

# SEL Engineering Services



# Systems and services for utility and industrial electric power systems

SEL Engineering Services (ES) provides complete protection, automation, communications, and power management solutions for critical electrical infrastructure worldwide. We have expertise in utility and industrial power system management, integration of distributed energy sources (DERs), and cybersecurity best practices. SEL industry-experienced engineers provide the best possible solution for every project, meeting a growing need in the electric power industry as companies deal with reduced engineering staffs and increasingly complex requirements.

## Protection Services

SEL ES specifies, designs, implements, tests, and commissions protection systems. SEL engineers are experts at modern multifunction microprocessor relay technology. Our teams design protection for generation, transmission, distribution, and low-voltage systems worldwide. Protection schemes commonly include all the design documentation, testing procedures, and setting reports for protection, control, automation, and communications systems.

SEL ES also provides electric power system modeling and studies. These models are used for arc-flash, feasibility, volt/VAR optimization, equipment sizing, scheme design, and stability studies. Our teams also provide hardware-in-the-loop (HIL) testing for both protection and control systems.

### KEY OFFERINGS:

- Protection scheme designs and system protection planning
- Protective relay settings and documentation
- Conversion of electromechanical relay settings
- Relay retrofit/replacement applications
- Transmission planning
- Protection panel design and integration
- Relaying standard development
- Event analysis and troubleshooting
- Arc-flash studies and hazard mitigation schemes
- System modeling and studies
- Substation design
- Synchronizing systems
- Phase-shifting power transformer protection
- NERC PRC, FAC, TPL, and MOD compliance
- NRC and NEI open-phase detection
- Falling conductor detection
- VT/CT sizing
- Metering and power quality applications
- IEC 61850 engineering

## Automation Services

SEL ES offers proven automation and integration solutions using SEL technology. These solutions include fully configured, tested, and documented settings for networking, control, communications, automation, and protection equipment. We provide comprehensive automation solutions for electrical power system substations, commercial buildings, industrial sites, generation plants, and manufacturing sites worldwide. We also provide complete substation upgrades and replacement of legacy protection and remote terminal units (RTUs).

### KEY OFFERINGS:

- SCADA design and implementation
- HMI design and implementation
- SEL Real-Time Automation Controller (RTAC) settings and configuration
- RTU replacement
- Communications architecture
- Substation automation
- Control panel design and integration
- DNA® (Distribution Network Automation)
- Intelligent electronic device (IED) integration
- Condition monitoring
- NERC PRC-005 solutions
- Metering settings and reports
- Renewable integration
- Gas-insulated switchgear (GIS) retrofitting

## POWERMAX® Control Systems

The SEL PowerMAX Power Management and Control System is an integrated control system composed of scalable hardware, software, logic processes, and engineering services. POWERMAX uses algorithms (proprietary libraries) that run on the SEL RTAC platform. POWERMAX systems are used for microgrids, military forward-operating bases, industrial power management, and utility special protection systems. These comprehensive solutions offer HIL testing, robust cybersecurity systems, and full integration with your existing protective relays. There are POWERMAX systems installed and operating throughout the world today.

### KEY OFFERINGS:

- Load shedding
- Generation control
- Load management
- Synchronization
- Automatic islanding
- Volt/VAR optimization
- Islanded and grid-connected operation
- SCADA
- Metering and monitoring
- Redundant architectures
- Complete cybersecurity
- Engineering toolsets
- HIL testing

## Secure Solutions

With extensive operational technology (OT) and cybersecurity expertise, the SEL Secure Solutions team builds effective solutions that improve cyber defense and streamline ongoing management. Additionally, the SEL Security Operations Center (SOC) provides continuous support for system analytics, reporting, incident response, and forensics.

### KEY OFFERINGS:

- Assessment services, including development of compliance, risk, and remediation plans
- Centralized user access controls
- Password management
- Secure remote access
- Networking for substation LAN/WAN
- Centralized update management, including firmware, patches, antivirus signatures, and the Microsoft Windows Server Update Service
- Baseline monitoring
- Security information and event management (SIEM) systems for event logging and alerting
- SEL SOC for system analytics and monitoring
- Incident response and forensics
- System recovery

We offer five versions of POWERMAX, as shown in the table.

	POWERMAX for Mobile Microgrids	POWERMAX for Garrison Microgrids	POWERMAX for Commercial Microgrids	POWERMAX for Industrial Power Management	POWERMAX for Utilities
<b>Focus</b>	Efficiency, resilience	Resilience	Uptime, economics	Uptime	Stability
<b>Primary Benefits</b>	Parallel capability; no single point of failure; interoperability; simplicity (plug and play); cybersecurity with software-defined networking (SDN)	Seamless islanding; cybersecurity with SDN; no single point of failure; diesel generator integration; incrementally scalable	Seamless islanding; HIL testing; cybersecurity with SDN; incrementally scalable	Seamless islanding; HIL testing; selectivity (minimize process impact); cybersecurity with SDN	Speed (larger stability margins); HIL testing; selectivity (least impact); cybersecurity with SDN
<b>Example Applications</b>	Military forward operating bases (FOBs), disaster relief agencies, mobile operations	Military bases	Universities, communities	Heavy industries	Utilities
<b>Power Consumption</b>	<0.5 MW	<10 MW	>10 MW	>100 MW	>1,000 MW

## **System Modeling and Studies—HIL Testing Makes a Difference**

SEL provides HIL testing services for protection and control systems. We maintain a large model power system laboratory in Pullman, Washington. This facility contains a large number of Real Time Digital Simulator (RTDS) racks used exclusively for HIL testing of SEL protection and control systems under realistic conditions.

SEL provides custom modeling, analysis, and reports. Using simple tools, like those from SKM and ETAP, we also provide engineering studies, including relay coordination studies, relay settings reports, stability margin reports, and more.

### **KEY OFFERINGS:**

- HIL testing of protection and control systems
- Customer-attended factory acceptance testing
- Planning and feasibility studies
- Customized first-principle models, as required
- Event analysis
- Protection coordination and settings studies
- Stability analysis
- Power quality and harmonic analysis
- Motor-starting studies
- Equipment-sizing reports



SEL Engineering Services  
+1.509.332.1890 | [esinfo@selinc.com](mailto:esinfo@selinc.com) | [selinc.com](http://selinc.com)