Model-Driven Real-Time Solutions

for Power Systems

etap
Powering Success

SCADA & Monitoring

Power Management

Generation Management

Transmission Management

Advanced Distribution Management

Microgrid Master Controller

Intelligent Load Shedding

Substation Automation

etap®
Powering Success

Model-Driven Enterprise Solution

Fully integrated suite of software products that provides mission critical power management solutions.

Modeling,
Simulation, Design, Analysis, Sizing, Evaluation, Planning to
Real-Time Model-Based
Monitoring, Event Playback, Predictive Analysis,
Control, Optimization, Automation, Situational Intelligence to
Operation

Commercial

Industrial

Generation

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Transmission

Transportation

Distribution

ETAP® Real-Time™ power system enterprise solution can maximize the entire production process, reduce losses, and increase profits through continuous monitoring, simulation, and optimization of the system.

Operations

The ability to seamlessly integrate process information with electrical system constraints is essential to a reliable operation. Virtual testing of operator actions (predicting system response) prior to implementation can reveal potential problems, hence reducing human errors and the risk of service interruptions. ETAP assists operators in making informed and logical decisions to reduce operating costs and improve system reliability.

Maintenance

Real-time maintenance alerts and assessments of system components ensures just-in-time predictive maintenance of critical plant equipment. Mean-time-to-repair and mean-time-to-failure rates are calculated to evaluate the network and equipment online reliability indices. This translates into cost reduction and prevention of expensive unplanned shutdowns.

Engineering

As the world leader in power system engineering analysis tools, ETAP integrates with data acquisition devices to provide actual system operating conditions for the purpose of real-time simulation. ETAP takes the guesswork out-of-system analysis.

Financial

ETAP can interface with accounting and billing systems to provide up-to-the minute energy usage and fuel cost information, while providing recommendation and prediction scenarios to minimize peak power consumption and eliminate tariff penalties.

Planning

System planners can improve performance of production scheduling, thus increasing the system capacity using adaptive planning tools provided by ETAP's trending and prediction functions.

SCADA & Monitoring

Visualize   Record   Control

Model-driven monitoring provides an intuitive real-time visualization and analyses platform via intelligent graphical user interface, one-line diagram, geospatial view, and digital dashboards.

Network Topology Builder

Network Topology Builder is a user-friendly environment for creating and managing the network database used for schematic network visualization and is the foundation of real-time applications.

SCADA Integrator

Enables quick creation of standardized and reusable templates, efficient system integration and rapid deployment across the entire organization.

Native Communication Protocols

Operates seamlessly with third-party hardware, DCS, or data collection systems regardless of manufacturer and models. ETAP supports all standard network protocols including MMS, ModBus, DNP, IEC 61850, IEC 60870, ICCP, NetBeui, T103, NetDDE, UCA, IPX/SPX, and TCP/IP via OPC interface.

Visualization & Dashboards

SCADA Human Machine Interfaces (HMI) provides a modern graphical dashboard with electrical intelligence and situational awareness. Smart visualization views, combined with predictive analytics, enable the system dispatcher to effectively view and analyze key performance indicators.

Web & Mobile Views

Access design, analysis, and operational data from anywhere via the world-wide-web. The application is capable of connecting to a single or multiple ETAP Real-Time Servers and workstations. Online and simulation applications can be connected to user-friendly web HMI's to monitor and analyze the system on-the-go.

State Estimation & Load Allocation

State-of-the-art techniques are used to provide dependable and fast convergence of state estimation for unobservable subsystems. It includes essential tools for model validation such a comparison between telemetered data, estimated values, and power flow results at any instance in time.
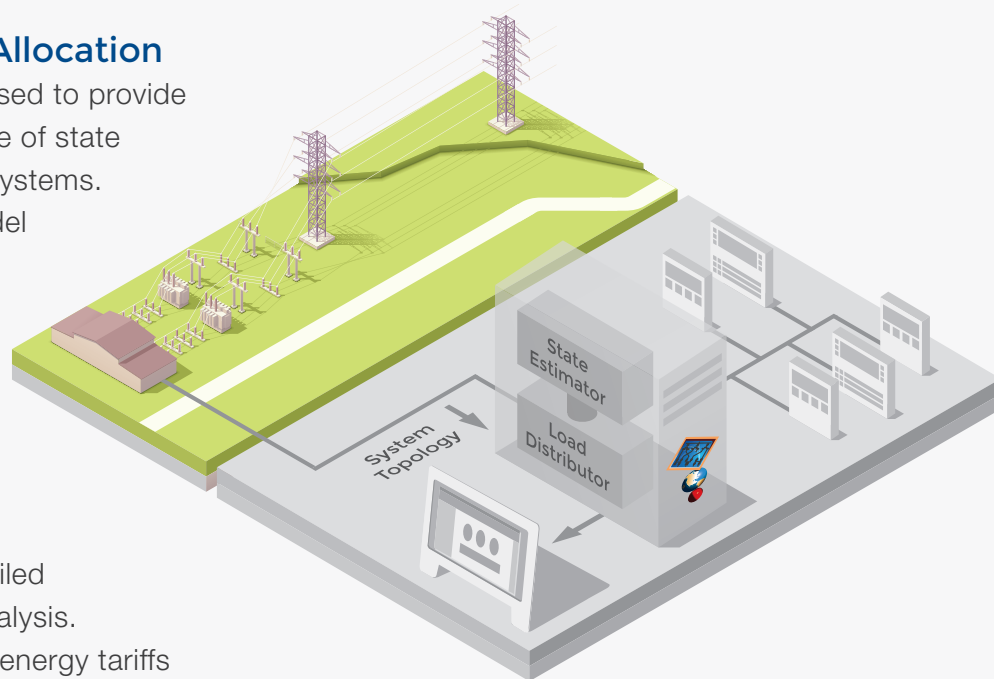
Energy Accounting

Energy Accounting provides detailed energy consumption and cost analysis. Reports are generated based on energy tariffs and electrical power market exchange information. ETAP tracks and creates energy billing reports based on user-definable energy cost functions and energy tariffs.

Data Trending

Data Trending is a user-friendly and flexible trending application that supports real-time as well as archived data trending.

Alarming & Notification

Alarming & Notification management system prioritizes events via graphical and tabular views. Model-driven SCADA enables early detection and announcement of problems, including non-telemetered devices, before a critical failure takes place.

Event Logging

Data acquired from the monitoring equipment is recorded to provide an event log of all activities in the system. The event log provides a complete history of the power system's operation when played back. Important facts such as sequence of equipment operation and maintenance records can be easily retrieved. History can be tabulated or viewed graphically on an hourly, daily, monthly, or yearly basis. Detailed, continuous data can be displayed with time increments down to the nearest millisecond. Events can be browsed and printed on-demand.

Power Management System

Analyze   Predict   Prevent

Real-Time Data

Real-Time Server

Playback Historian

Power Management Console
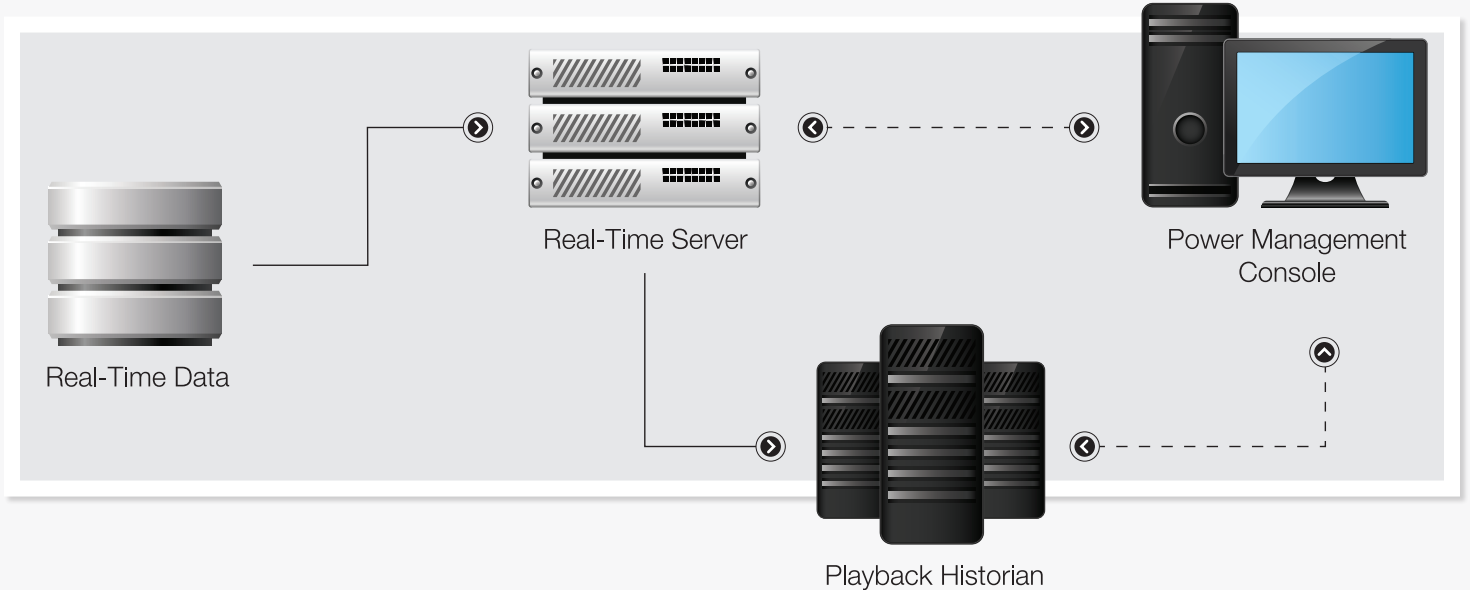
Power Management includes powerful analytical tools that allows for detection of system behavior in response to operator actions and events via the use of real-time and archived data.

Predictive Simulation

Predictive Simulation is a powerful set of analytical modules that allows prediction of system behavior in response to operator actions and events using real-time and archived data. With Predictive Simulation, not only can you perform analysis using real-time system parameters and online system model, you can also simulate "what if" scenarios and predict an outcome before system actions are taken.

Preventive Simulation

Preventive analytical modules provide automated alarms and warnings to the operator, based on events that may potentially occur such as generator outages, contingencies, and suggest remedial actions.

Benefits

- Accurate analysis with actual operating values
- Improve system planning & design
- Recognize & correct potential hidden problems
- Prevent system interruption
- Determine under-utilization of system resources
- Identify the cause of operation problems
- Accelerate engineer & operator training
- Virtual test of operator / controller actions
- Validate system settings

✔ **Predict System Response**
✔ **Simulate Real-Time & Archived Data**
✔ **Explore Alternative Actions**
✔ **Perform "What If" Scenarios**

Operator Training Simulator

OTS provides an environment that is effective for operator training and assistance. Operator training is accelerated using dynamic graphical simulation of the power system. This makes training an ongoing process. The ability to simulate the sequence-of-operation using real-time data is of fundamental importance in order to avoid inadvertent plant outages caused by human error, equipment overload, etc.

Simulation Modules

- Load Flow
- Short-Circuit
- Arc Flash
- Device Coordination & Selectivity
- Sequence-of-Operation
- Motor Acceleration
- Harmonics
- Transient Stability
- Reliability Assessment
- Optimal Power Flow

Event Playback

Event Playback is especially useful for root cause and effect investigations, improvement of system operations, exploration of alternative actions, and replay of What-if scenarios. ETAP can be configured to provide a complete picture of the electrical system from the stored data. The operator can explore the effects of alternative actions at any point of recorded data.
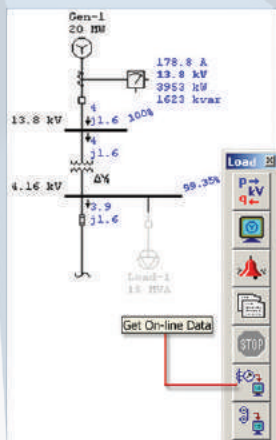
1. Get Online Data
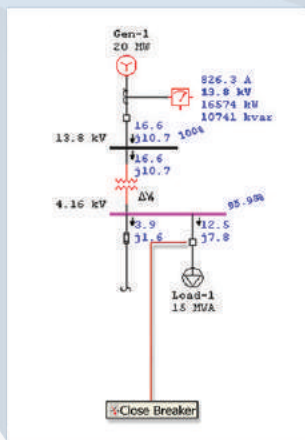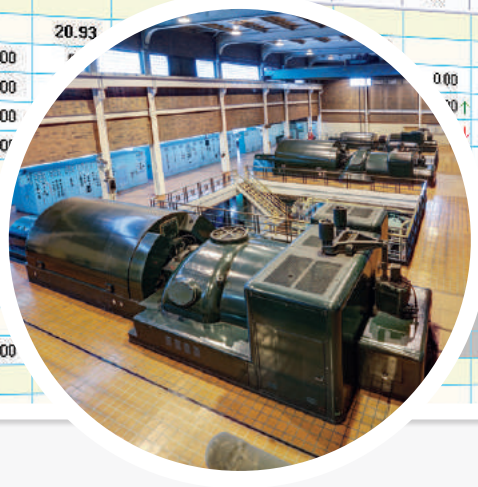
2. Close a Circuit Breaker
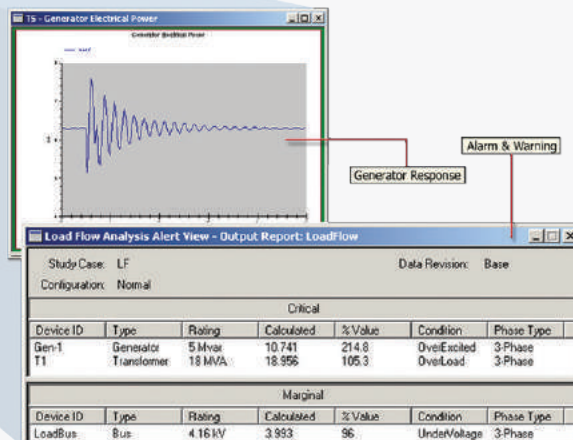
3. Predict System Behavior & Response

Graphical Display of System Response & Alerts

Generation Management System

Balance   Optimize   Dispatch

Generation Management System is used to monitor, control, and optimize the performance of generation and transmission systems. GMS provides system balance and optimization changes to meet network security, economic, operational, regulation, and environmental requirements.

Automatic Generation Control

Automatic Generation Control is a multi-area supervisory control that utilizes real-time data to regulate generation levels in order to maintain system frequency and power exchanges with neighboring areas at scheduled values.

- ✔ Multi-Area Control
- ✔ Load Frequency Control
- ✔ MW & Mvar Sharing
- ✔ NERC Performance Standard

Reserve Management

Reserve Management continuously monitors system operating capacity and dynamically calculates the system generation versus load forecast balance to ensure protection against contingency losses.

Interchange Scheduling

Interchange Scheduling provides the capability to schedule energy transfer from one control area to another while considering wheeling, scheduling ancillary services, and financial tracking of energy transactions. Dedicated for electricity power exchange and scheduling, Interchange Scheduling incorporates energy scheduling, transaction management, and energy cost analysis / reporting.

Economic Dispatch

Economic Dispatch allocates changing generation demand of a power system amongst controllable generator units to achieve optimum area economy. As part of the generation management system, Economic Dispatch software utilizes advanced optimal power flow algorithms in order to determine the optimal generation pattern, while maintaining adequate reserve margins.

Unit Commitment

Unit Commitment finds the least-cost dispatch of available generation resources such as nuclear, thermal, and renewables, to meet the electrical load. Unit Commitment includes constraints such as: minimum stable operating levels, ramp rates, unit maintenance periods and requirements, scheduled and forced outage information, etc.
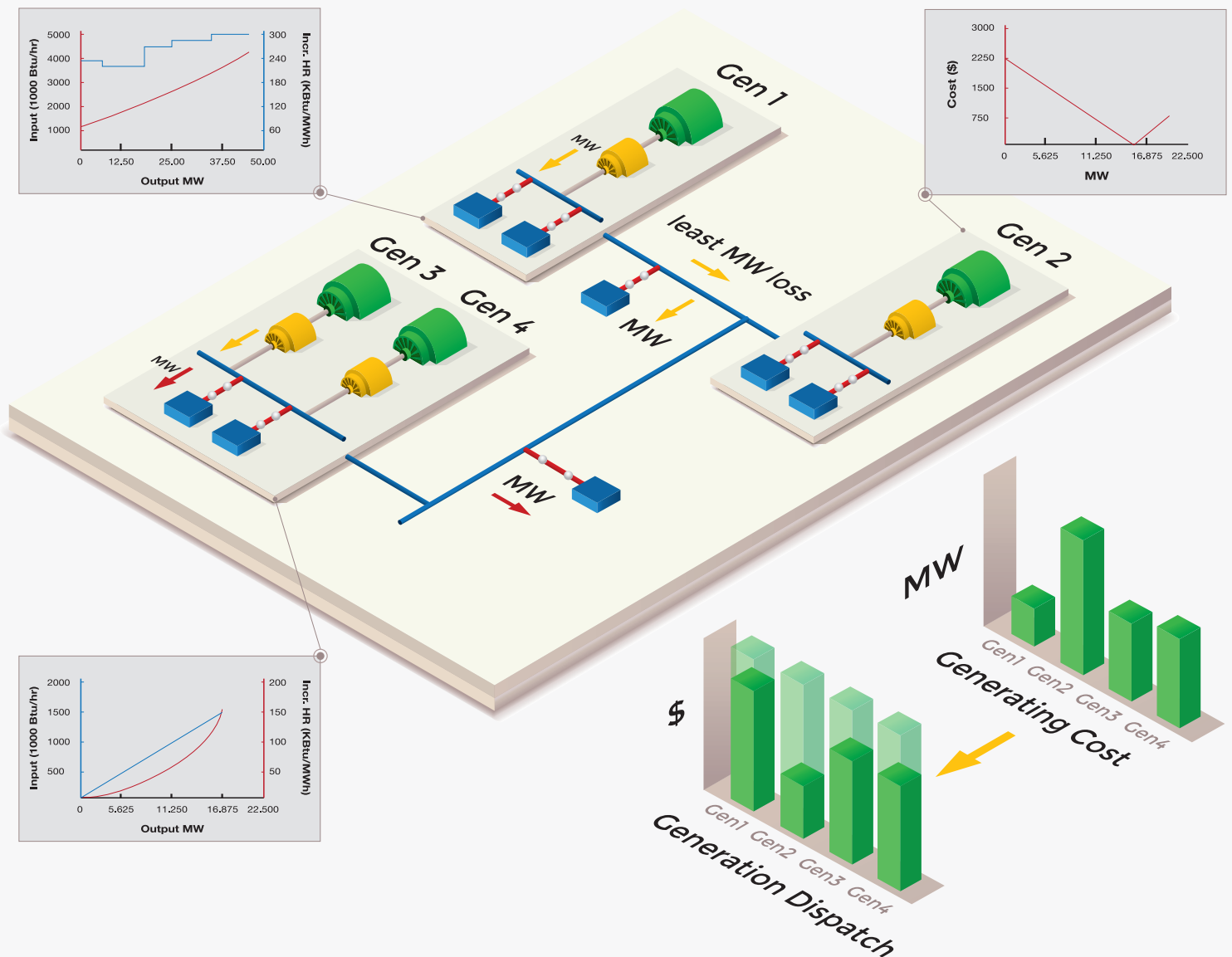
Energy Management System

Automate   Manage   Schedule

Energy Management System applications are designed to reduce energy consumption, increase electrical system reliability, improve equipment utilization, and predict system performance, as well as optimize energy usage.

Network Security Analysis

Network Security Analysis system is ideal for online security analysis, situational awareness support, operations planning and offline engineering studies. Capabilities include, Network Topology Processor, Contingency Analysis, Short Circuit Analysis, Voltage Stability, etc.

Economic Dispatch

Allows for steady-state real-time optimization, enabling energy consumers to automate the operation of their power system, reduce system losses, and reduce peak load consumption. Economic Dispatch provides guidelines for optimal electrical system operation in order to meet power requirements, steam requirements, and minimize fuel cost per generator. Energy producers can improve power exchange, and maximize security.

Equipment Outage Scheduling

Schedule outages including generators, transmission lines, transformers, breakers, switches, loads, and compensation devices. In addition to outages or unavailability of components, equipment derating can also be scheduled due to maintenance such as transformer fan maintenance, generator derating due to cooling limitations, etc. Outages are not limited to just power system components, but may be physical equipment such as computer system maintenance.

Common Information Model Interface

CIM Interface allows for physical or abstract rep-resentation of the power system model as objects, attributes and their associations. CIM interface allows for bi-directional transfer of data from ETAP to other vendor systems.

Microgrid Master Controller

Predict   Optimize   Control

Microgrid Master Controller allows for design, modeling, detailed analysis, islanding detection, optimization and automated control of Microgrids used for offices, retail parks, industrial facilities, data centers, campuses, offshore facilities, ships, etc.

Generation Optimization

Supervisory control that utilizes real-time data to regulate generation levels in order to maintain power exchanges with neighboring areas at scheduled values. The program can automatically detect loss of grid and switch control strategies to regulate voltage and frequency in an islanded condition. Optimization algorithms consider system constraints and multiple objectives such as minimizing energy costs, renewable energy availability, fuel costs, etc.

Generation & Load Forecasting

Generation and Load Forecasting is an ideal tool for microgrid users and utilities to reliably and accurately forecast future short term loading and generation especially from inconsistent sources such as wind and solar.

Energy Storage Management

ETAP compensates for voltage and frequency fluctuations associated with switching of large power electric load in microgrid applications. Microgrid Master Controller is used to manage power control strategies and improve overall power quality by regulating both active and reactive power produced or consumed.

Demand Side Management

ETAP Demand Side Management delivers a more reliable and economical operation, while maintaining the power system's operational integrity. Evaluate energy-reducing strategies such as moving on-peak usage to off-peak periods or shifting from one rate schedule to another to improve the bottom line.

Advanced Distribution Management System

Situational Intelligence   Integrated   Comprehensive
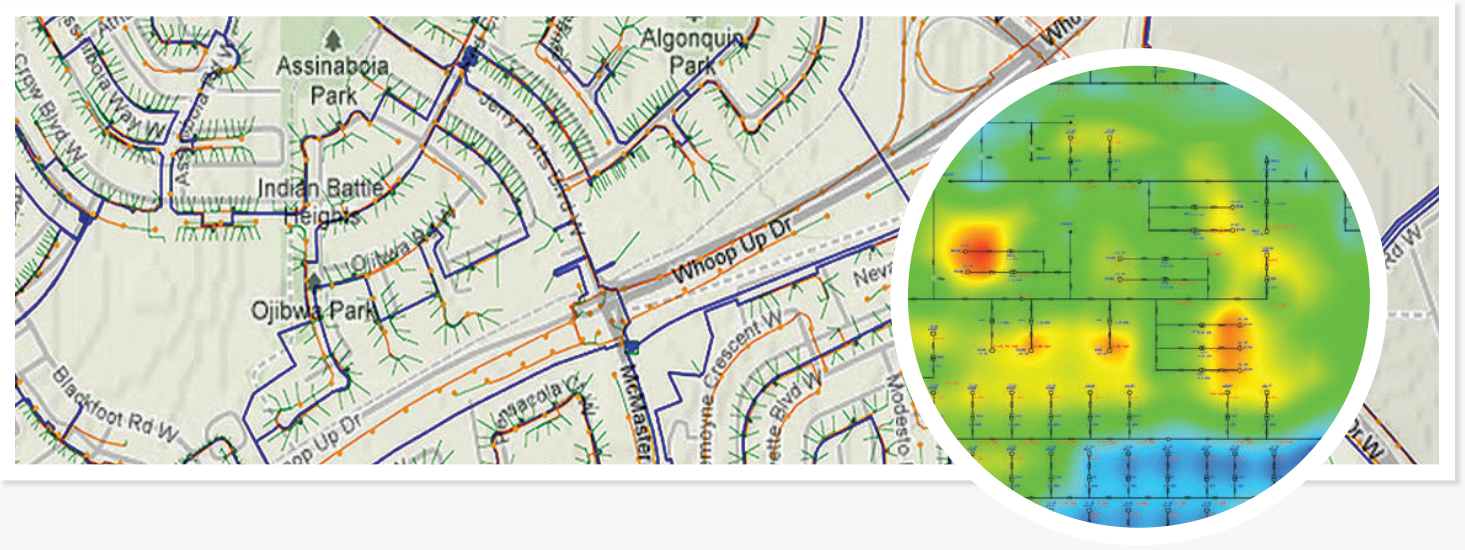
Advanced Distribution Management System (ADMS) is an integrated electrical system design and real-time power distribution management system. ETAP ADMS provides the necessary mission critical applications to efficiently, reliably and securely manage, control, visualize, and optimize distribution networks.

Intelligent Geospatial Diagram

Intelligent Geospatial Diagram is a user-friendly environment for creating, visualizing and managing geospatial network databases. It is also the foundation for real-time applications. It allows for direct import of electrical data from a GIS database and dynamically creates equivalent feeders / reduced networks, while maintaining a complete geospatial view of the distribution system.

Visualize & Analyze Distribution Systems Using Geospatial & Feeder Schematic Views

Distribution Network Applications

DNA is a powerful set of analytical modules that allows the prediction of unbalanced system behavior in response to operator actions and events using real-time and archived data.

- Unbalanced Load Flow
- Unbalanced Short-Circuit
- Arc Flash
- Device Coordination & Selectivity
- Sequence-of-Operation
- Motor Acceleration
- Harmonics
- Reliability Assessment
- Optimal Power Flow
- Switching Optimization

Distribution State Estimation

Distribution State Estimation combined with Load Allocation provides intuitive, intelligent, and integrated real-time monitoring and estimation of unbalanced distribution systems including unobservable subsystems. Calculate technical and unaccounted losses.

Fault Location, Isolation, Service Restoration

FLISR provides operator assistance by identifying one or more probable locations of the fault in the network and proposing the fault isolation switching actions to be taken in order to clear that fault. Further, FLISR proposes switching plans to restore the supply for unaffected parts of the faulted feeder. The plans are presented to the DMS operator for analysis and execution.

Switching Management

Switching Sequence / Work Order Management allows the dispatcher to build, simulate, and verify a complete switching program using a fully graphical user interface and execute the approved switching programs in one step, while maintaining compliance with safety and security procedures.

Load Forecasting

Load Forecasting reliably predicts and trends system loading based on algorithms that adaptively correlate multiple input variables, such as weather conditions, as part of an accurate load forecast.

Outage Management System

ETAP OMS assists in the restoration of power by predicting failure isolation device and provides information on outage extent and number of customers impacted. ETAP OMS also interfaces with other third party applications for Crew Management, Storm Management, Estimated Restoration Time, etc.

Volt / Var Optimization & Control

ETAP VVOC monitors real-time voltages, watts and vars from LTCs, regulators, capacitors, voltage sensors, and additional monitoring points, such as customer meters. VVOC includes an optimization engine to meet a utility's desired power factor and voltage targets and resolve any conflicts.

Feeder Balancing & Loss Minimization

ETAP automatically determines the optimal system configuration to achieve multiple user-specified objectives using switching optimization algorithm. It provides optimal status of existing switching devices and suggests locations for new tie open points in the system. ETAP is used by planners and operators to minimize system real losses and reduce or eliminate abnormal operating conditions.
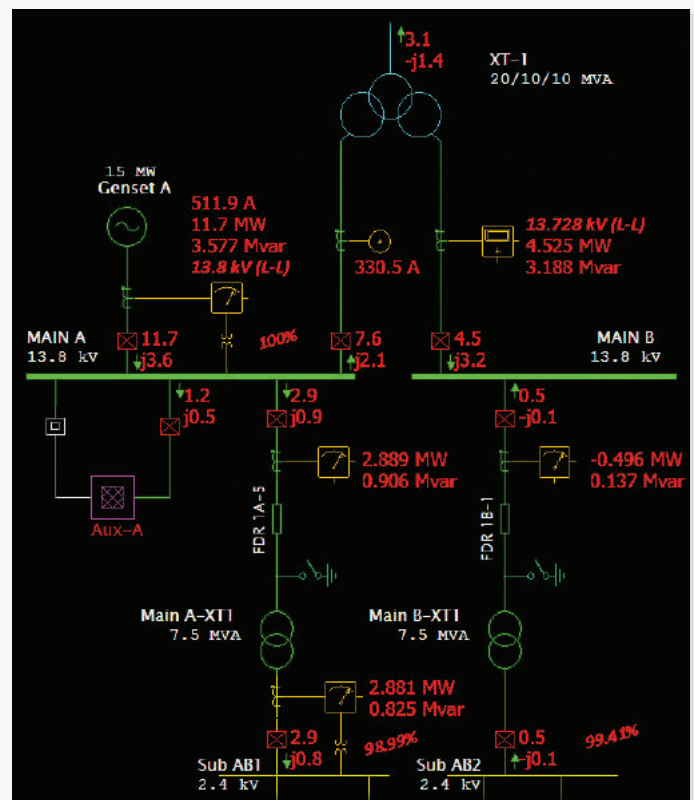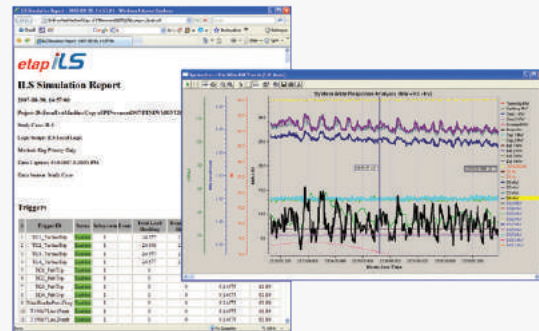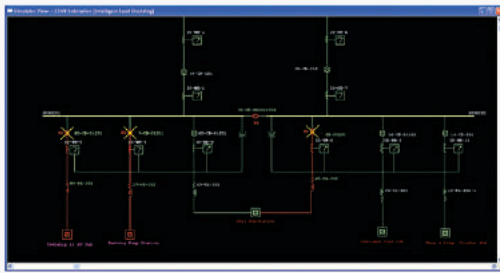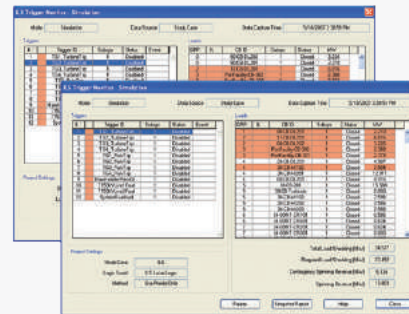
Intelligent Load Shedding

Fast   Proactive   Reliable

1. Simulate Triggers
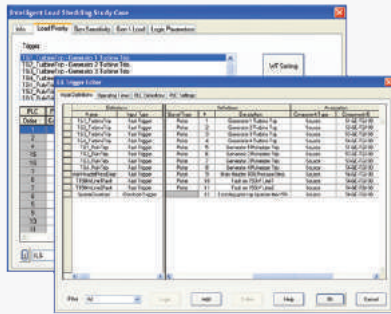
2. Evaluate Actions

4. Analyze Recommendations

3. Update Logic

Intelligent Load Shedding (ILS) provides optimal, fast load shedding based on actual operating conditions of the system, including type and location of the disturbances. ILS dynamically determines the best load shedding priority in a fraction of a second.

Load Preservation

Load Preservation first calculates the minimum required power to be shed for each subsystem and accordingly selects the optimal combination of loads that will satisfy the requirements.

Load Restoration

Load Restoration monitors system operating conditions after a load shedding event and restores loads while maintaining system stability and reliability.

Load Shedding Validation

Load Shedding Validation evaluates and confirms load shedding decisions in real-time mode. ILS integrates with the ETAP Transient Stability Analysis module to simulate and verify the load shedding requirements and recommendations before system commissioning.

Faster than Real-Time

ILS dynamically manages the stability of the system to respond faster to disturbances

Substation Automation

Protect   Control   Automate
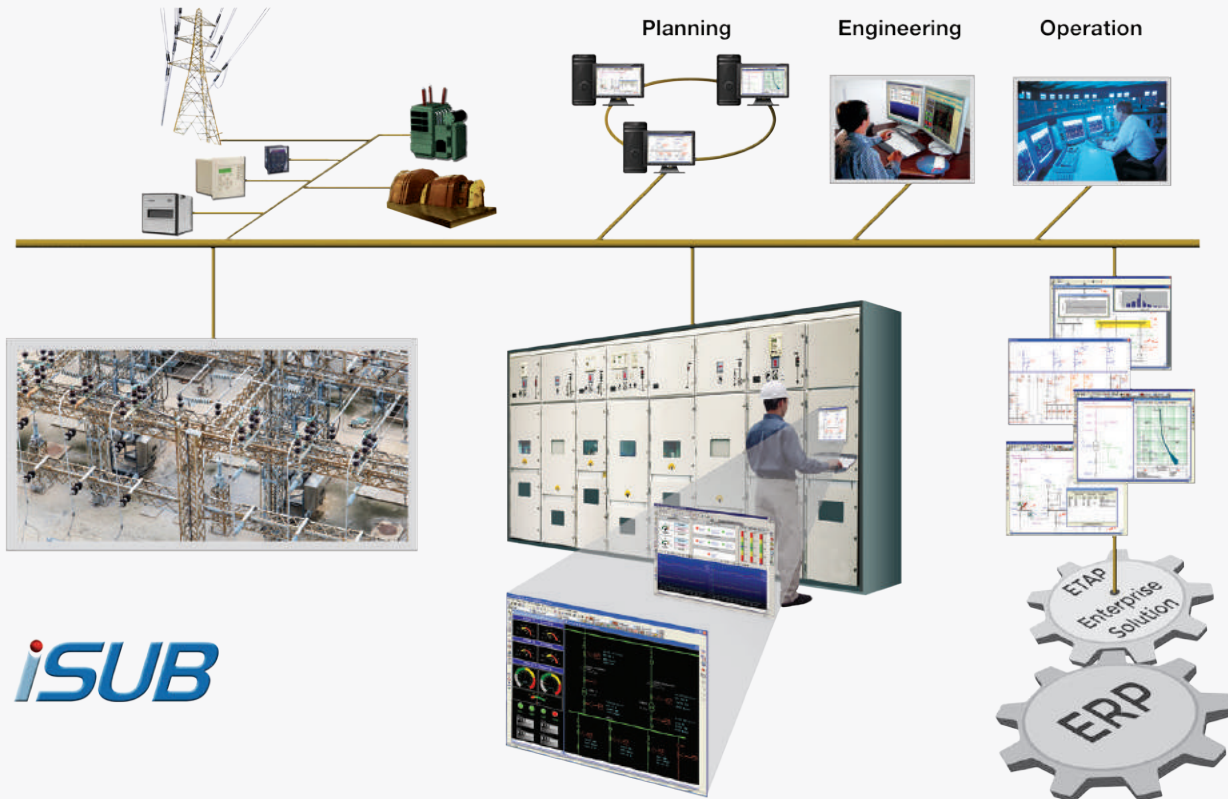
Intelligent Substation is a management application packaged as a focused product for substation automation. iSub provides protection, control, automation, monitoring, and communication capabilities as a part of a comprehensive substation solution.
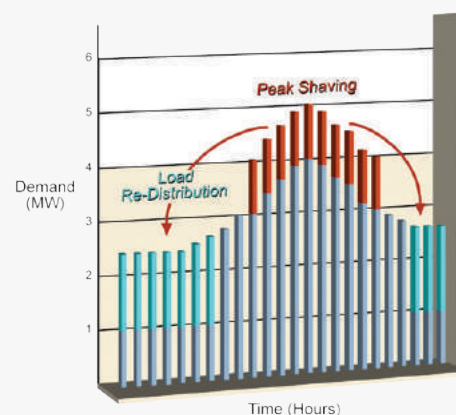
Substation Automation

Substation Automation utilizes intelligent analysis processes to dynamically manage the monitored data for substation level and central system evaluation.

Load Management

Load Management evaluates and implements energy-reducing strategies such as peak load shifting, load start inhibition, and shedding of non-critical loads to reduce energy cost.

Switching Management

Switching Management allows the dispatcher to build, simulate, and verify a complete switching program using a fully graphical user interface and execute the approved switching programs in one step while maintaining compliance with safety and security procedures.

Automatic Generation Control

Common Information Model

GMS **AGC** Operator Training Simulator **ILS**

DNA Power Management System

Intelligent Substation

FLISR

SCADA **ADMS** Optimal Power Flow

IEC 61850

ICCP **OPC**

VVO Smart Grid Intelligent Load Shedding

Advanced Distribution Management System

Energy Management System **OTS**

iSUB **Volt / Var Optimization**

Fault Location, Isolation & Service Restoration

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