



DF8000 Catalogue

SCADA/EMS/DMS/OMS System



For Reliable, Secure and Economical Energy System Operation

Dongfang Electronics International Engineering Co., Ltd.
Dongfang Electronics Co., Ltd.

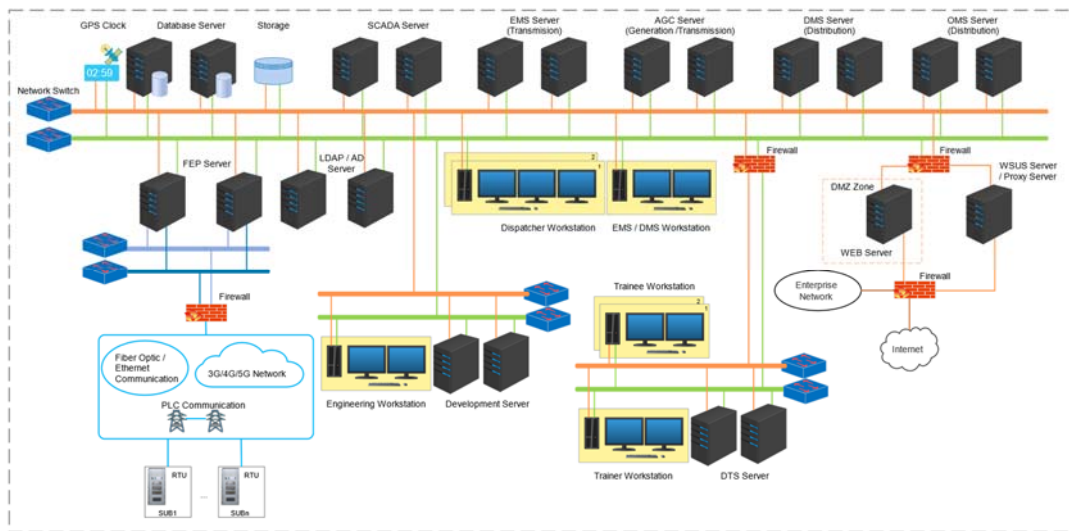
Summary

DF8000 SCADA/EMS/DMS/OMS system is a whole set integrated solution for analysis, simulation and operation of electric power generation, transmission, and distribution. DF8000 provides the functions of supervisory & control, network analysis, safe and economical operation instruction, dispatch information management, dispatcher training simulator, data integration platform with third party software and communication between different control centers etc.

DF8000 is developed under an established quality assurance program and has been used as high reliability Electrical Power Automation Systems software worldwide.

DF8000 was developed under a modular designing concept and with Server/Client architecture. According to your requirement, DF8000 can also provide cloud native solution. It is a Reliable, Scalable and Flexible system.

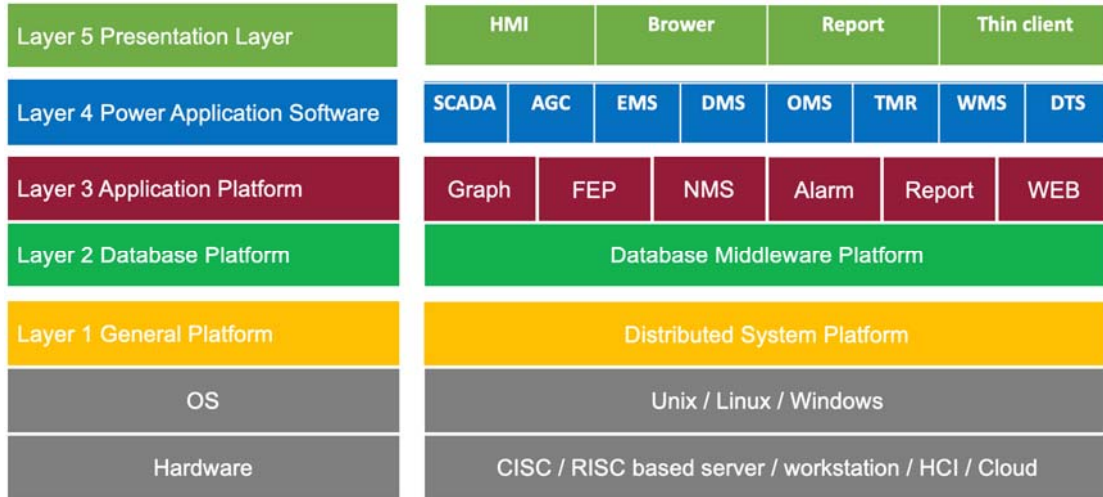
As a fully integrated enterprise solution, DF8000 is a Real-Time Intelligent Power Management System to monitor, control, simulate, and optimize the operation of your energy system.



Typical Configuration for Dispatch Control Center

System Hierarchy

DF8000 SCADA/EMS/DMS/OMS software system has five layers in design:



The First:

Distributed System Operation and Development Middleware Platform

It is called general OS platform layer. It is a middleware between DF8000 SCADA/EMS/DMS/OMS system and different operating systems. This middleware isolates DF8000 applications with OS, at the same time, it provides uniformed OS function interface for SCADA, EMS, DMS, OMS applications, and it provides operation environment for the applications. And it makes DF8000 SCADA/EMS/DMS/OMS system high portable. It assures that different operation systems like Windows, UNIX, Linux can be used at the same time in a DF8000 system. For example HP-UNIX, IBM AIX, SUN Solaris, Linux, Windows Server & Windows Workstation, etc. So, it can provide most cost-effective SCADA/EMS/DMS/OMS solutions for power enterprises and protect the customer's investment.

The Second:

Object-Oriented Real-Time Database

Middleware Layer following IEC61970/IEC61968

It is called uniform power application platform, it adopts the object-oriented power device model definition and EMSAPI established by IEC, it is a power system application oriented real time database management system. The special platform, makes SCADA, EMS, DMS, OMS have application-level openness based on IEC 61970/61968 CIM/CIS, and makes the application software modules "Plug and Play" possible. With this openness design, DF8000 is easy to integrate with the third-party software modules in control center.

The Third:

Application Platform Layer

It provides general application interfaces and service for SCADA, EMS, DMS, OMS and other applications. It is composed of integrated GUI, integrated drawing-model-database editing tool, printing service, data acquisition service, web service and interconnection adapter with other systems.



The establishment of application platform layer makes it easy for the system development and upgrade.

The Fourth:

Power Application Software Layer

This layer includes many power system applications, such as SCADA, AGC, NAS, DMS, OMS, AMR, GIS, ICCP, and Power Market supporting software. Training simulator applications (DTS) is also in this layer, which is the mirror image of SCADA/EMS/DMS/OMS, and it can establish flexible one-to-one and one-to-

more Trainer and Trainee mode for providing whole training simulation environment in study mode supplied by SCADA, NAS and AGC etc.

The Fifth:

Presentation Layer

This layer uses virous technologies to provide the human and machine interface, to present data to the user for deep understanding of the power grid and for best monitoring, control, and optimization of the power grid.

Application Modules

DF8000 SCADA Software Modules
DF8000 SCADA HMI
DF8000 SCADA Database Editor
DF8000 SCADA Data Viewer
DF8000 SCADA Database Backup Manager
DF8000 SCADA Database Connection Monitor
DF8000 SCADA Drawing Editor
DF8000 SCADA Front End Viewer
DF8000 SCADA Front End Sever
DF8000 SCADA Real Time Alarm Viewer
DF8000 SCADA Historical Event Viewer
DF8000 SCADA Report Manager
DF8000 SCADA System Manager
DF8000 SCADA Real Time Database Sever
DF8000 SCADA Real Time Database Viewer
DF8000 Advanced SCADA Software Modules
DF8000 Web Server
DF8000 Application Programming Interface
DF8000 OPC Server and Client
DF8000 Sequence Switching Management
DF8000 ICCP Application
DF8000 Enterprise Application Integration Platform

DF8000 Work Order Management
DF8000 EMS Software Modules
DF8000 Network Topology
DF8000 State Estimation
DF8000 Short Circuit Calculation
DF8000 Contingency Analysis
DF8000 Voltage Stability Analysis
DF8000 Transient Stability Analysis
DF8000 Transmission Network Power Flow
DF8000 Optimal Power Flow
DF8000 Reactive Optimization
DF8000 Automatic Voltage Control
DF8000 Economic Load Dispatch
DF8000 Automatic Generation Control
DF8000 Reserve Monitor
DF8000 Load Forecast
DF8000 Interchange Scheduling
DF8000 Outage Scheduling
DF8000 Unit Commitment
DF8000 DMS Software Modules
DF8000 Distribution Network Topology and Coloring
DF8000 Distribution Network Power Flow
DF8000 Volt / Var Control
DF8000 Load Shedding Application
DF8000 Fault Location Isolation and Service Restoration
DF8000 Loss Minimization via Feeder Reconfiguration
DF8000 Load Balancing via Feeder Reconfiguration
DF8000 Distribution Load Forecasting
DF8000 Operation Monitor
DF8000 Under Load Switching
DF8000 Energy Losses / Operational Losses Calculation
DF8000 Reliability Analysis
DF8000 OMS Software Modules
DF8000 Outage Management System
DF8000 GIS Software Modules
DF8000 Geographical Information System
DF8000 DTS Software Modules
DF8000 Dispatched Training Simulator

System Features

Integrated Hardware/Software Platform

- Provide uniform application developing interfaces to improve the efficiency of system upgrade and customer development
- Provide Uniform, extensible, distributed, transparent operating system platform
- Flexible configuration and expansion ability
- Support Unix OS, Windows series OS and Linux OS
- Support commercial relation database such as Oracle, Sybase, SQL Server and MySQL
- Standard external communication interface to integrate with other systems

Features of SCADA Package

- Secured operation via Area of Responsibility and password verification
- Secured data viewing on displays and alarm processing based on AOR
- Perfect data processing and calculations functions, such as engineering unit conversion, multi-level limits checking, and rate of change checking
- Advanced alarm and event processing
- Network topology analysis and dynamic coloring
- Support alarm information forwarding via mobile short message system
- Control permissive interlocks logical definition interface
- Support continuous SCADA snapshots for archiving or PDR
- Support network / computer redundancy
- Support Server/Client Topology Model, and support remote operation workstation accessing SCADA function
- Provide programming language for customized function developing

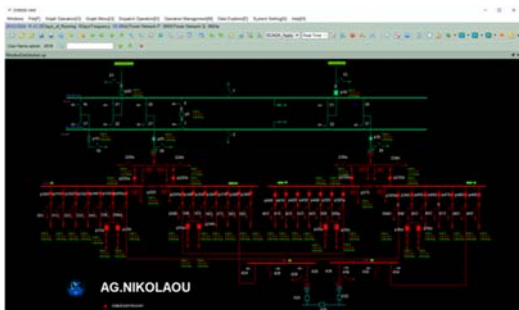
Friendly Human Machine Interface

- Built-in intelligent graphics
- Display Real-time data on one-line diagrams
- Configurable font types, styles & colors
- Configurable display ratings & modes
- Graphical display of equipment impedance & grounding
- Automatic distinguish of energized & de-energized elements
- Text box editor with dynamic link to properties
- Intelligent text box & hyperlink marks
- User-friendly plotting
- CIM based diagram-model-database integration
- CIM based graphic primitive and modeling
- Diagram drawing, model building, and data editing integrated
- Plot-browse-test integration
- Transmission/distribution network modeling integration
- Customizable HMI
- Use advanced QT developing platform, provide identical HMI style under different OS
- Support user customized device primitive and menu
- Provide Unitizing Summaries Displays
- Support X-Window and OSF/Motif and three-dimensional graphics Based on OpenGL
- Support various drawing format such as Bitmap, DXF and gif images
- Support automatic diagram generation, including diagram of total network power flow, diagram of power supply tracing, diagram of bay, etc.

Basic SCADA Modules

DF8000 SCADA HMI

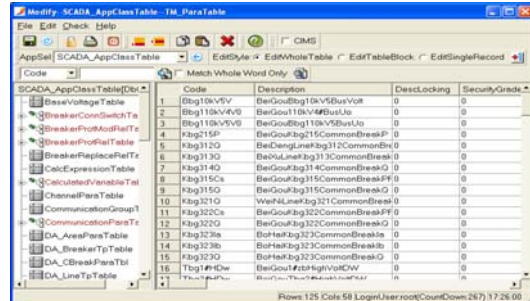
DF8000 SCADA HMI Module is distributed and fully graphical human-machine interface developed based on network window system X-Window, industrial standard OSF/Motif or Windows and three-dimensional graphics standard OpenGL. The system fully considers the different requirements proposed by different applications, such as NAS, DMS, AGC, DMIS, AMR and TMS when designing, and mixes the miscellaneous requirements. All the operations can be performed on the human-machine interface, via clicking mouse to make the operation more convenient. The shortcut operations are defined too, which make the operation simpler and more convenient. The single key can be defined to navigate display also to speed up the operation.



DF8000 SCADA Database Editor

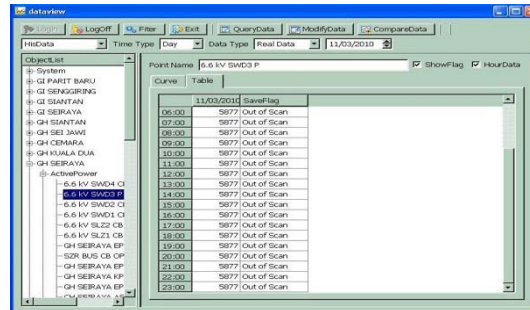
- Set an object-oriented data model referenced to CIM, to establish the foundation for the “plug-and-play” of the application software.
- Implementing the “seamless connection” between commercial relational database and real-time database.
- Fulfill real-time database management of distributed application environment to realize the independence and transparency of physical storage.

- Implement the fast copy and backup of database.



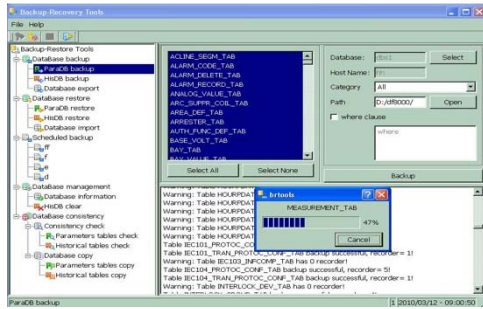
DF8000 SCADA Database Viewer

DF8000 SCADA Database Viewer Module is responsible for the query or modification of historical data. The system provides a database interface to display data at any time interval in tables or curves. The historical data can be modified with proper authority, and the system will re-calculate the modified data and make statistics again.



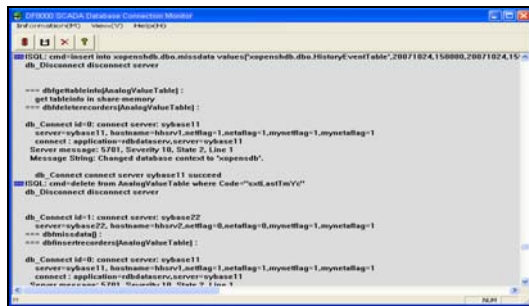
DF8000 SCADA Database Backup Manager

DF8000 SCADA Database Backup Manager module is for dumping, replication, and transcription the database. Its menu is convenient and friendly. To display the parameter table structure is also provided.



DF8000 SCADA Database Connection Monitor

DF8000 SCADA Database Connection Monitor Module is the interface for outputting database accessing command and the operation result. This interface helps the system administrator to diagnose the system running status.

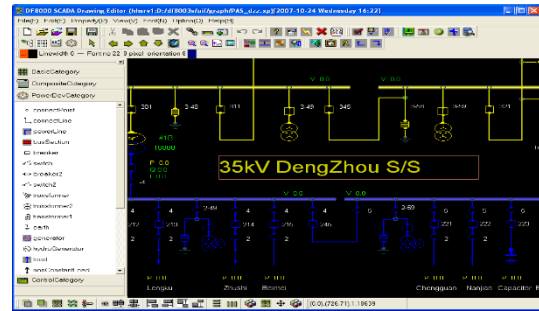


DF8000 SCADA Drawing Editor

DF8000 SCADA Drawing Editor Module adopts the object-oriented technique. All devices and electric power symbol are treated as objects. The system can display three-dimension images and flashes, many kinds of fonts. The system also supports Unix system X terminal and simulated X terminal on a PC.

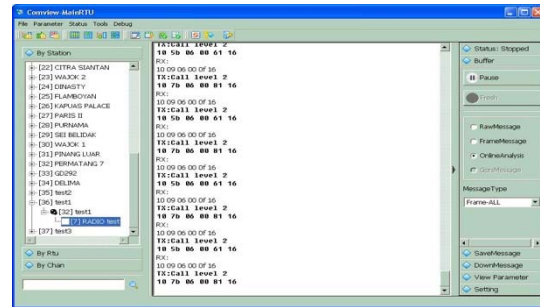
DF8000 SCADA Drawing Editor Module can display drawing on static or dynamic mode with multilayer structure. The system has unlimited display of layer and view and may set database information for power device. The system also integrates the power device symbol pre-defined function. The DF8000 SCADA Drawing Editor can synchronize the modified drawing via

network after the archiving command is issued.



DF8000 SCADA Front End Viewer

DF8000 SCADA Front End Viewer Module displays the parameters of the FEP system, checks the channel buffer, monitors the RTU status, watches the raw real-time data, and tests the data transmission. It also acts as the protocol analyzer.



DF8000 SCADA Front End Sever

- Support synchronous/asynchronous channel
- Auto-switch main/standby channel according to channel status
- Auto-switch main/standby FEP according to host status
- Monitor and control the running status of channel
- Support all standard international communication protocol (such as IEC60870-5-101, IEC60870-5-103, IEC60870-5-104, IEC61850, MODBUS serial or over IP, DNP 3.0 serial or over IP, SPABUS, SNMP, ICCP etc.)
- Access third party software database via OPC



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- Adopt Terminal Server to allow the serial equipment to be connected to LAN and WAN directly.
- Support wired communication and wireless 5G/4G/3G/GPRS communication.

DF8000 SCADA Real Time Alarm Viewer

All the alarm and event have attributes like priority, point or device name, substation name, type, time, status or value, area of responsibility, etc. And alarm style, description, sound or not are user definable.

Alarms include fault trip, no command change of switch, protection signal, fault trip times of breaker violating limit, analog value violating limits, change rate of analog point violating limit, and so on.

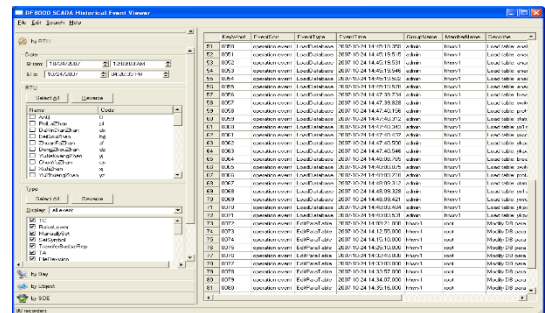
DF8000 SCADA Real Time Alarm Viewer provides SMS and Email Messenger. The module uses the short-message service supplied by the mobile communication service to send the classified and filtered SCADA system's information to the dedicated mobile phone. The subsystem can make the user gathering the real-time information of the power grid easily at any time and in any place via using the public SMS. It can speed up the efficiency for restoring the power grid from abnormal accident. Customer can set the information style according to their requirement. The system can improve the operation efficiency and reduce the labor intension for the operator.

Alarm No.	Alarm Name	ID	Time	Substation	Alarm-Event	Action-Response
37	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
38	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
39	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
40	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
41	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
42	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
43	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
44	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
45	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
46	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
47	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
48	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
49	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
50	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
51	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
52	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
53	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
54	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
55	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
56	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
57	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
58	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
59	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active
60	10kV line outage	4750000	2015/03/16 10:54:19.390		Alarm	Active

DF8000 SCADA Historical Event Viewer

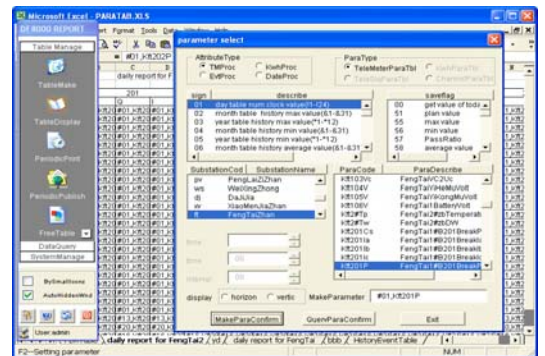
DF8000 SCADA Historical Event Viewer Module is the interface to retrieve the history event. It is useful to analyze accident of the power grid. The interface provides the access to set the event searching condition.

The module provides the function of event editing, such as add an event record, delete an event record, or modify an event record.



DF8000 SCADA Report Manager

- Based on MS Excel, access all the functions provided by the Excel.
- Customized reports generation.
- Access the history database by ODBC driver.
- Push the reports to Web regularly.



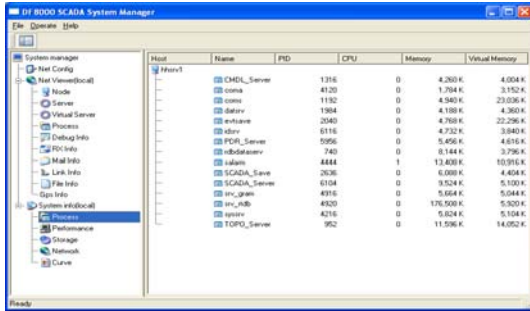
DF8000 SCADA System Manager

- Provides system performance output interfaces according to the OS system management functions.
- Provide network communication management.
- Provide distributed objects management.



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- Provide node and process management.
- Provide system on-line diagnose interface.



maintaining the consistency of real-time database in the platform level and carries perfect full-scale management. It makes that the upper applications can process interior data centrally, efficiently balances the system load, and improves the usability and stability of the system.

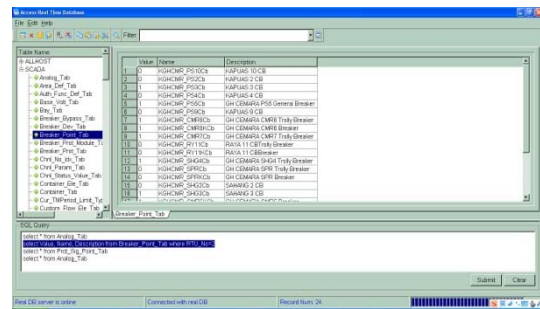
DF8000 SCADA Real Time Database Sever

DF8000 SCADA Real Time Database Sever adopts Server/Client mode. There is only one node whose database is taken as the referenced one in the whole system, the other nodes copy the referenced one as their local real-time database. The copies of real-time database are updated automatically and kept the same with the referenced one, to meet the data consistency requirement of the distributed system.

Distributed real-time database management solves the problem of

DF8000 SCADA Real Time Database Viewer

DF8000 SCADA Real Time Database Viewer Module is the interface to display real time database parameter. The interface provides access to view and modify the parameter and help the system administrator to diagnose the consistency between real-time database and relational database.



Advanced SCADA Modules

DF8000 Web Server

- Based on Browser/Server (B/S) architecture.
- Provide graphical data browsing via browser.
- Provide scalable vector graphics and OpenGL displaying style at browser.
- The real-time data can be updated on the browser.
- Browsing various reports via browser.
- Query the power device parameters via browser.

- Access history data and events via browser.

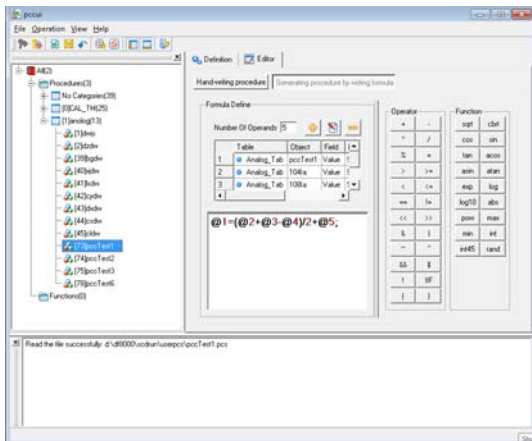




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DF8000 Application Programming Interface

- Support constant and variable definition.
- Support following kinds of calculations.
- Arithmetical calculation such as +, -, *, /.
- Relation calculation such as >, <, ==.
- Logic calculation such as AND, OR, NOT, XOR.
- Bit operation such as &, |.
- Mathematic function such as square, square root, mod etc.
- Statistics function such as maximum, minimum, and average.
- Bit operation function such as shift left, shift right, rotate shift left, rotate shift right, bit set.
- Trigonometric function such like cos, sin.
- Time function.
- Logic function.
- Permit function.
- User defined function.
- Support sentences of evaluate, return etc.
- Support commands such as remote control, manual data setting.



DF8000 OPC Server and Client

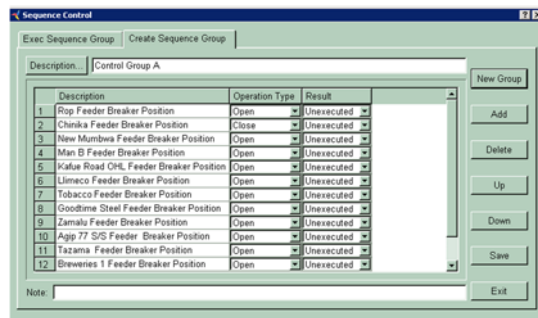
- Provide connection to OPC server.
- With a general interface, the data can be in the same format without considering whether the source data come from PLC, RTU, IED, parameter, analyzer, application software, etc.
- Provide protocol library of IEC60870-5-

101, DNP3.0, MODBUS, SPABUS and MODBUS Slave by OPC service.

TagName	CurrentValue	Quality	TimeStamp
UNIT1.TRAIN.NOEI.TAG1.INPUT	1	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG1.FV	29.54	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG2.INPUT	0	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG2.FV	230.48	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG3.INPUT	0	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG3.FV	113.28	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG4.INPUT	0	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG4.FV	243.01	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG5.INPUT	0	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG5.FV	121.95	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG6.INPUT	1	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG6.FV	154.47	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG7.INPUT	1	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG7.FV	174.02	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG8.INPUT	0	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG8.FV	227.73	0FC QUALITY GOOD	13:50:12
UNIT1.TRAIN.NOEI.TAG9.INPUT	0	0FC QUALITY GOOD	13:50:12

DF8000 Sequence Switching Management

- Support fast batch remote controls on the pre-defined objects to fast change operation status of the power network.



DF8000 ICCP Application

- Provide debug tools.
- Exchange data with the third-party software through ICCP protocol.



DF8000 Enterprise Application Integration Platform

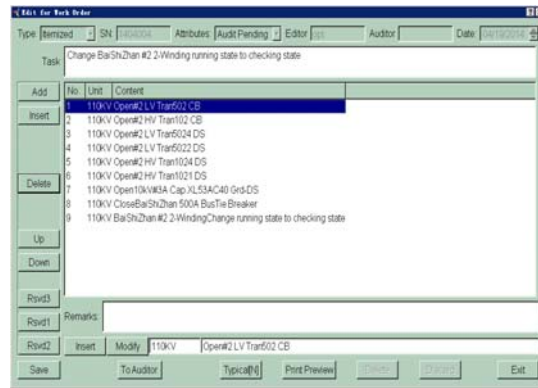
- Support various connections with third-party application software.
- Provide connection tools with ODBC,

ICCP and Text file.

- Data of SCADA DB may be exchanged as text file

DF8000 Work Order Management

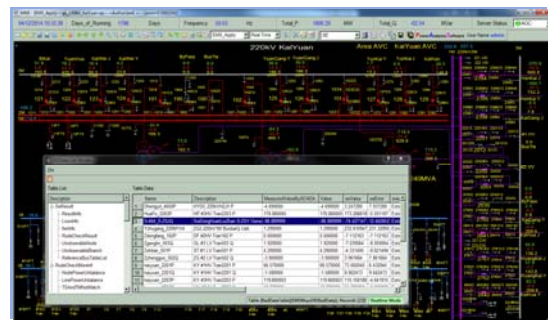
- Manages the work order in the whole cycle of the work forms, including the making, the approval, the implementation and finally the filing of forms.
- The link needed by the SCADA system during the operation under the responsibility of Dispatcher.



EMS Modules

DF8000 Network Topology

- Network modeling, network connection analysis, network monitor and so on.
- Dynamic grid be-painting.
- The results can be displayed on network topology diagrams or trees.
- Network topology function can be applied to the whole or local network.

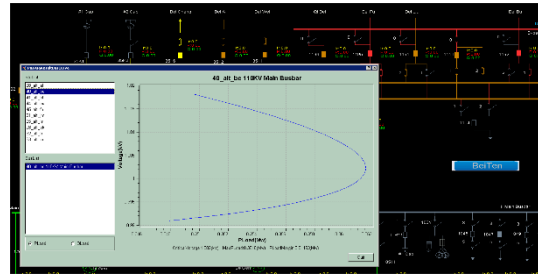
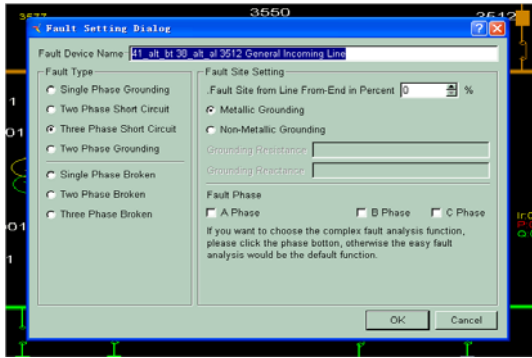


DF8000 State Estimation

- Provide measurement rationality-check.
- Check and distinguish wrong status of switches.
- SE automatically maintains the model of bus load forecasting.
- Recognize bad data based on the forecast residual error.

DF8000 Short Circuit Calculation

- Support different kinds of fault, including phase-to-ground, phase-to-phase, phase-to-phase grounding, three-phase faults.
- Flexible control. Consider the normal load flow influence or not. Consider the resistance influence or not. Concern grounding resistance
- Set fault directly on the diagram.
- Multi-fault analysis, up to 20 simultaneous faults.
- Network operation mode management: Create, Save, Load.



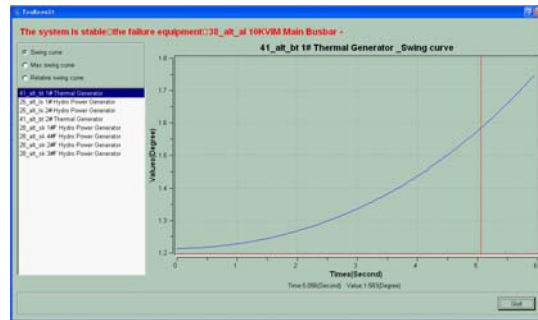
DF8000 Contingency Analysis

- Save the snapshot with whole electric grid data when a fault happens.
- Analyze the contingency with respect to the splitting of interconnected network grid, loop breaking, load shedding, transmission overload, etc.
- Provide limit violation amount, limit violation device caused by the contingency, and identify the weak point/area in the grid.
- Provide contingency definition, contingency screening, and full contingency analysis.

DF8000 Transient Stability Analysis

- Real-time mode or study mode transient stability analysis.
- Clear analysis result display using tabular or curve.
- Graphical user-defined model data editor.
- Convenient fault definition.

Contingency Name	Contingency Type	Contingency Location	Contingency Time	Contingency Status
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed
41_01_110KV Main Busbar	Three Phase Short Circuit	41_01_110KV Main Busbar	0.000000	Completed

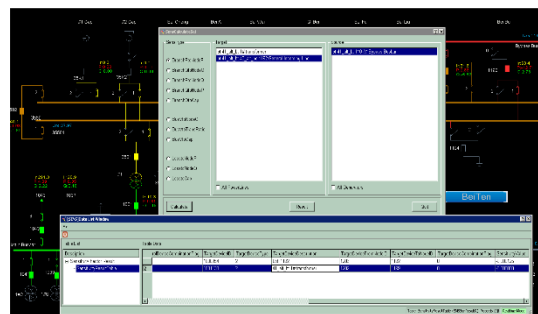


DF8000 Transmission Network Power Flow

- Provide a better power-running scheme in accordance with local network operating mode.
- The algorithm is reliable to assure convergence.
- Simulate specified scenario of power-grid operation modes.
- Display the power flow results on the single line diagram.

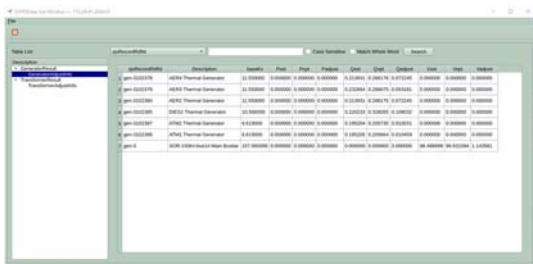
DF8000 Voltage Stability Analysis

- Determine the ability of the power system, ensure the system voltage in a reasonable range.
- Real-time mode or study mode analysis.
- Definable key voltage monitor point.
- Intuitive voltage collapse point display.



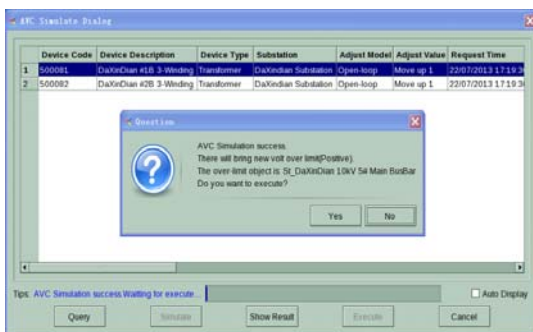
DF8000 Optimal Power Flow

- Optimize the security and economy of power system operation.
- Support control variables including Generation output (MW, Mvar), Transformer taps, Switchable shunt capacitors and reactors, SVC, MW interchange transactions, and Load shedding.
- Consider constraints such as bus voltage limits, branch flows, generator output limits, SVCs admittance limits, and LTC tap limits.
- Multi-objectives, global optimization.



DF8000 Reactive Optimization

- Object function can be defined as the operation cost, voltage-var limits, system losses and total costs.
- Data source will be state estimation results, load flow results, real-time data, or the stored historical data.
- HMI is provided for user to modify object function, controlled variable and constraints.



DF8000 Automatic Voltage Control

- Monitor and analyze reactive power and bus voltage to minimize loss by adjusting capacitor and tap ratio of transformers.

- Constraint reactive power and voltage limits to access to optimal area for power balancing.



DF8000 Economic Load Dispatch

- PLC incremental cost curves.
- Network transmission losses penalty factors.
- PLC operating limits.

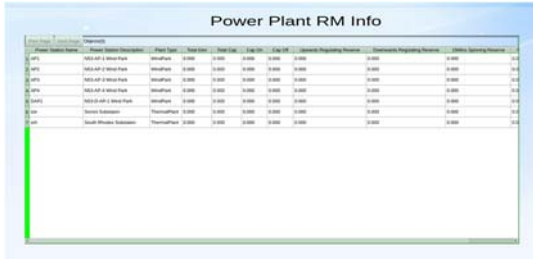
DF8000 Automatic Generation Control

- Collect telemetry for all the required quantities.
- Filter telemetry.
- Select best alternative telemetry where redundant values are available.
- Accept scheduled interchange.
- Compute the Area Control Error (ACE).
- Filter ACE.
- Calculate control allocation.
- Issue controls to generators.
- Model and monitor generator response.
- Monitor NERC performance.
- Provide the data interface to electricity market.
- Adopting the Object-Oriented structure design.



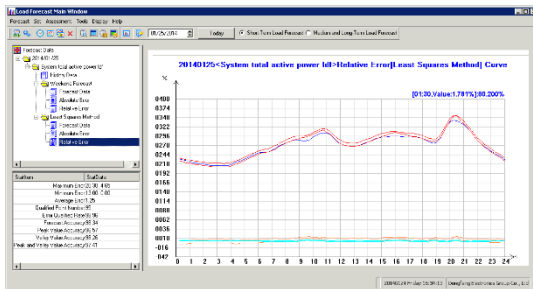
DF8000 Reserve Monitor

- Generating units reserve capacity calculation.
- Plant reserve capacity calculation.
- Regional reserve capacity calculation.
- Reserve alarm.



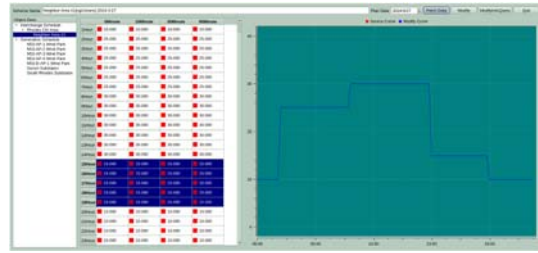
DF8000 Load Forecast

- Forecast loads of multiple areas at the same time.
- Historical forecasting errors can be calculated automatically.
- The forecasting model could be selected based on the historical forecasting error.



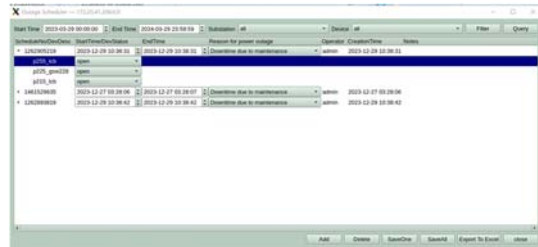
DF8000 Interchange Scheduling

- Interchange schedules management.
- Any modification will be logged along with the reason of the change.
- Interactive graphical interface.
- Flexible retrieval function.



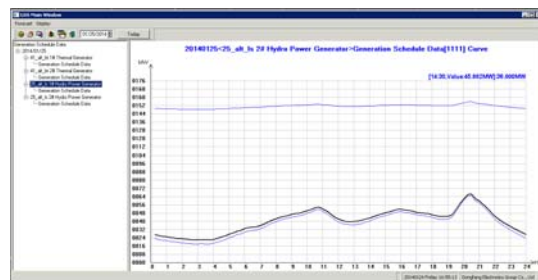
DF8000 Outage Scheduling

- Outage schedules management.
- Any modification will be logged along with the reason of the change.
- Select outage device directly on the diagram through graphical interface.
- Flexible retrieval and sort function.



DF8000 Unit Commitment

- Determine on/off schedule for a given combination of generating units.
- Units/Plants modelling.
- Production cost calculation.
- Simple & practical algorithm.



DMS Modules

DF8000 Distribution Network Topology and coloring

Network topology analyzes interconnections among devices in the distribution network, transforming physical models of distribution network into mathematical ones on which power flow computation and network reconfiguration modules are based.

- Entire network topology analysis, dealing with all kinds of substation topology types.
- Generating the node-branch model of specified island.
- Identifying abnormal on/off states of breakers/switches making use of active powers, reactive powers, currents, voltages, etc.
- Identify the loop network or multi supply network.
- Power supply tracing, providing different colors for feeder and circuit tracing.
- Periodic triggered, event triggered and manual triggered.



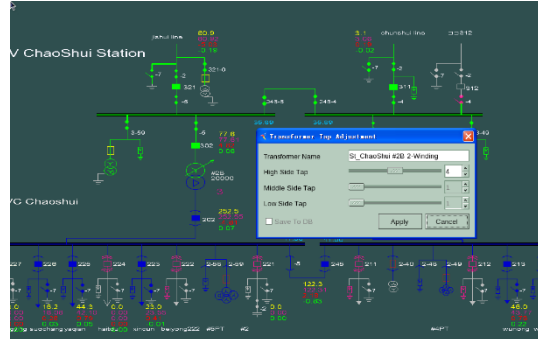
DF8000 Distribution Network Power Flow

Power Flow Application can analyze power flow distribution of the whole distribution network as per the network topology structure and node power injection.

- Network power flow analysis including radial networks and ring networks.
- Support various types of devices: lines

(overhead lines, cables, etc.), transformers, loads, capacitors, reactors, etc.

- Simultaneously calculate power flows of multiple islands.
- Calculate three-phase balanced power flows and three-phase unbalanced power flows.
- Calculate node voltage amplitudes and phase angles.
- Calculate active power, reactive power, and current of each branch.
- Calculate theoretical losses under different operation modes.
- Run on real-time mode or study mode.
- Simulate device operations in the study mode.
- Voltage and reactive power optimization.
- Periodic triggered, event triggered and manual triggered.



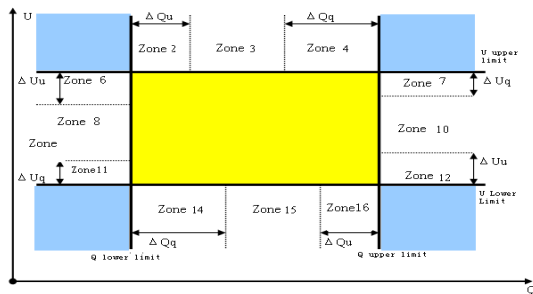
DF8000 Volt / Var Control

The Volt/Var control (VVC) application continuously monitors the distribution network and computes the optimal distribution control settings to minimize MW energy loss and voltage/var violations in three-phase, unbalanced and meshed distribution system. VVC computes the optimal control settings for switchable capacitors and tap changers of voltage regulating transformers.

DF8000 supports Distributed Energy

Resources (DERs), so VVC can also control the DERs to ensure the voltage and reactive power in the setting range.

- Only Monitoring Mode: VVC application just monitors the voltage, reactive power, and related devices, and not to adjust the related devices.
- Open Loop Mode: The scheme generated by VVC application is executed only after getting the approval of the operator.
- Close Loop Mode: The scheme generated by VVC application is executed automatically without approval of the operator.



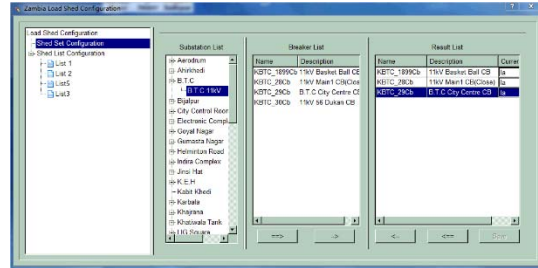
DF8000 Load Shedding Application

The load shedding application can automate and optimize the process of selecting the best combination of switches (Circuit Breakers) to be opened and controlling to shed the desired amount of load. The LSA will recommend various combinations of switching operations scheme by given a total amount of load to be shed; the recommendation is based on basic rules for load shedding & restoration.

- The rules of LSA can be by load priority, by 24 hours load shed /restore history or by number of consumers affected.
- Provide abundant load shed or restoration schemes in case of that switch refuses to be operated.
- The LSA can be manual starting mode and auto starting mode.
- The LSA auto starting mode can be based on power frequency or on the predefined

time of day.

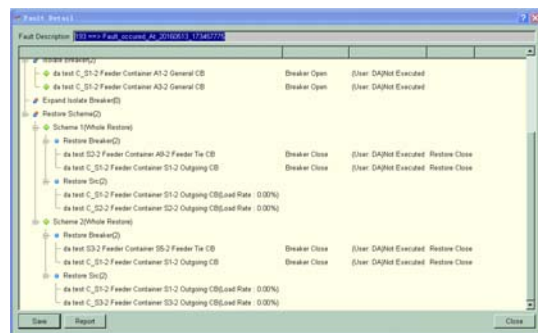
- Satisfying limit conditions of branch currents and node voltages.
- Tabular display the combinations of switching operations scheme.



DF8000 Fault Location, Isolation and Service Restoration

The FLISR application provides tools to the dispatcher for location, isolation, and service restoration of distribution system after a fault occurs. The FLISR function can be triggered by any change in the network topology. It generates analysis report lists of fault type, fault location, operation schema to isolate the faulty sections & service restoration.

- Consider the case of the switch failing to be remote operated, when calculate the fault Isolation and service restoration schemes.
- With 'preset defined template scheme' setting to reduce the restoration time.
- The scheme of restoration can be implemented at 'automatic' mode or 'Manual' mode.
- Provide simulation and analysis functions to FLISR schemas.



DF8000 Loss Minimization via Feeder Reconfiguration

The LMFR identify the opportunities to minimize technical losses in the distribution system by reconfiguration of feeders in the network, by switching capacitor banks, by changing transformer taps for a given load scenario.

- Reconstruction can be done on a network of any topology.
- Reduce the network losses with the means of changing switch states.
- With the constraints of branch currents and node voltages.
- Tabular display the result of the reconfiguration operation.
- Considering the constraints of operation times of the Reactive power device regulation and transformer taps adjusting.
- In the study mode, the reconfiguration results can be simulated and analyzed.
- The LMFR can be Manual triggered and Periodic triggered.

Output	Name	Description	ActualCurrent/Voltage	TransformerTaps/Kv
00 Current Scheme	540002	Dr_PunguA 50kV Man Busbar	0.0000	0.0000
Effect List of the Scheme	540002	Dr_PunguA 50kV Man Busbar	0.0000	0.0000
Operating Breaker List	540002	Dr_PunguA 50kV Man Busbar	0.0000	0.0000
Output of the scheme simulation	540002	Dr_PunguA 50kV Man Busbar	111.6233	-0.1618
01 Scheme	540003	Dr_PunguA 110kV 4F Man Busbar	111.6233	-0.1626
Effect List of the Scheme	540003	Dr_PunguA 110kV 4F Man Busbar	111.6233	-0.1626
Operating Breaker List	540003	Dr_PunguA 110kV 4F Man Busbar	111.6233	-0.1626
Output of the scheme simulation	540003	Dr_PunguA 110kV 4F Man Busbar	111.6233	-0.1626
02 Scheme	540004	Dr_PunguA 110kV 5F Man Busbar	111.6233	-0.1618
Effect List of the Scheme	540004	Dr_PunguA 110kV 5F Man Busbar	111.6233	-0.1618
Operating Breaker List	540004	Dr_PunguA 110kV 5F Man Busbar	111.6233	-0.1618
Output of the scheme simulation	540004	Dr_PunguA 110kV 5F Man Busbar	111.6233	-0.1618
03 Scheme	540005	Dr_PunguA 35kV 4F Man Busbar	36.3179	-2.0084
Effect List of the Scheme	540005	Dr_PunguA 35kV 4F Man Busbar	36.3179	-2.0084
Operating Breaker List	540005	Dr_PunguA 35kV 4F Man Busbar	36.3179	-2.0084
Output of the scheme simulation	540005	Dr_PunguA 35kV 4F Man Busbar	36.3179	-2.0084
04 Scheme	540006	Dr_PunguA 35kV 5F Man Busbar	36.3179	-2.0079
Effect List of the Scheme	540006	Dr_PunguA 35kV 5F Man Busbar	36.3179	-2.0079
Operating Breaker List	540006	Dr_PunguA 35kV 5F Man Busbar	36.3179	-2.0079
Output of the scheme simulation	540006	Dr_PunguA 35kV 5F Man Busbar	36.3179	-2.0079
05 Scheme	540007	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
Effect List of the Scheme	540007	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
Operating Breaker List	540007	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
Output of the scheme simulation	540007	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
06 Scheme	540008	Dr_PunguA 35kV 1 Man Busbar	0.0000	0.0000
Effect List of the Scheme	540008	Dr_PunguA 35kV 1 Man Busbar	0.0000	0.0000
Operating Breaker List	540008	Dr_PunguA 35kV 1 Man Busbar	0.0000	0.0000
Output of the scheme simulation	540008	Dr_PunguA 35kV 1 Man Busbar	0.0000	0.0000
07 Scheme	540009	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
Effect List of the Scheme	540009	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
Operating Breaker List	540009	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000
Output of the scheme simulation	540009	Dr_PunguA 110kV 1 Man Busbar	0.0000	0.0000

Load Balancing via Feeder Reconfiguration

The LBFR function optimally balances the segments of the network that are over & under loaded. This function helps in better utilization of the capacities of distribution facilities such as transformer and feeder ratings.

- Reconfiguration can be done on a network of any topology.
- Balance loads with the means of

changing switch states.

- With the constraints of branch currents and node voltages limits.
- Tabular display the result of the reconfiguration operation.
- In the study mode, the reconfiguration results can be simulated and analyzed.
- The LBFR can be Manual triggered and Periodic triggered.

Output	Name	Switch Name	Station Name	Real_State	L3/3_State
00 Current Scheme	2000027	Bus32 A050A19 Tie Breaker	Bus32 Power Distribution station	Open	Close
Effect List of the Scheme	2000027	Bus32 A050A19 Tie Breaker	Bus32 Power Distribution station	Open	Close
Operating Breaker List	2000027	Bus32 A050A19 Tie Breaker	Bus32 Power Distribution station	Open	Close
Output of the scheme simulation	2000027	Bus32 A050A19 Tie Breaker	Bus32 Power Distribution station	Open	Close
01 Scheme	2000028	CAS-St Busk 3(2) Tie Breaker	CAS(Stab-3 Substation(2))	Open	Close
Effect List of the Scheme	2000028	CAS-St Busk 3(2) Tie Breaker	CAS(Stab-3 Substation(2))	Open	Close
Operating Breaker List	2000028	CAS-St Busk 3(2) Tie Breaker	CAS(Stab-3 Substation(2))	Open	Close
Output of the scheme simulation	2000028	CAS-St Busk 3(2) Tie Breaker	CAS(Stab-3 Substation(2))	Open	Close
02 Scheme	2000029	110kV 100 General Breaker	CAS(Stab-1 Substation)	Close	Open
Effect List of the Scheme	2000029	110kV 100 General Breaker	CAS(Stab-1 Substation)	Close	Open
Operating Breaker List	2000029	110kV 100 General Breaker	CAS(Stab-1 Substation)	Close	Open
Output of the scheme simulation	2000029	110kV 100 General Breaker	CAS(Stab-1 Substation)	Close	Open
03 Scheme	1500-St_BusGouVT 203 General Breaker	BusGou Substation	Open	Close	Open
Effect List of the Scheme	1500-St_BusGouVT 203 General Breaker	BusGou Substation	Open	Close	Open
Operating Breaker List	1500-St_BusGouVT 203 General Breaker	BusGou Substation	Open	Close	Open
Output of the scheme simulation	1500-St_BusGouVT 203 General Breaker	BusGou Substation	Open	Close	Open

DF8000 Distribution Load Forecasting

Support short-term forecasting and medium-&long-term forecasting. Short-term forecasting is executed for up to next 7 days to forecast the load. Medium-&long-term forecasting is used for forecasting load of the future months and years.

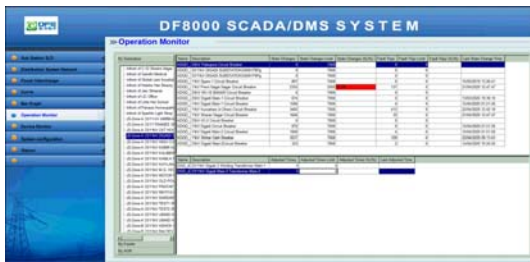
- Multi-forecast methods, including Least Squares Method, Time Series Method, Exponential Smoothing Method, Auto-Regression Method, Artificial Neural Network Method and Kalman filtering Method.
- Consider various kinds of affection factors, such as weather, event, and holiday.
- Provide user correction tools.
- Examination and statistical analysis function.



safety of the power grid.

DF8000 Operation Monitor

- For breaker devices, the operation monitor function displays the device's identification information, the total number of state changes, the number of fault trips, and the time of last state change.
- For transformer devices, the operation monitor function displays the device's identification information, the number of raise / lower operations, and the time of last raise / lower operation.
- The limits of the number of state changes and the number of fault trips for the breaker devices, and the limit of the number of raise / lower operations for the transformer devices can be set. Once over limit, the operation monitor function calculates the corresponding over-limit ratio and generates an alarm message to alert the operator.



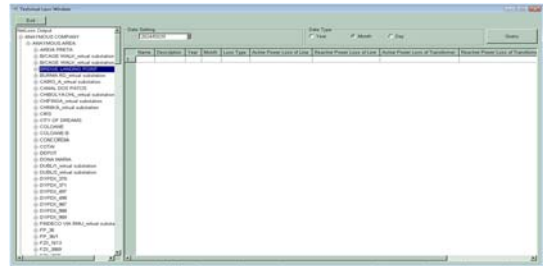
DF8000 Under Load Switching

- Provide load transfer analysis.
- Outage transfer: Some equipment needs to be temporarily out of service due to failure or maintenance. In this case, the loads originally supplied by the out of service equipment will be transferred to other backup power source.
- Line unloading: Some feeder is overloaded or heavy load. In this case, part of the loads in the area whose power are originally supplied by the overload (or heavy load) feeder will be transferred to other power supply paths to eliminate the overload (heavy load) and ensure the



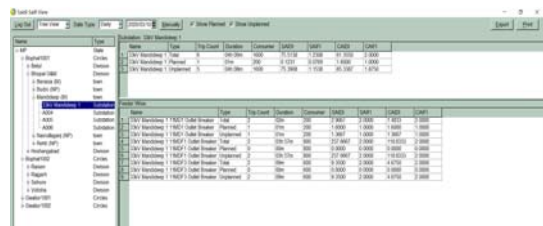
DF8000 Energy Losses / Operational Losses Calculation

- Energy losses are the difference between injected energy and consumed energy.
- Operational losses (technical losses), including copper losses and iron losses of all kinds of power grid devices.
- Energy losses and Operational losses can be calculated by feeders, substations, areas, towns and the whole system.



DF8000 Reliability Analysis

- Reliability index calculation complies with IEEE 1366 standard.
- Reliability index calculation is calculated based on feeder, substation, region, system and based on day, week, month, quarter, year.
- Reliability index calculation result reports can be exported with various format, such as Microsoft Excel, HTML, PDF.



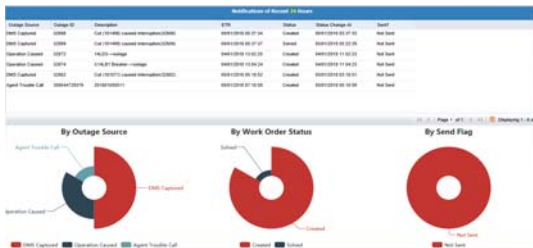
OMS Modules

DF8000 Outage Management System

DF8000 OMS is a set of intelligent and complete power outage management system, which is used to help power enterprises quickly identify, locate and deal with various power outage events, to reduce power outage losses, improve power supply reliability and customer satisfaction.

Distribution and processing status of blackouts, team location and real-time status, customer reporting location, real-time network status of power equipment, tag, blackout range and other information are displayed in the geographic background map.

- Customer Fault Reporting Management
- Intelligent fault diagnosis
- Mobile Job Management
- Resource management
- Field Team management
- Operating Order Management
- Situation monitoring
- Customer self-service
- Analysis of IEEE Reliability Index
- BI Business Intelligence Analysis



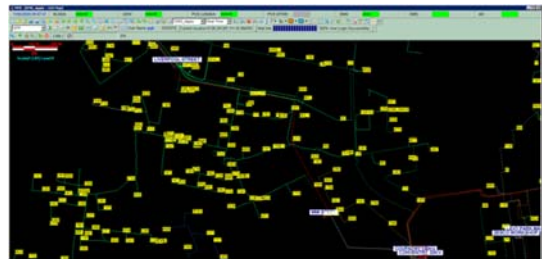
GIS Modules

DF8000 Geographical Information System

- The maps in standard format (e.g., DWX

and DXF of AutoCAD, SHP of ESRI) can be imported as the background. The proportion is from 1:500 to 1:2000.

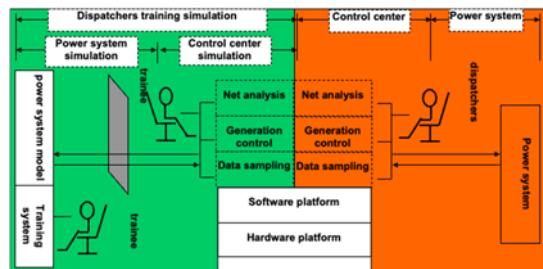
- The power grid can be presented as the geographical distributed grid diagram of the electric devices, the distribution single feeder diagram with the geographical map as the background and one-line diagram of the substation.
- The print area can be defined as the full view diagram or specified zone. The print area can be divided into several blocks when it's too large.



DTS Modules

DF8000 Dispatched Training Simulator

- Provides the same operating environment as the EMS/DMS system
- Training the dispatchers to improve one's dispatch ability when the power system is at normal, fault or restoration status
- Simulates power grid restoration operation after fault occurs
- Provides Post fault Analysis and typical fault simulation



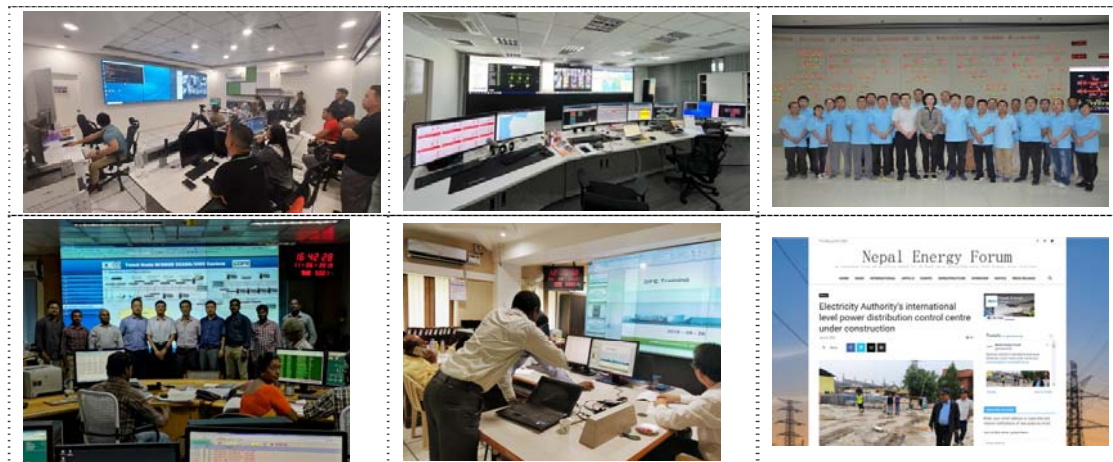
Typical Projects of DF8000

More than 110 transmission control centers and over 300 distribution control centers have chosen DF8000 system.

- Beijing 2008 Olympic Stadiums DMS system, Beijing, China
- India Tamil Nadu, Madhya Pradesh, Rajasthan, Odisha, Pondicherry, Jharkhand (totally 23 sets) SCADA/DMS
- India Madhya Pradesh state SCADA/EMS
- Malaysia Sarawak Energy SCADA/DMS.
- Indonesia Pontianak Power Distribution Network SCADA/DMS
- Chad Power Distribution Network SCADA/EMS
- Equatorial Guinea Grid Power

SCADA/DMS/EMS

- Nepal Electricity Authority Distribution System Control and Data Centre SCADA/ADMS/OMS
- Guangzhou Power Dispatch Center
- Zhuhai Power Dispatch Center
- Hangzhou Power Dispatch Center
- Kunming Power Dispatch Center
- Shaoxing Power Dispatch Center
- Guiyang Power Dispatch Center
- Liuzhou Power Dispatch Center
- Lincang Power Dispatch Center
- Yuxi Power Dispatch Center
- Tibet Power Dispatch Center
- Yantai Power Dispatch Center
- etc.



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