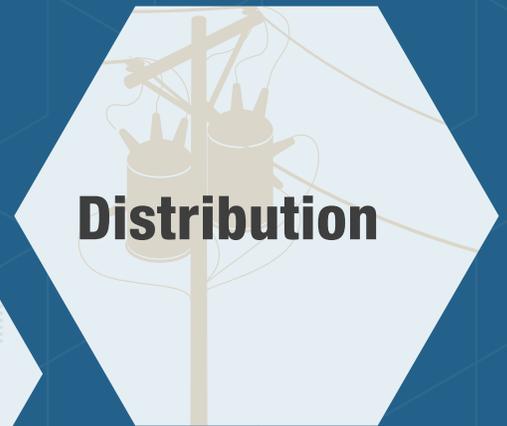




etap GridTM
Integrated Smart Grid Solutions



etap *Grid*[™]

An integrated and interactive enterprise solution for design, simulation, operation, control, optimization, and automation of generation, transmission, distribution, and microgrid power systems.

Integrated Mission Critical Solutions - Modeling to Operation

- Model-Driven Enterprise Solution
- State-of-the-art Geospatial Transmission & Distribution Views
- Adaptive Planning & Analytical Applications for Situational Intelligence
- Extremely Fast, Robust and Efficient Real-Time Network Applications
- Intelligent Power Management System for Operators, Managers & Engineers
- Built-in Interoperability Foundation for Data Exchange across the enterprise
- Redundant Fault-Tolerant Software Architecture

Transmission

Transmission network planning and management applications utilizes intelligent model-driven database combined with SCADA / EMS capabilities.

- Modern Graphical User Interface
- Transmission Network Planning & Analysis
- Single Real-Time & Planning Model
- Integrated Protection & Distance Coordination
- Transmission Line Sag, Tension & Ampacity
- Grid Optimization
- Dynamic Stability & Transients
- Substation Automation
- Energy Management System (EMS)



Distribution

Integrated distribution network solution combining Network Analysis, SCADA, GIS, DMS & OMS into a single, easy-to-manage model-driven supervisory system.

- Intelligent Geospatial, Substation & Feeder Diagram
- Distribution Network Planning & Analysis
- Electrical Safety & Protection
- Distribution System Optimization
- Demand Side Management
- Distribution Feeder Automation
- Network Outage Management
- Advanced Distribution Management System (ADMS)



Microgrid

Microgrid applications allow facilities to plan, operate & optimize energy supply-and-demand, automate islanding strategy and provide ancillary services

- Intelligent Geospatial Diagram
- Distributed Energy Resources
- Generation Control & Dispatch
- Network Optimization
- Demand Response
- Dynamics & Transients
- Microgrid Energy Management System (MEMS)

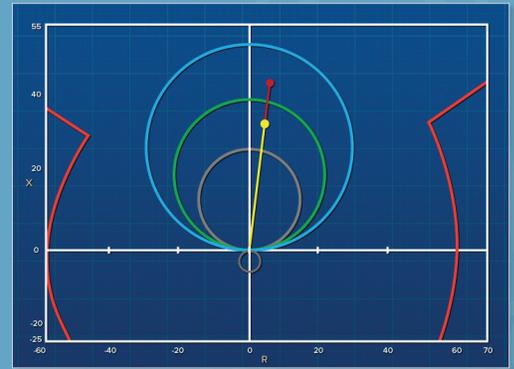


etap Grid™ Transmission

Network Planning, Analysis, Protection & Real-Time Energy Management System

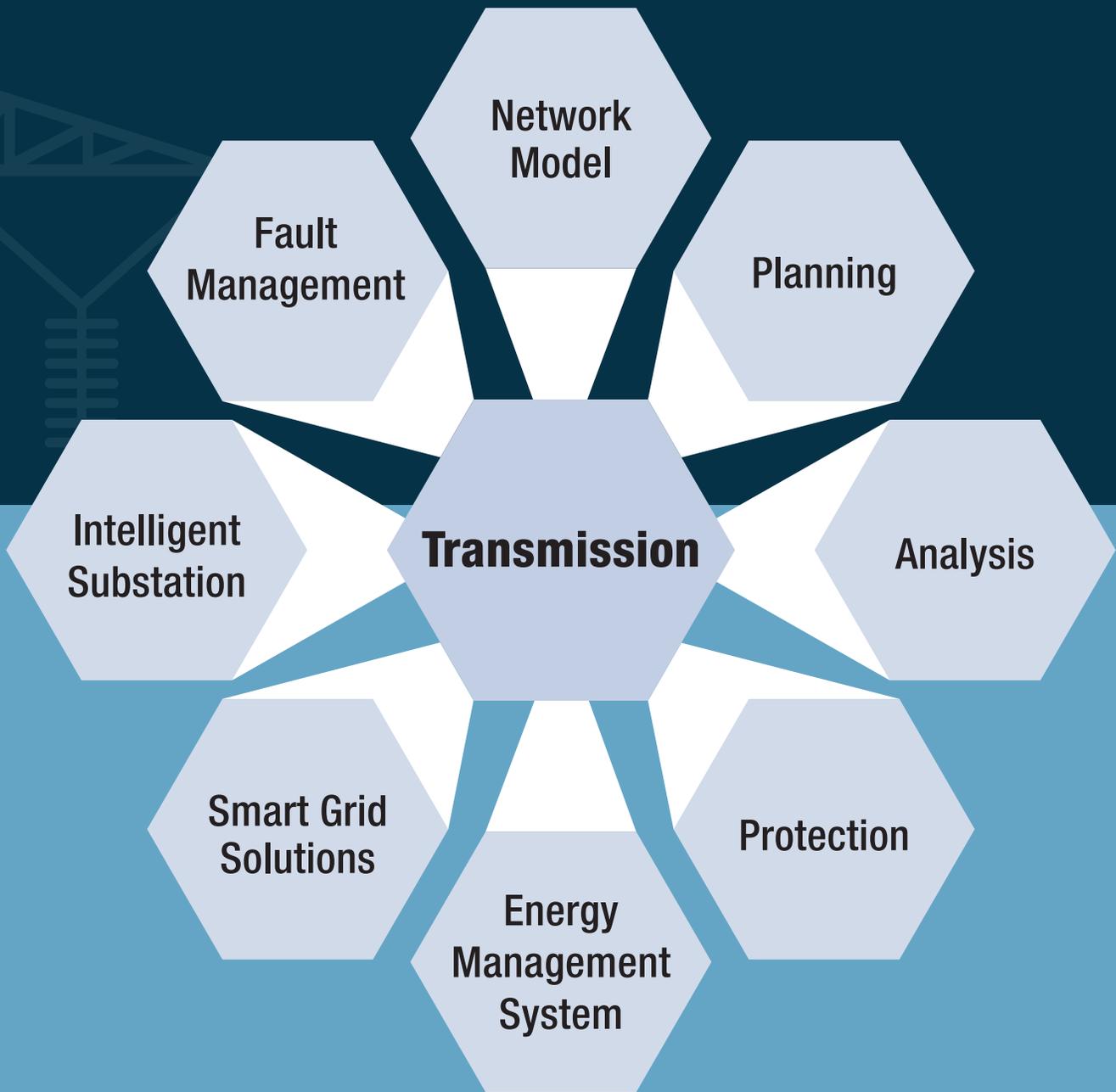
ETAP's transmission system platform combines detailed substation models, network topology, system analysis, and SCADA / EMS into one common database.

The intuitive and user-friendly graphical interface integrated with robust and proven design, analyses, and operation platform provides a complete solution to transmission planners and operators.



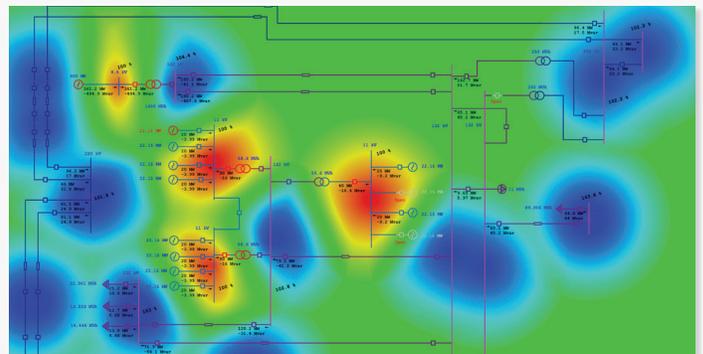
Modeling to Operation

- Reduce software maintenance cost by utilizing a single software
- Avoid the need to write scripts with built-in scenario, study & project wizards
- Improve power system life-cycle management
- Reduce effort to maintain interoperability between multiple databases & data provisioning
- Substation templates with detailed bus-breaker schematics & analysis
- Solve very large transmission & sub-transmission meshed networks quickly & accurately



One Program, One Database, One Solution

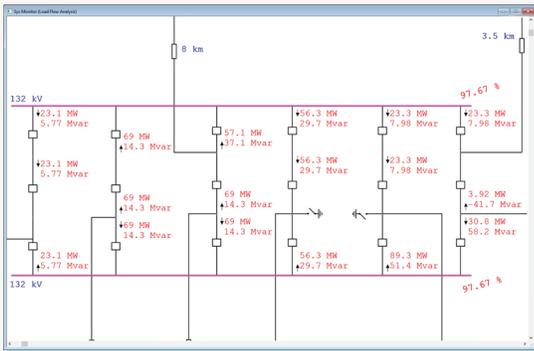
- Real-Time Transmission Network Applications
- Contingency & Reliability Assessment
- Voltage & Transient Stability
- Optimal Power Flow
- State Estimator
- Automatic Generation Control
- Economic Dispatch
- Interchange Transaction Scheduling



Transmission Solutions

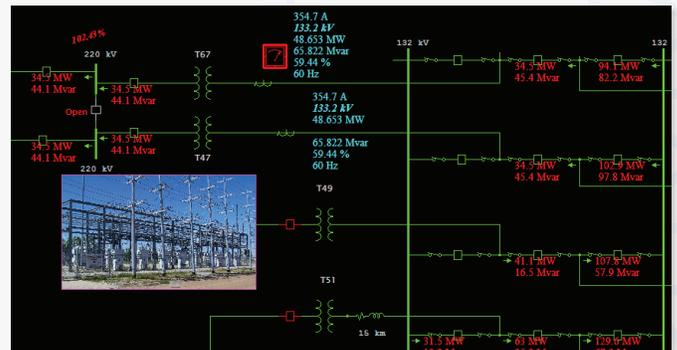
Modeling

- Intelligent One-Line Diagram
- Intelligent Geospatial Electrical Diagram
- 3-Dimensional Database
- Engineering Libraries & Warehouse
- Transmission, FACTS & Relay Models
- Switching Device Interlock Logics
- Network Auto-Build & Templates



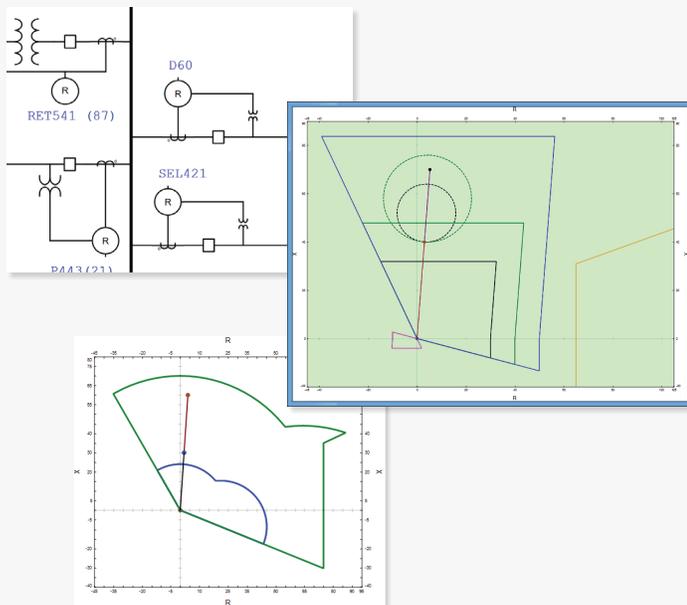
Planning & Analysis

- Load Flow - Balanced & Unbalanced
- Short Circuit - ANSI, IEC, GOST
- Open Phase Fault
- Protection & Coordination
- Arc Flash Hazard Analysis
- Optimal Power Flow
- Contingency Analysis
- Substation Grounding Analysis
- Underground Cable Thermal Analysis



Protection & Coordination

- Distance Relay Protection & Evaluation
- Time-Current Protective Device Coordination
- Automated Device Evaluation
- Sliding Fault Analysis & Sequence of Operation
- Verified & Validated Device Libraries
- Interface with Relay Test Equipment



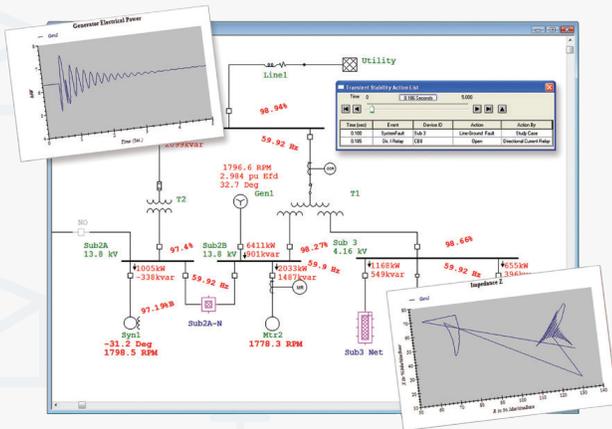
Transmission Line

- Line Constants
- Mutual Coupling Effects
- Sag & Tension
- Derating & Capacity Assessment
- Phase & Ground Conductor Library
- HVDC Transmission Line



Dynamics & Transients

- Transient Stability
- Voltage Stability
- Small Signal Stability
- Dynamic Parameter Estimation & Tuning
- Generator Start-Up
- User-Defined Dynamic Models



Intelligent Substation

- Substation Automation
- Advisory & Supervisory Control
- Switching Sequence Management
- Load & Voltage Management

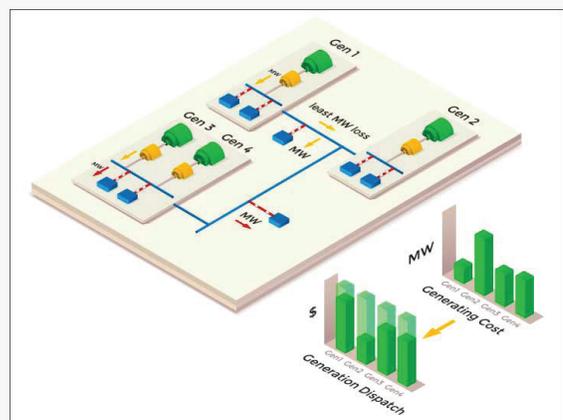


Energy Management System

- Model-Driven SCADA
- Network Topology Processors
- State Estimation
- Load Allocation
- Predictive Analysis - What-If
- Operator Training Simulator
- Sequence of Events Archiving & Playback
- Interchange Transaction Scheduling
- Generation Reserve Monitoring
- Dynamic Line Rating
- Load Forecasting
- Web & Mobile Dashboards

Smart Grid Solutions

- Intelligent Load Shedding
- Automatic Generation Control
- Economic Dispatch
- Unit Commitment



Data Exchange & Interfaces

- PSS®E
- PSCAD™
- EMTP-RV
- Common Information Model (CIM)
- Project Merge

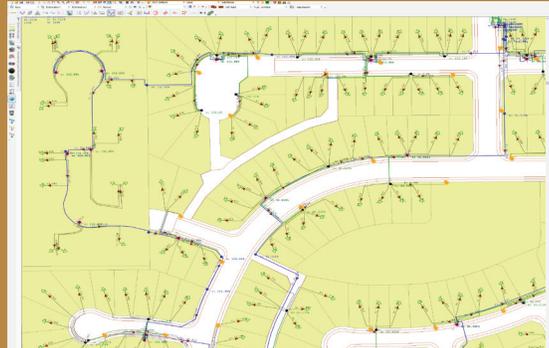


Distribution

Geospatial-Driven Simulation, Planning, Protection & Advanced Distribution Management System

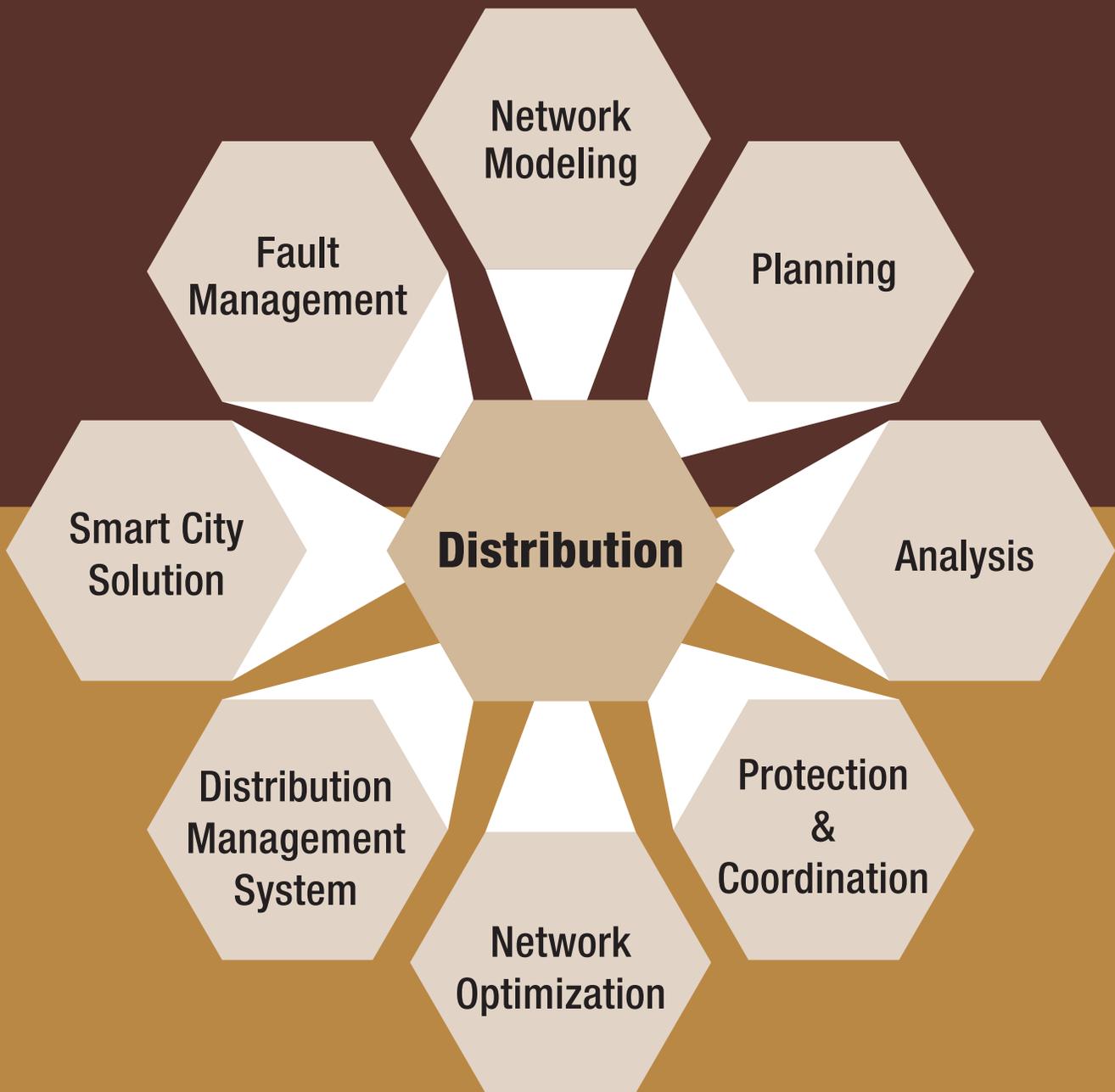
ETAP's distribution system planning and operations solution offers a progressive platform for simulating, analyzing and optimizing the performance of Smart Grid.

ETAP Grid can be configured as a stand-alone or integrated ADMS with distribution SCADA and outage management systems.



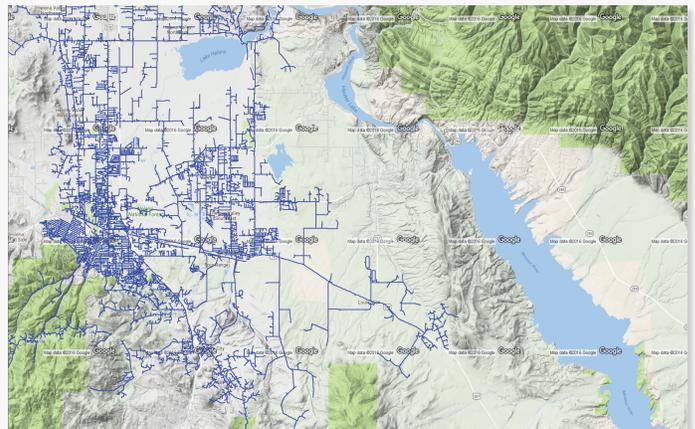
Distribution Planning & Management System

- Synchronized intelligent geospatial & logical feeder single-line diagrams
- Common network model for planning & distribution management with a unified interface
- Modular, state-of-the-art, responsive components using the latest hardware & software technologies
- Synchronize network model from multiple data sources such as GIS, OMS, CIS, etc.
- Eliminate file based data transfer & minimize effort to maintain interoperability between multiple databases
- Solve for radial & looped three-phase and single-phase systems
- Reduced software maintenance cost by utilizing a single software



Distribution Network Applications

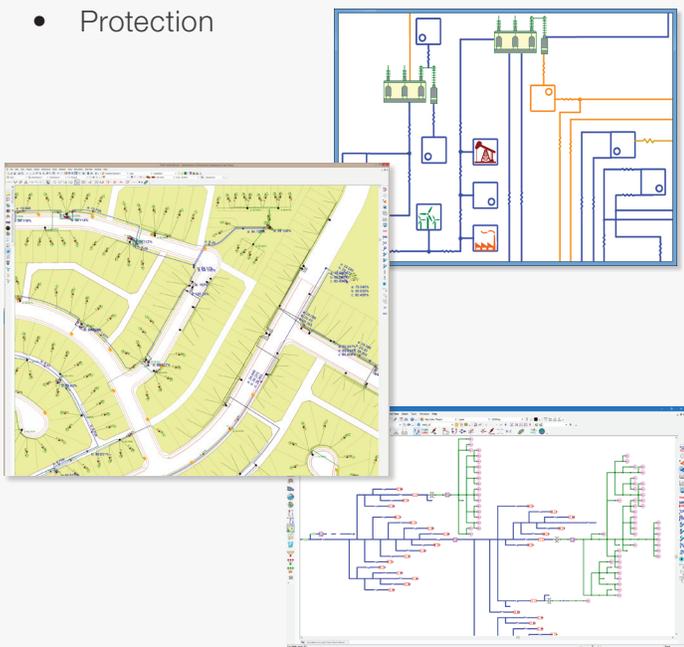
- Intelligent Geospatial Diagram
- Unbalanced System Network Analysis
- State Estimation & Load Allocation
- Volt / Var Optimization & Control
- Loss Minimization & Load Balancing
- Switching Management
- Outage Management
- Fault Location, Isolation & Service Restoration



Distribution Solutions

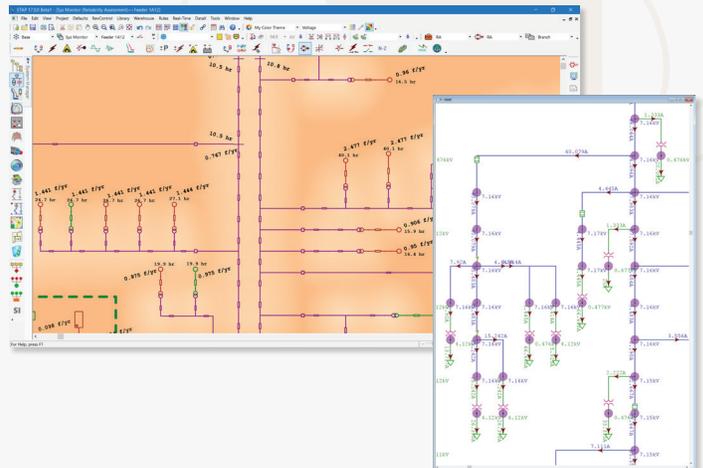
Modeling

- Intelligent Geospatial Diagram
- Substation & Feeder Diagram
- Distribution Equipment Models
- Engineering Libraries & Warehouse
- Cable Raceway & Substation Ground Grid
- SCADA Visualization
- Protection



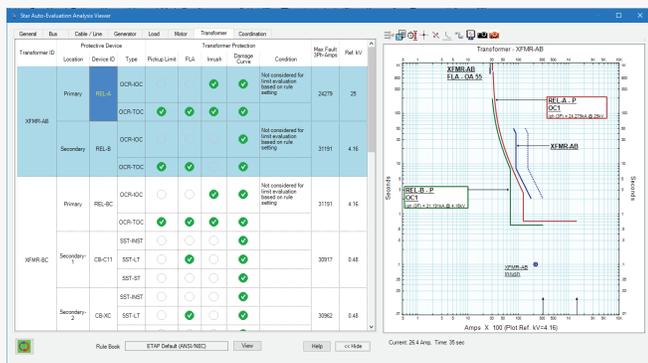
Analysis

- Unbalanced System Load Flow
- Unbalanced System Short Circuit
- Reliability Assessment
- Load Allocation
- Time Domain Load Flow
- Contingency Analysis
- Arc Flash Hazard Analysis
- Dynamic Motor Starting
- Harmonic Analysis
- Voltage Stability



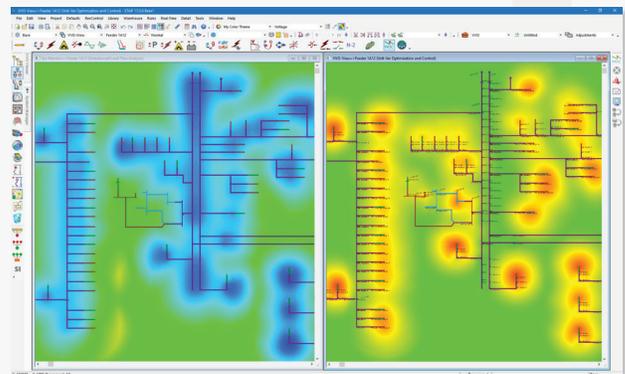
Protection & Coordination

- Overcurrent Coordination
- Protective Device Sequence-of-Operation
- Protective Device Engineering Library
- Interface with Relay Test Equipment



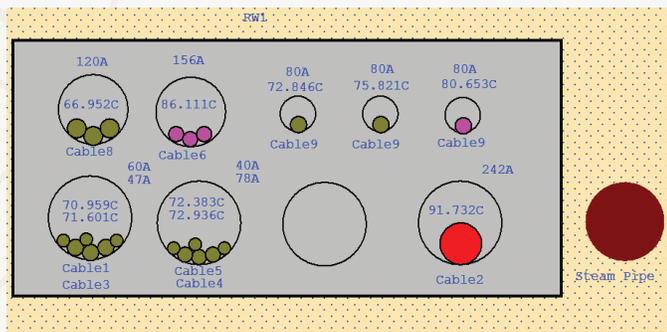
Optimization

- Optimal Capacitor Placement
- Switching Optimization
- Optimal Power Flow
- Fault Management & Service Restoration



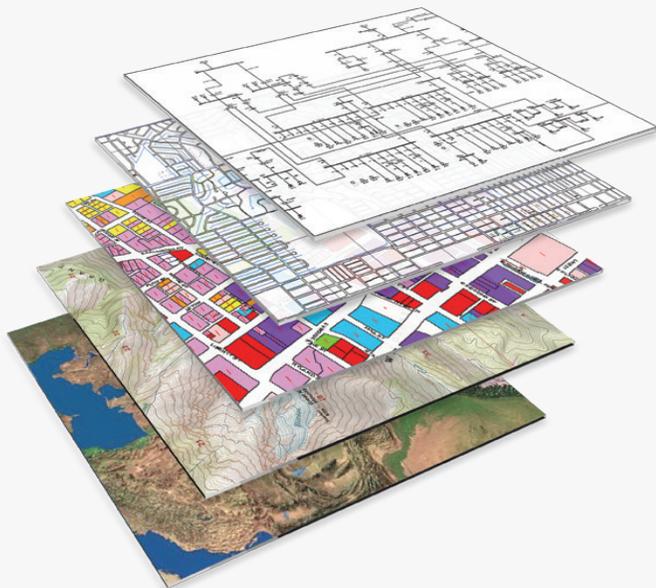
Line & Cable

- Cable Sizing
- Cable Thermal Analysis
- Cable Ampacity
- Cable Pulling
- Distribution Line



Data Exchange

- MultiSpeak
- Common Information Model (CIM)
- Esri ArcGIS™
- GE Smallworld™ Electric Office GIS
- Intergraph® InService OMS

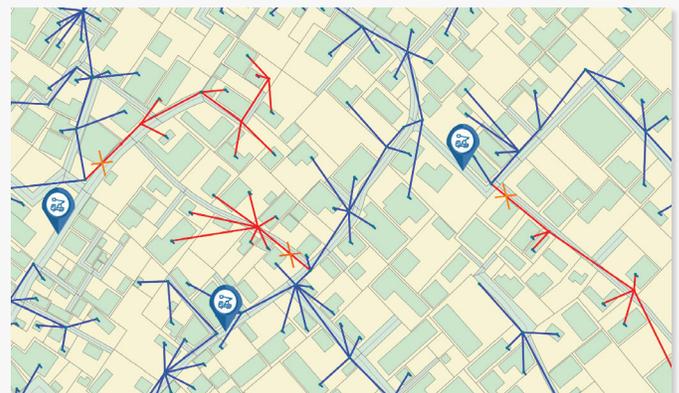


Substation Automation

- Load Management
- Switching Management
- Substation Automation

Advanced Distribution Management System (ADMS)

- Electrical SCADA
- Network Topology Processor
- Distribution State Estimation
- Online Predictive Analysis
- Event Playback
- Volt / Var Optimization & Control
- Feeder Reconfiguration
- Fast Load Shedding & Demand Management
- Fault Location, Isolation & Service Restoration
- Short-Term & Long-Term Load Forecasting
- Operator Training Simulator
- Web & Mobile Dashboards
- Outage Management System

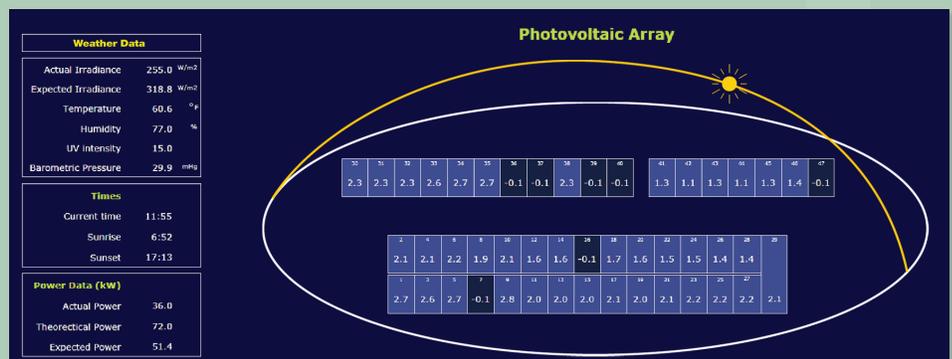


etap Grid™ Microgrid

Smart Technology for Design, Analysis, Planning, Optimization, Control & Operation of Microgrids

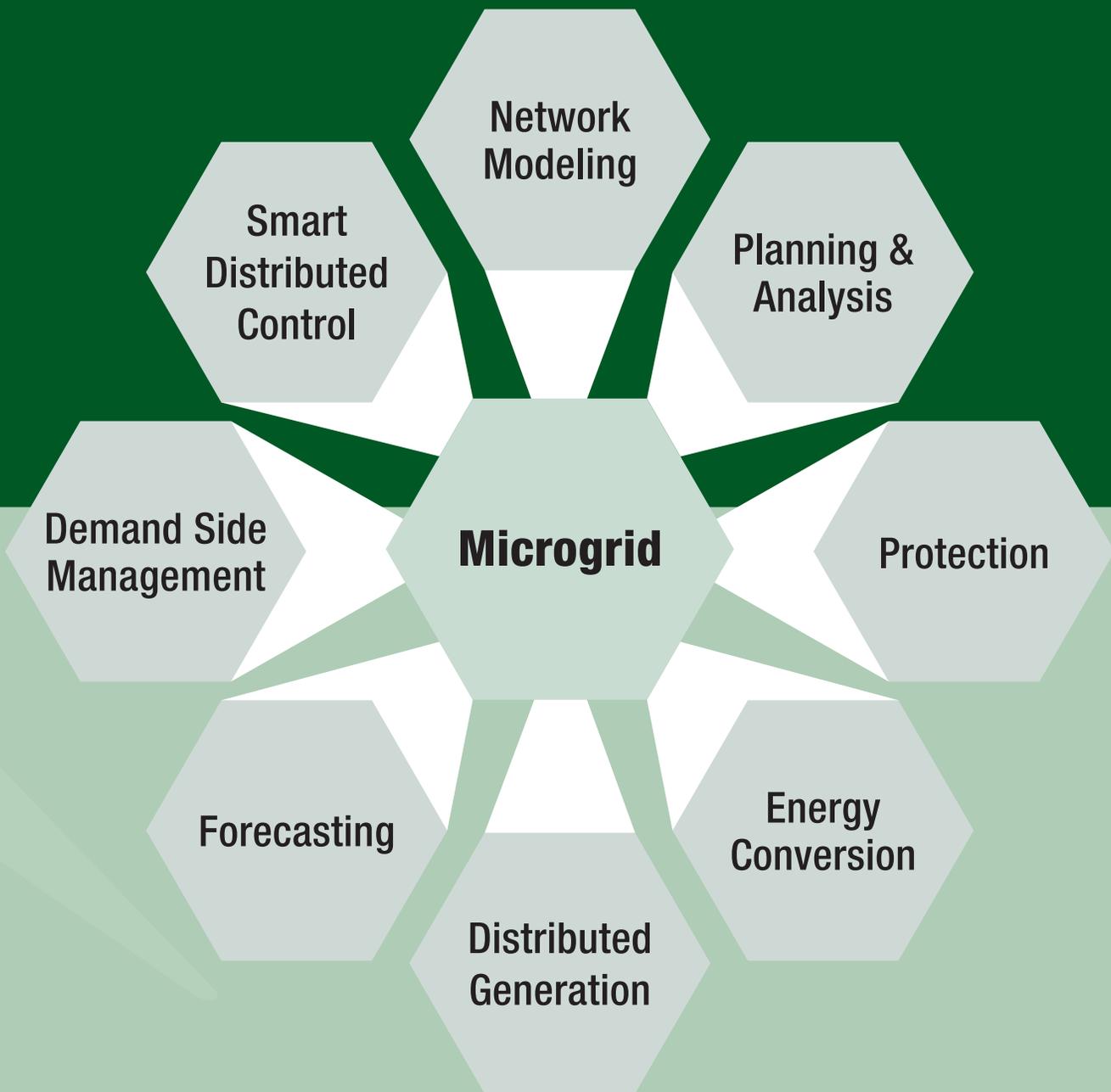
ETAP is used by microgrid developers and engineers for detailed analyses and sizing of distributed energy resources and associated equipment. Microgrid Master Controller brings the design to life by connecting the system model with real-time data.

The solution is used by commercial offices, retail parks, industrial complexes, mission critical facilities, data centers, university campuses, offshore facilities, and ship systems.



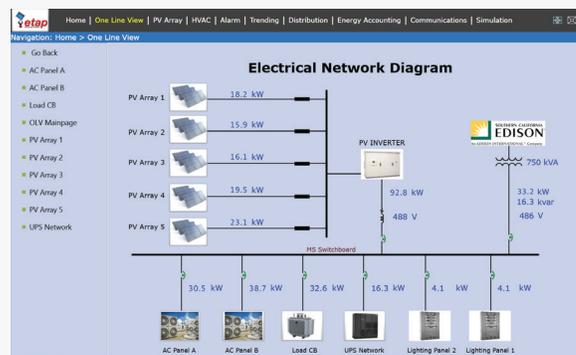
Integrated Microgrid Management & Control

- Design, model & operation microgrids using a single software solution
- Detailed modeling, simulation and optimization of complex dynamic electrical systems
- Predictive analysis & forecasting of loads and generation
- Modeling of microgrid elements, including photovoltaic, energy storage devices, diesel generators, wind turbines, gas & steam generators, fuel cells, etc.
- Lower Total Cost of Ownership (\$/kWh) by optimizing & lowering C&I + O&M + Fuel related costs
- Demand Management, Peak Shaving & Time-of-Use Load Shifting
- Automatically manage & optimize control strategies under grid-connected or islanded modes



Reduce Demand + Optimize Generation + Advanced Management = Grid Independence

- Power System Monitoring & Simulation
- Real-Time Electrical Network Applications
- Electrical Asset & Energy Price Optimization
- Demand Response Management
- Comprehensive Renewable Asset Modeling
- Distributed Energy Resource Management
- Short-Term Generation & Load Forecasting



Microgrid Solutions

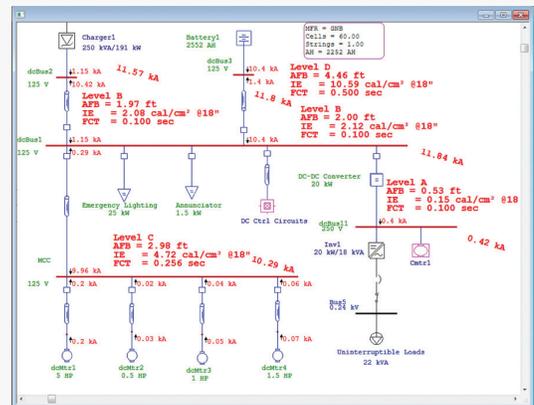
Modeling

- One-Line Diagram
- Intelligent Geospatial Diagram
- Logic - User-Defined Dynamic Models
- Substation Ground Grid
- Cable Raceway
- SCADA Visualization
- Distributed Generation Equipment



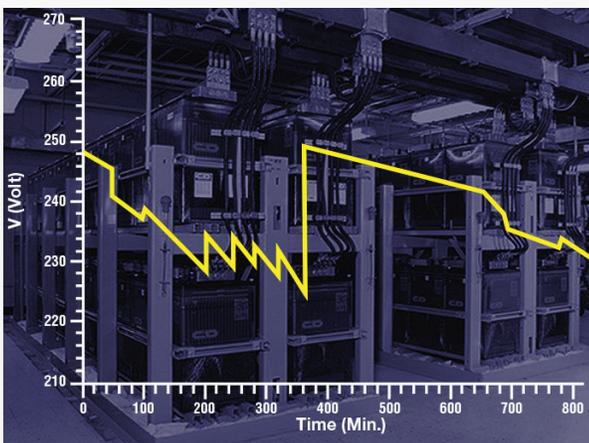
Planning & Analysis

- Unbalanced Load Flow
- Panel Systems
- Short Circuit
- Arc Flash Hazard Analysis
- Contingency Analysis
- Power Quality - Harmonics Analysis
- Time Domain Power Flow
- Optimal Power Flow



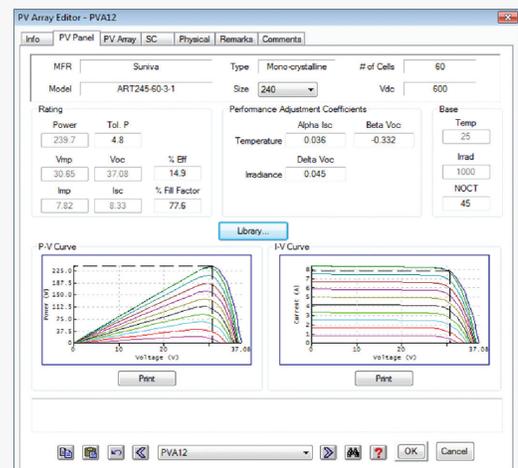
Energy Storage

- Battery Storage
- Flywheel Energy Storage
- Hydroelectric / Pumped Storage



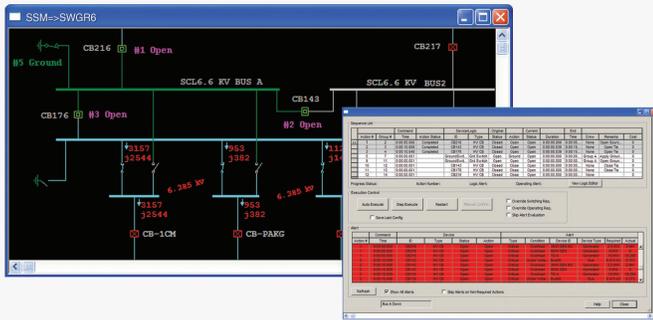
Distributed Resources

- Wind Turbine Generator
- Photovoltaic / Solar
- Inverters & Converters
- Fuel Cell



Substation Automation

- Substation Automation
- Switching Sequence Management
- Load Management



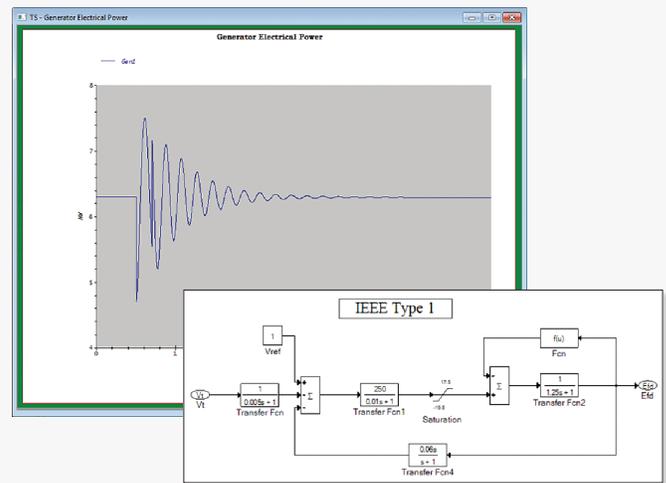
Smart Distributed Control

- Model-Driven SCADA
- Master & Slave Controllers
- State Estimation & Load Allocation
- Predictive Analysis
- Sequence of Events Playback
- Automatic Generation Control
- Economic Dispatch
- Unit Commitment
- Interchange Transaction Scheduling
- Intelligent Load Shedding
- Generation & Load Forecasting
- Web & Mobile Dashboards



Dynamics & Transients

- Transient Stability
- Voltage Stability
- Dynamic Parameter Estimation & Tuning
- Generator Start-Up
- User-Defined Dynamic Models
- Motor Parameter Estimation & Tuning

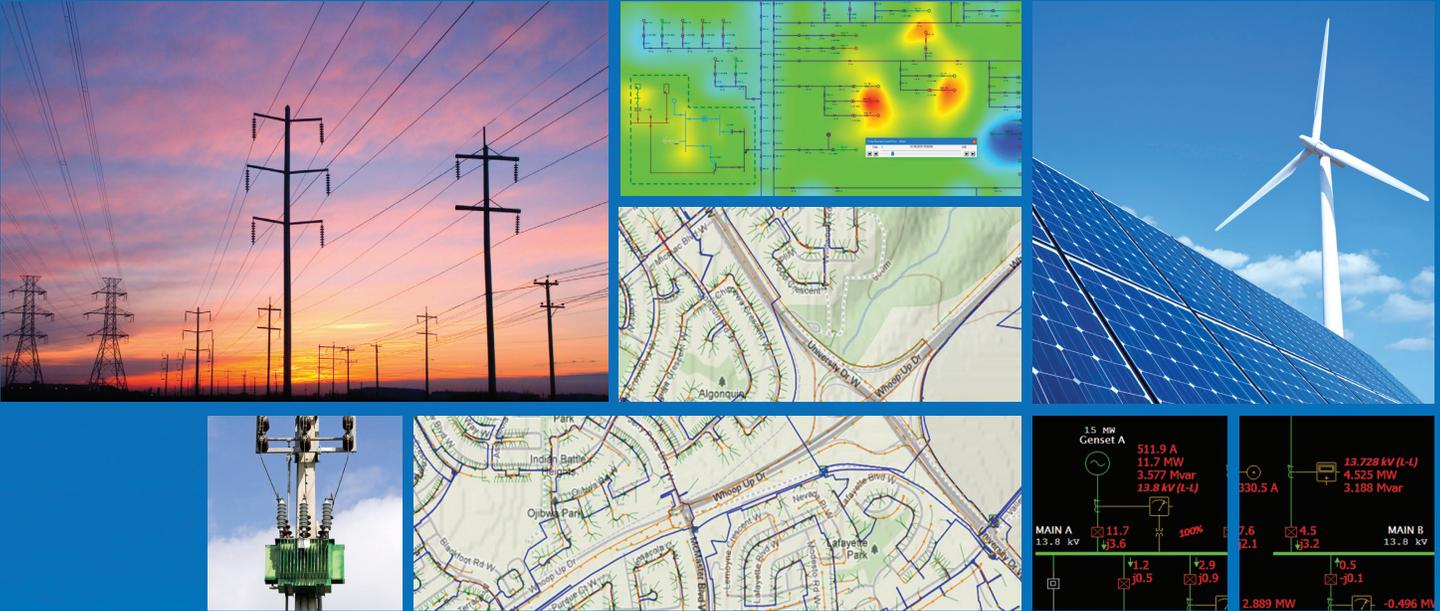


Data Exchange

- Project Merge
- CIM Interface
- OPC Interface
- Native SCADA protocols: Modbus, DNP3, IEC 61850, etc.



Comprehensive Network Management Solutions for Transmission, Distribution & Microgrid Systems



etap.com

Quality Assurance Commitment

ETAP is Verified and Validated (V&V) against field results, real system measurements, established programs, and hand calculations to ensure its technical accuracy. Each release of ETAP undergoes a complete V&V process using thousands of test cases for each and every calculation module. ETAP Quality Assurance program is specifically dedicated to meeting the requirements of:

Registered to ISO 9001:2008



Certification No. 10002889 QM08

ISO 9001:2008
ASME NQA-1

10 CFR 50 Appendix B
CAN / CSA-Q396.1.2

10 CFR Part 21
ANSI / IEEE 730.1

10 CFR Part 50.55
ANSI N45.2.2

ANSI/ASME N45.2

© 2017 ETAP / Operation Technology, Inc. All rights reserved. Certain names and/or logos used in this document may constitute trademarks, service marks, or trade names of Operation Technology, Inc. Other brand and product names are trademarks of their respective holders.

B16-ETAPGRID-JAN2017