



SEL ENGINEERING SERVICES AND SOLUTIONS

PROTECTION SERVICES

- Protection scheme designs and system protection planning
- Protective relay settings and documentation
- Conversion of electromechanical relay settings
- Relay retrofit/replacement applications
- Protection panel and cabinet design and integration
- Relaying standard development
- Event analysis and troubleshooting
- Arc-flash studies and hazard mitigation schemes
- Generator synchronizing systems
- One-line and three-line ac and dc schematics (breaker control drawings, relay I/O, and SCADA)
- Phase-shifting power transformer protection
- NERC PRC, FAC, TPL, and MOD studies and compliance
- NRC and NEI open-phase detection
- Falling conductor mitigation
- Metering and power quality applications
- VT/CT sizing
- IEC 61850 engineering
- Multiplexer design
- Programmable logic controller and microwave scheme design
- Panel layouts, logic diagrams, wiring diagrams, communications/network diagrams, and circuit/cable schedules

- Transient/dynamic stability studies
- Small signal stability studies
- Voltage stability studies
- Path-rating and transfer capabilities studies
- Congestion/load growth studies
- Import and export studies
- Transmission and load interconnection studies

AUTOMATION SERVICES

- SCADA design and implementation
- HMI design and implementation
- Gas-insulated switchgear (GIS) retrofit
- Synchrophasor systems
- SEL Real-Time Automation Controller (RTAC) settings and configuration
- Communications architecture
- Remote terminal unit (RTU) replacement
- Control panel design and integration
- Fault location, isolation, and service restoration (FLISR)
- Event monitoring, collection, and analysis
- Device integration
- Equipment condition monitoring
- NERC PRC-005 solutions
- Metering settings and reports
- Renewable integration
- Security system design

POWER MANAGEMENT SYSTEMS (POWERMAX®)

- Remedial action schemes
- Industrial power management
- Microgrid control systems
- Wide-area monitoring, protection, and control systems
- Mobile microgrids
- Other POWERMAX solutions:
 - Generation control
 - Load management
 - Synchronization
 - Automatic islanding
 - Volt/VAR optimization
 - Islanded and grid-connected operation
 - Metering and monitoring
 - Blackout prevention technology
 - Integrated protection systems
 - Point of common coupling (PCC) control
 - Seamless islanding controls
 - Inverter and conventional dispatch
 - Renewable generation integration
 - Energy storage integration
 - Integrated power quality metering
 - Emissions and cost optimization
 - Grid support functions
 - Dynamic system protection



TRANSMISSION, DISTRIBUTION, AND SUBSTATION ENGINEERING

- Front-end engineering design (FEED) studies, equipment specifications, initial cost estimates, and conceptual designs
- Geotechnical investigation and topological survey coordination support
- Site development, including grading, drainage, and access roads
- Structural analysis for seismic, wind, and thermal load resistance
- Site-specific design of steel, concrete, or hybrid structures
- Thermal and electric performance analysis
- Issued-for-construction packages, complete with bills of materials and construction specifications
- Project support, including permitting, environmental coordination, responsible charge engineering, and as-built drawings
- Transmission route and structure planning
- Overhead and underground design for pole lines, duct banks, vaults, and cable systems
- Distribution mapping and drafting, including GPS and full-service CAD capabilities
- Large-scale distribution improvements, underground networks, and utility pole relocations

COMMISSIONING SERVICES

- Factory acceptance tests (FATs)
- Site acceptance tests (SATs)
- Dynamic protection system testing and commissioning
- Dynamic automation system testing and commissioning
- Substation print/circuit testing and validation
- Secondary maintenance testing
- Power quality testing
- End-to-end testing

CYBERSECURITY SERVICES

- Security assessment study
- Two-day, fixed-fee, onsite security assessments
- Vulnerability assessments (paper and active)
- Security policy framework review/creation
- Incident management
- Secure remote access
- Network and server design and hardening
- Specialized software solutions
- Centralized secure data management system
- Log management and engineering
- Password management
- NERC CIP compliance services
- Mock audit, vulnerability assessments, and patch management outsource
- Transient device management, policy/procedure review/creation, and baseline management

SYSTEM MODELING AND STUDIES*

- Hardware-in-the-loop (HIL) testing
- FATs
- SATs
- Firmware validation testing
- NERC CIP compliance support
- Planning feasibility studies
- Event analysis
- Protection coordination and settings studies
- Transient/dynamic stability studies
- Power quality and harmonic analysis
- Motor starting studies
- Equipment sizing reports

INSTALLATION SERVICES

- Installation of protection and control systems
- Installation of automation control systems
- Relay retrofit and upgrade services: relay, door, and panel replacements
- Installation of SEL arc-flash protection sensors
- Complete control house installation and integration
- Routing and terminating control and communications cables, including fiber
- Continuity and Megger testing

ADDITIONAL SERVICES*

Consulting

- Project criteria development
- Root-cause and forensic analysis
- Cost-benefit risk analysis
- Independent review
- Post-project assessments
- Grid modernization
- FEED and needs analysis studies
- Physical security
- Construction support
- Staff augmentation—engineering and project management

Training

- Custom project training
- Project training collateral
- Customized teaching

*Applicable to all categories



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