auxiliary service analysis
- Power system model and parameter check
- Post-disturbance review and simulation curve check



Dispatcher Training Simulator (DTS)

Dispatcher Training Simulator

Dispatcher Training Simulator(DTS) is used for dispatcher training examination, anti-fault exercise and operation analysis. DTS can simulate power system normal status, emergency status, fault status and restoration process, and enable trainees to study normal operation, fault handling and system restoration in an identical dispatching environment compared to actual control center.

Functions

- Dispatcher training and examination: To develop dispatchers' fast decision-making/handling capability. The training system is working under normal dispatch environment and simulating system fault conditions.
- Anti-accident Exercise: It contains independent anti-accident exercise of local grid and union anti-accident exercise with other grids.
- Operation mode analysis: Operators can analyze each operation mode, establish reasonable and safe system operation mode, and study special operation mode of grid.
- Configuration and checking of settings: Engineers are able to check and study system configuration and devices settings .
- Union training: DTS can be interconnected with substation simulation training system for full process training of grid production.

Trainer Subsystem

Trainer subsystem consists of 3 parts: preparations for training, control and supervision during training and post-training treatment. It is used to complete preparation of training data, monitor and control training process, and display or print training reports and dynamic curves etc.

Power System Simulation Subsystem

Power system simulation method includes stable state simulation (also referred to static simulation) and dynamic simulation.

Stable state simulation shall consider the change of generator and load power, change of load flow and system frequency after disturbance in the system. Dynamic Load Flow Algorithm and Dynamic Frequency Calculation Algorithm are used for simulation, and electromechanical transient process is not considered. The automation equipment can be triggered according to power network static status. Logic method and setting method are used to simulate relay protection. In this model, medium and long-term dynamic processes shall be considered.

Stable state simulation can simulate the load flow changes, node voltage variation and system frequency variation after the change of generator output, voltage, load, transformer tap position, switch/insulation switch status and tie-line load flow, etc. It also can simulate the operations of protection and automation devices after a fault occurs to realize real-time simulation of power system.

Control Center Simulation Subsystem

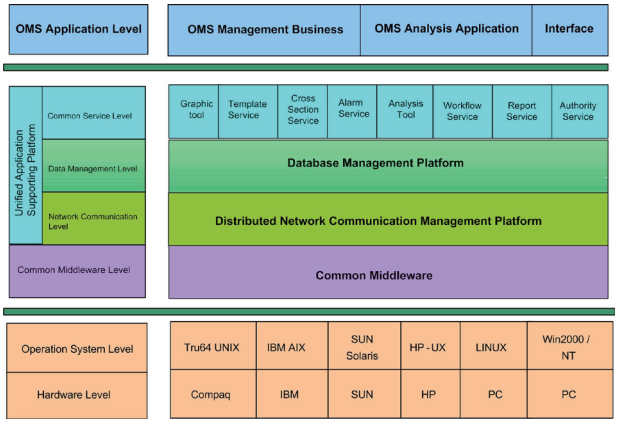
Control center simulation is consistent with the actual control center. Various of online dispatching automation functions are provided, including supervisory control system and online application software.

Operation Management System (OMS)

Operation management system provides integrated and unified operation analysis and management for power grid. The management relies on the process operation platform using various supporting technologies such as processing management tool, workflow engine and processing templates, to realize the unified operation management of dispatching centers and to provide technical supports for dispatching automation operation decisions.

Software Structure

OMS are operating based on a unified supporting platform. The platform covers three levels: common services level, data management level and network communication level. Services that related to dispatching operation management are integrated in the common services level.



OMS application level includes various OMS businesses and connection interfaces. The standard interfaces are provided by common services to support connections to third party systems.

Functions

Operation Management System includes OMS platform and OMS online applications. It is composed of the following three parts:

- **Customization Function**

The customization function provides report customization service, workflow customization service, operation rule definition service, authority configuration service and reminding item service.

- **Workflow Software Drive**

The workflow software drive offers workflow drive engine operating on automation software.

- **Online Application Control Panel**

The online application control panel is used to manage and process all kinds of dispatching businesses.

OMS business functions include:

- Common Sub-system
- Dispatching Operation Sub-system
- Operation Mode Sub-system
- Dispatching Planning Sub-system
- Relay Protection Sub-system
- Automation Sub-system
- Communication Sub-system
- Comprehensive Sub-system

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