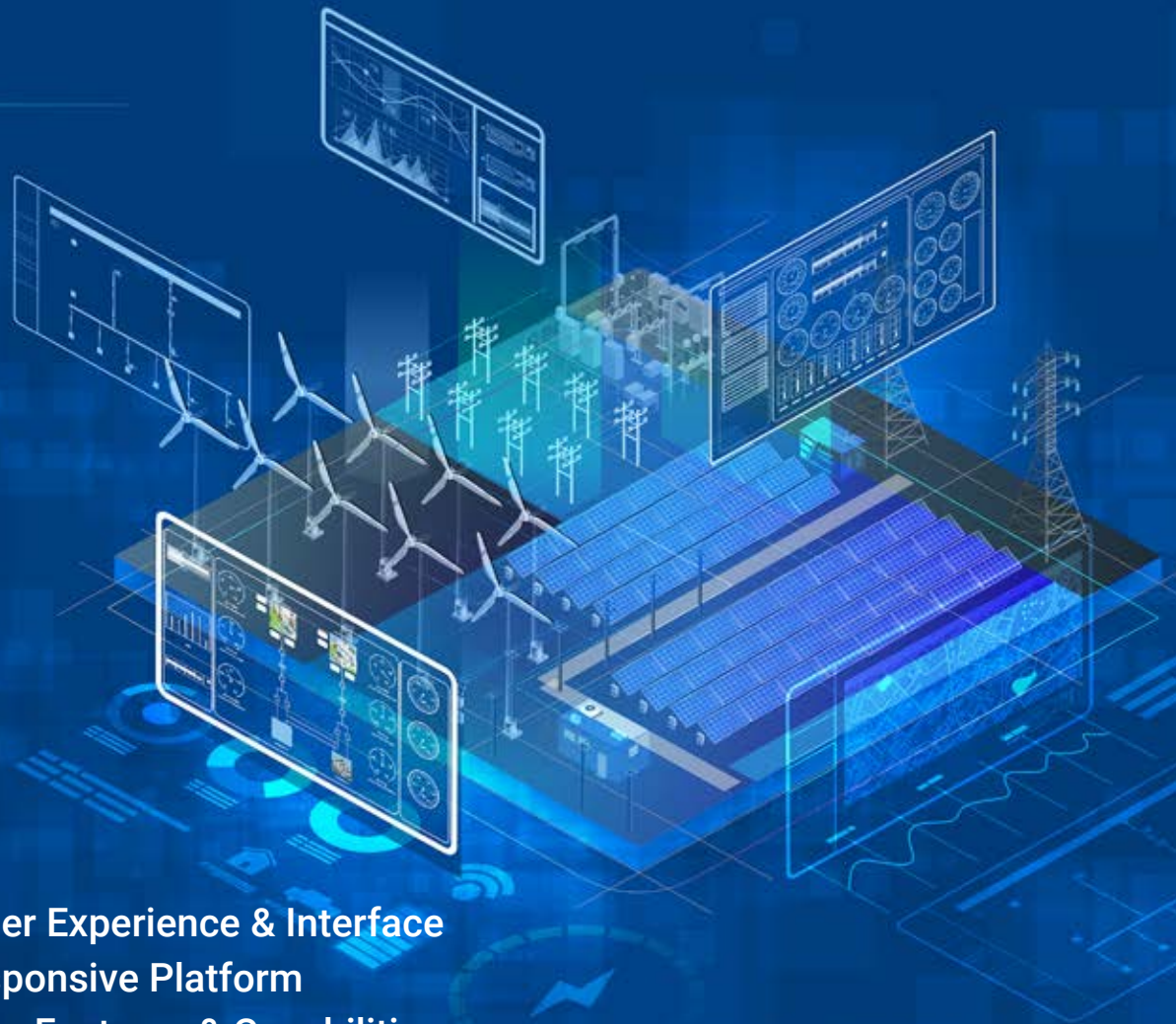


etap 22

Sustainability through Continuous Intelligence

Integrated Electrical Digital Twin Platform
Enriched with Intelligent Solutions



Improved User Experience & Interface
Faster & Responsive Platform
1000s of New Features & Capabilities

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POWERING THE DIGITAL ENERGY LANDSCAPE

ETAP 22 offers a multitude of newly integrated power analysis modules, electrical design capabilities, automation, and operations solutions. ETAP 22 addresses user requirements and industry needs with advanced renewable energy modeling, safety compliance, simulation tools, and leading edge, model-driven, real-time network management solutions.

Upgrade to ETAP 22 for an improved user experience with 1,000s of enhancements, time-saving improvements, and best practices to be more sustainable, efficient, resilient, safe, and maintain reliability.

DESIGN SOLUTIONS

ArcSafety™

Arc Flash

- ArcFault based on IEC 60909-2016
- Arc Flash Decay
- Single Phase Arc Flash

AC & DC Arc Flash

- Schau. H; Halinka. A
- DGUV-I203-077 (Worst-case)

DC Arc Flash

- Generation categories
- Single-diode/two-diode I-V, PV systems

Arc Flash Auto™

- Single pole effect on 3-phase fault transforming to a LL fault
- Global Rulebook option to automatically skip nodes

Arc Flash Calculators

- DC Arc Flash
 - Arc elongation for PV Systems
 - Arc erosion for various conductor sizes
 - Transient DC Arc Flash Plots
- German Arc Flash
 - Iterative method
 - DGUV-I203-077 (Worst-case)
 - Arc elongation effect for PV systems
 - Arc erosion for various conductor sizes

Arc Flash Ease of Use

- Completely redesigned Study Case
- Result Analyzer with TCC Analysis Tools

LOCALIZED SHOCK RISK ASSESSMENT

Regional Electrical Worker Safety Standards

- United States (NFPA), Canada, Mexico, Brazil, Russia, China, Australia, Europe (IEC), Austria, France, Greece, Germany, Italy & Spain

eLabelMaker™

- Graphical tool for creating Arc Flash Label templates
- Create modern Arc Flash Labels
- Include QR codes
- Generate localized labels

LIGHTNING RISK ASSESSMENT

- Identify & assess risks for a structure due to lightning flashes
- Comply with NFPA 780-2014 for lightning protection systems
- Reference lightning density / frequency maps
- Occupancy & protection assessment
- Catalog of predefined structure

TIME DOMAIN LOAD FLOW

- Support for Smart Inverter, STATCOM, SVC & VFD
- Graphical results & plots for SVC, STATCOM, VFD, induction & synchronous motors
- Expanded AC/DC element plot parameters
- Improved networks under VFD - no-load, parallel and meshed network
- User-defined Python report

UNBALANCED NETWORK LOAD FLOW ANALYSIS

- Auto-Run load flow upon network modification or scenario changes
- Plot Analyzer support for 1-phase systems
- Enhanced GIS calculation and display
- Improved networks under VFD - no-load, parallel and meshed network
- Supports capability curve for renewable sources
- Optimized performance for solar panel and inverter control, to converge better and faster
- Supports user-defined Python report in Report Manager

GridCode™

Conform & Maintain Compliance

- Automated Grid Code Evaluation - Analyze & Verify
 - Real & reactive power capability
 - LV & HV ride-through
 - Frequency ride-through
 - Dynamic voltage & frequency support
- Country & Utility Grid Code Rulebooks
 - User-definable
 - P-Q & V-Q Capability
 - Equipment voltage-dependent P-Q Capability
 - Equipment control including voltage & frequency drop
 - Ride-through curves
- Country Codes
 - ENA EREC G99 2021 (UK)
 - ENA EREC G5/5 2020 (UK)
 - IEEE 1547 2018
 - PRC-024-2 (North America)
 - Enedis-PRO-RES_64 2020 (France)
 - RTE DTR 2020 (France)
 - Guida Tecnica - Allegato A.68 - Rev.03 12/2019 (Italy)
 - Guida Tecnica - Allegato A.17 - Rev.02 12/2019 (Italy)

SMART INVERTERS

- Autonomous, logic-driven decision making
- Multiple modes of operation & control
 - Volt – Var
 - Volt – Watt
 - Watt – Power Factor
- Control curves or static var support
- Real or reactive power priority modes
- Consider smart inverter constraints
- Maintain compliance per IEEE 1547 & California Rule 21

CURRENT TRANSFORMER SATURATION

- Export to Excel
- Result plots
- Transient Short Circuit plots

RELIABILITY ASSESSMENT

- Improved visualization with Datablocks
- Enhanced plotting with GIS Diagram
- Enhanced handling for STATCOM, SVC, UPS, and Wind Turbine

GEOSPATIAL ELECTRICAL DIAGRAM

- Substation Diagram
- Relay & instrumentation with One-Line diagram synchronization
- Hide & Show Elements

New

INTELLIGENT CONTROLLERS

- Short, medium to long-term planning and assessment
- Primary, secondary and tertiary controls
- Dynamic modeling of equipment controllers
- Vendor Black-Box (DLL) Dynamic link library interface
- Ready-to-use with configurable parameterization
- Wind Turbine, Solar Inverters, Energy Storage Systems, STATCOM
- Hybrid Power Plant / Station Controller for secondary control
- Grid Following & Grid Forming Inverters
- Microgrid Controller, Gateway, Synch Check Relay
- Operator Training Simulator
- Grid Code Analyzer

DYNAMICS

Transient Stability

- Unbalanced faults (LG, LL, & LLG) for branches
- Fault impedance for Bus and Branch faults
- For utility: new Voltage Ride Through – LVRT & HVRT
- Generator frequency action
- Frequency estimation method with voltage blocking for Hz relay action
- Improved convergence speed
- Inverter charging/discharging state

eMTCosim™

- Co-simulate Phasor & Electromagnetic Transients with ETAP eMT 5.0

User-Defined Dynamic Models

- UDM for Inverter with Norton/Thevenin network interface
- Renewable Energy and Grid Forming Inverter models
- User-Defined Dynamic Model library with Renewables

HARMONIC ANALYSIS

- Total and displacement power factor
- Transformer derating based on ANSI/IEEE C57.110-1986 considering eddy current losses
- Cable derating based on Harmonic Distribution Factor
- Capacitor overload alerts based on IEEE 18-2002
- Enhanced harmonic library editing functions
- Zero sequence Harmonic Frequency Scan
- Harmonic Emission Limits:
 - AS61000: National Electricity Rules
 - AS61000: Victorian Electricity Distribution Code
 - ENA EREC G5/5 2020: British Harmonic (updated)
 - ENA EREC G5/5 2020: British Harmonic: Compatibility Levels (updated)

New

ACTIVE HARMONIC FILTER

- Active Filter Harmonic Correction – Automatic & Manual
- Filter Sizing
- Unbalanced Correction
- Unbalanced Harmonic Load Flow & Compliance

New

UNBALANCED NETWORK SHORT CIRCUIT ANALYSIS

Unbalanced Network Short Circuit Analysis International Standards:

- IEEE Standard – C37 Series
- IEC Standard – IEC-60909, IEC-61660 & IEC/IEEE 62271-37-013
- GOST Standard - GOST R 52735 & GOST 28249

Unsymmetrical 3-phase & 1-phase AC System and Unified AC & DC System Modeling

- Phase domain representation of 3-phase & 1-phase systems
- Modeling of unsymmetrical 3-phase lines & cables, etc.
- Modeling of coupled 3-phase and 1-phase lines
- Modeling of special distribution transformers (open-delta, Scott-T & booster XFMRs, etc.)
- Unified AC & DC systems combined with rectifiers/converters
- Analysis of a fault in DC system automatically includes effect of AC system components and vice versa

Short Circuit Simulation for Shunt Fault Types

- Fault types - 3Ph, 3PhG, LG, LL, LLLG
- Fault phases – ABC, ABCG, AG, BG, CG, AB, BC, CA, ABG, BCG, CAG
- Simultaneous shunt faults of different fault types & phases at different locations

Short Circuit Simulation on GIS System

- Fault calculations on user-specified shared buses
- Fault calculations along user-specified feeders
- Feeder fault calculation on all junction points or multi-connection junction points
- Device evaluation for protective devices in GIS systems, including those specified in edge editors

AC & DC Device Duty Evaluation

- ANSI/IEC AC device duty evaluation based on all fault types - 3-phase, LG, LL, & LLLG
- ANSI/IEC AC device duty evaluation based on all available fault phases
- IEC-61660 DC device duty evaluation considering rise-time constant and peak or quasi steady-state current
- ANSI DC device duty evaluation based on user-specified worst case modeling

ANSI & IEC Standard AC Short Circuit Analysis

- Complying with latest version of ANSI & IEC standards
- Simulation of all possible types and phases of shunt faults
- Simulation of single shunt or simultaneous shunt faults of different fault type & phase and at different locations
- Device duty evaluation and alerts based on all fault types and phases

GOST Standard AC Short Circuit Analysis

- Complying with GOST R 52735 (AC HV) & GOST 28249 (AC LV)
- Adjust cable resistance due to fault current
- Induce effect of arc resistance at fault location
- Consider contact resistance and relay coil impedance in LV system calculations
- Options for AC decay of synchronous and induction machines
- Generate fault current waveforms with respect to time

DC System Short Circuit Analysis per IEC-61660

- Calculate total fault current and individual contributions
- Fault calculations include peak, quasi steady-state current, time to peak and rise-time constant

Cont.

UNBALANCED NETWORK SHORT CIRCUIT ANALYSIS

- Device duty evaluation on rise-time constant and fault current, peak or quasi steady-state current at user's choice
- Radial and looped systems with multiple sources

Generator Circuit Breaker Duty Evaluation

- Duty evaluation per IEC/IEEE 62271-37-013 and IEEE C37.013

Short Circuit Report & Visualization

- Datablock for rating and results displayed in both OLV & GIS views
- Underrated devices alerted by color in OLV & GIS views
- Current waveforms for GOST AC & IEC 61660 DC system fault calculations
- Detailed reports for short circuit analysis

STAR™

Protection, Coordination & Selectivity

- Automated coordination evaluation beyond minimum time
- User-defined fields for protective devices
 - Template editor per equipment type with import & export capability
 - Data Manager with editing capability including data revisions
 - Report Manager with preview & comparison of UDF values, and creation of Excel report
- Star Sequence of Operation Slider
- Ignore Maintenance Switch in Sequence of Operation
- Star View TCC
 - Motor line & terminal acceleration curve
 - Minimum time area
 - Visible/invisible curves from right-click menu
 - Find minimum time difference in normalized view
 - Visibility and display enhancements

StarZ™

Distance Protection

- Simulate protection impact based on Unbalanced Faults - AG, BG, CG, AB, BC, CA, ABG, BCG, and CAG
- Single phase distance relay - integration with eTraX™ for railway system protection simulation
- Create and manage Star Views / TCCs in StarZ mode
- Normalized TCC based on StarZ single-fault report
- Enhanced library with user-defined comparators & digital source stencil
- Vendor specific transformer/bus/line differential relay

VERIFIED & VALIDATED MODELS

Verified & Validated Equipment Libraries

- New protective device models (8,500+)
 - Low-voltage circuit breakers
 - Low-voltage trip devices
 - Fuses
 - Relays
- Solar/PV panel models (4,000+)
- Cable models

New

FlickerMeter™

- Instantaneous, short-term (PST) & long-term (PLT) flicker indices
- Electromagnetic compatibility (EMC) based on IEC 61000-4-15
- Signal processing capability
 - COMTRADE/CSV input
 - Analyze multiple simultaneous signals
 - Capable of processing up to 500 million data points

iSLD™

- Result & component animation
- AutoComplete™
- Network Manager
- Equipment resizing
- Create & expand composite networks
- Hide & show elements

New

UNBALANCED HARMONICS

- Harmonic Load Flow with unbalanced loading conditions
- Harmonic compliance with IEEE/IEC limits
- Mitigation & unbalanced system correction using Active Harmonic Filters

POWER SYSTEM OPTIMIZATION

Switching Sequence Management (SSM)

- Validation of switch plans using Unbalanced Power Flow
- Simulate switch plans on One-Line or GIS diagram
- Export sequence plans to Excel
- Export plans to online Sequence Management Viewer

Switching Optimization

- Alert & visual display on One-Line & GIS diagram
- Enhanced modeling for switched capacitor banks
- Enhanced feeder balancing & optimize voltage objectives
- New Phase Load Balancing objective

Volt/Var Optimization

- Alert visualization on GIS diagram
- Enhanced modeling for switched capacitor banks & distribution transformers

Fault Management & Service Restoration

- Improved minimize overloading & optimize voltage objectives
- Voltage vs. distance plot for each phase

CABLE SYSTEMS

- Protective & neutral conductor sizing tables:
 - BS 7671
 - IEC 60364
 - NF C15-100
- Cable model forms
 - BS 7671:2018+A2:2022
- Energy capability K2S2 for each conductor (Phase, Neutral, PE)
- Maximum possible energy based on short circuit & device settings
- New conduit types and enhanced annotations for Underground Raceway Systems

DIGITAL TWIN ELEMENTS

- Enhanced Controller with inverter dynamics
- Grounding impedance for 2-W, 3-W, and zigzag grounding transformers

APPLICATION PLATFORM

- Updated equipment editors
- Improved high-resolution display support
- More responsive and performance improvements throughout
- Username & access role display on the application title
- Copy textbox to clipboard for other applications

TRANSPORTATION, RAILWAYS

Design, Analysis & Operation of AC/DC Systems

- Multiple train type categories & speed limits
- Lock track length in a geospatial view
- Speed limit error check for multiple train types

DATA EXCHANGE

Legacy Conversion Tools

- SKM Import
 - Enhanced conversion from SKM PowerTools® including DC Systems
 - Improved automatic single-line diagram generation
- Power Analytics / EDSA Import
 - Built-in conversion from Power Analytics® / EDSA®
 - Automatic single-line diagram generation
- EasyPower / ESA Import
 - Enhanced conversion from EasyPower including support of MCC Loads
 - Automatic single-line diagram generation
- DataX™ AVEVA®
 - Data exchange with AVEVA Engineering 15.1
- DataX™ ESRI ArcGIS®
 - ESRI ArcGIS import in Universal Mapping
- eXCAD™ – AutoCAD® DWG™ Exchange
 - Accelerate & generate digital design deliverables to AutoCAD
 - Improved automatic one-line diagram generation from AutoCAD

PROTECTIVE DEVICES

Digital Twin Elements for Modeling Network Protection

- Medium Voltage Circuit Breaker
- Generator Breaker category - IEC/IEEE 62271-37-013 Std.
- Quick-Pick with sorting & filtering
 - Low Voltage Circuit Breaker
 - Expanded short circuit ratings
 - Slash Rating for ANSI molded case breakers
 - Individual-Pole Interrupting Rating for ANSI & IEC
 - Display of ZSI availability in Quick-Pick

etap API™

ETAP RESTful API for Interoperability

- Connect to ETAP from any device or platform
- ETAP services over REST API
- Secure connection (https) to DataHub™
- Readily implemented as a Python client in etapPy
- Run scenarios & studies
- Retrieve project data from connected software applications

etapPy™

Scripting & Study Automation using Python™

- Integration of ETAP and Python scripting language
- Run ETAP studies remotely and in parallel across machines
- API expansion, including automation of:
 - Switching Optimization
 - Unbalanced Short Circuit
 - Contingency Analysis
 - Detailed reference documentation (descriptions, example code)

FLISR™

Fault Location, Isolation & Service Restoration

- Network components capacity evaluation
- Forecasted affected area based on trouble calls
- Fault location based on trouble call, FPI signals & protection devices data
- Integrated with ETAP AFAS engine
- Automated isolation, partial restoration, & full restoration switching steps
- Control inhibition on affected feeders
- Integrated Switching Order Management
- SLD and GIS graphical web/workstation displays

ePPC™

Model-Driven Power Plant Controller & Energy Management System

- Renewable power plant SCADA & controller
- Control & manage hybrid power plants
- Point of interconnection active & reactive power control
- Generation optimization
- Power smoothing
- Energy storage management
- Performance testing & validation
 - Software-in-the-Loop (SIL)
 - Hardware-in-the-Loop (HIL)

OPERATION & AUTOMATION SOLUTIONS

eSCADA™

Electrical Control & Data Acquisition System

- Electrical SCADA
- Large tag handling (100K+) with ICCP driver
- Alarm management
 - Email and SMS notification & acknowledgment
 - HTML5 interface
- User Defined reports
 - System level
 - Shift change
 - Alarm reasons
 - Outage summary

AFAS™

Automated Fault Analysis System

- Operational and decision-support analysis software to analyze and locate the source of power disturbances and faults
- Automatic fault information retrieval - COMTRADE
- Enhanced COMTRADE handling: variable sample rate, a secondary factor of zero
- Fault type, impedance & location identification for branches
- Discriminate between permanent or temporary faults
- Graphical visualization & reporting of fault location
- Field data sequence of operation by relay, bay, substation & zone
- Compare sequence of operation - "as designed" & "as operated" cases
- Double-ended fault location for AC traction system, single circuit and double circuit lines
- Line positive and zero sequence estimation
- Phasor, RMS, harmonics, power & frequency estimation
- Considers CVT transient filter for different fault location techniques
- Relay setting assistance via Python Scripting
- Automatic event reports with model-based & rule-based root cause analyses
- Incident labels
- Integrates with ETAP eProtect™, eAPM™ & Outage Management System (OMS)

eOTS™

Operator Training Simulator

- Ensure operator readiness & foreplan contingencies
- Increase operator competency & audit productivity
- Improve system safety & security through real-world simulations
- Validate design using steady-state & dynamic simulation
- Faster startup & shutdown times
- Reduce planned turnaround time
- Minimize outages due to operator errors

etap DERMS

Distributed Energy Resource Management System

- Wind, solar & energy storage
- Grid Code compliance
- Integrated hosting capacity analysis
- Grid operation & optimization
- DER Forecasting

eTraX™

Solution for AC & DC Railway Systems

- Traction SCADA for railways
- Monitor train speed, tractive effort, position & power consumption

etap ADMS

Integrated Planning, SCADA, DMS & OMS

Volt/Var Optimization

- Advisory/supervisory modes
- HTML5 visualization dashboard
- Reporting and validation charts

Outage Management System

- Crew management
- Dispatch app
- CIS integration
- SOM integration
- Reclosure support

eSI™

Situational Intelligence for Actionable Decision Making

- Identifies potential problems under current conditions
- Predicts system contingencies before operator actions
- Continuous validation & identification of abnormal conditions



μGrid™

Microgrid Controller & Energy Management System

- Grid-tied, off-grid & networked microgrids
- Grid-connected and islanding control & management
- POI active & reactive power control
- Planned & unplanned islanding
- Optimal & rule-based dispatch of microgrid resources
- Black start & reconnect
- Generation & load forecasting
- Performance testing & validation

eAPM™

Asset Management & Maintenance

- Access asset information via mobile devices
- Manage maintenance
- Create and manage work orders
- Integrated with ETAP model
- Include procedures, test, and maintenance documentation records

CLOUD & MOBILE SOLUTIONS

eWeb™

Thin Client Visualization & Management

- HTML5/JS based web interface
- Load Flow & Short Circuit simulations
- Asset Management interface
- Real-Time dashboard integration
- Reports and work orders

CYBERSECURITY

Modern Internet Facing Application Security

- ETAP License Manager
- Mobile field data collection & synchronization (etapAPP)
- Network Project Management (NetPM)
- ETAP Real-Time HMI Viewer (eSCADA)
- ETAP Real-Time thin client dashboards (eWeb)

etapApp™

Mobile Field Data Collection & Synchronization

- Ergonomics
 - Interface layout optimized for tablet usability
 - Improved dark mode on the Android platform
 - Custom colors for One-Line diagram equipment
- Comment Summary
 - Searchable list of textbox comments
- New element – Smart Inverter
 - Capture information for inverters and smart inverters and synchronize with ETAP
- Analysis results
 - Validate collected data and graphical load flow results

etap 22

Empowers the design & automation of power systems.



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