POWER SYSTEM PROTECTION
Electrical Engineering Services

BENEFITS

Protecting Critical Assets

Whether working in an industrial facility or a power plant, many of today’s challenges regarding power system protection are the same. Organizations are trying to mitigate rising costs and adapt to shrinking budgets in the face of changing regulatory requirements and aging infrastructures. Often the solution becomes deferring maintenance, which decreases reliability and puts the company’s and the country’s electrical infrastructure at risk.

Rely on the experts at Vertiv™ to provide the best possible tools and technical expertise available to manage the increasing complexities of operating and maintaining your critical power system. From protection scheme engineering and design, to testing, maintenance and life-extension services, Vertiv’s Electrical Reliability Services has a solution to fit your needs.

Benefits

- Improve power system protection and reliability
- Ensure regulatory compliance
- Mitigate arc flash hazards and enhance worker safety
- Optimize system performance and efficiency

Safeguarding your electrical power system starts with the development of a protection scheme that will keep your infrastructure stable. This scheme needs to ensure isolation of components under fault conditions while leaving as much of your network in operation as possible. Protective relays, current and potential transformers, circuit breakers, batteries, and communication channels are all key components in any protection scheme. Keeping up with the rapid advances in technology, and the increasing demand for improved power system control and reliability can be difficult. Finding and retaining the technical resources that understand the technology and philosophies utilized in power system protection schemes can also be difficult.

The experts at Vertiv’s Electrical Reliability Services understand your challenges. Our customized solutions address your needs throughout a facility’s lifecycle. Whether you need commissioning and startup during the deployment stage; require testing and maintenance during operation; or are executing upgrades or retrofits for optimization, we have the experience needed to solve even your toughest protection problems.

Our power system protection services include:

- Engineering
- Commissioning and startup
- Maintenance and testing
- Compliance audit
- Life extension
- Comprehensive reports
Relay upgrades are available in small packaging for panel or rack mount, and can include LCD displays and communication ports with real-time metering and system monitoring from remote locations. Relay upgrades deliver immediate benefits in the form of improved protection flexibility, more independent function availability, and reduced maintenance and calibration costs.

**Engineering Services**

Our highly trained power engineers use advanced technology to create a comprehensive computer model of your system. This model is analyzed to deliver the information and recommendations you need to make informed decisions. This approach is essential for ensuring an efficient, integrated system that meets the growing and changing demands of your business. Our comprehensive engineering services include:

**Power System Studies**

By analyzing the operation of your power system during normal and fault situations, our engineers help you optimize the design, function, and operation of your protection system. Our power system studies include short circuit calculations, load flow, power factor correction, motor starting, power quality, harmonics and selectivity/coordination of relays and other protective devices.

**Protective Scheme Design Review**

Partnering with our technical staff to conduct a protective scheme design review and operational assessment helps you reduce potential arc flash hazards. Results from the study uncover potential hazards so options can be evaluated, and improvement or mitigation strategies can be employed.

**Short Circuit & Coordination Studies**

These studies determine the magnitude of currents flowing throughout your power system at various time intervals after a fault occurs, and evaluate the size and settings of a system’s protective devices to ensure minimum service interruption under overload and short-circuit conditions.

**Single-Line & Three-Line Diagrams**

Vertiv conducts a comprehensive site survey to update existing diagrams or develop new ones as required. These diagrams are essential for all future testing, service and maintenance activities, and need to change as your infrastructure changes to ensure your systems are adequately protected.

**Arc Flash Analysis & Labeling**

Arc flash studies provide recommendations for personal protective equipment (PPE); boundaries for limited, restricted and prohibited approaches; and recommendations for flash protection and safe work practices. Once our technical staff has completed an arc flash analysis, the appropriate hazard warning labels will be provided.

**Logic Programming & Settings**

Not all equipment manufacturers or engineering firms include the development of protective relay logic settings in their projects. The importance of accurate logic settings that are customized to your system is critical. Correct logic settings affect the speed, selectivity, and reliability of your protective relays. They ensure that your equipment does what it is intended to do and that it performs at its optimum capability.

Our protection engineers will evaluate your system and design settings to ensure the required protection for your operation. They also help leverage underutilized features including arc flash mitigation, lockout settings, event recording capabilities, and motor/generator protection features.
**Commissioning & Startup Services**

Like all other mission-critical systems, the power protection system (including relays) should be commissioned to confirm operational reliability. The process of commissioning is a documented quality assurance program that finds and resolves potential protection system problems before the system is started. The result is verification that the entire operational system as defined in the National Fire Protection Association’s National Electrical Code (NFPA 70) and the North American Electric Reliability Corporation’s Protection System Maintenance standard (NERC PRC-005-2) performs according to the design intent and the owner’s needs.

These tests are designed to prove that a particular protection scheme has been installed correctly prior to startup. All aspects of the scheme are thoroughly checked, from installation of the correct equipment through wiring checks and operation checks of the individual items of equipment. Testing of the complete scheme including end-to-end testing is then performed. This testing also includes system functional checks such as current injection, transfer trip, automatic transfer switch (ATS), uninterruptible power supply (UPS), and generator testing. Properly done, commissioning a project can help you avoid a range of problems which can lead to major equipment damage, disruption to service, and potential hazards to personnel.

**Maintenance & Testing Services**

Periodic testing is necessary to ensure that your protection scheme continues to provide satisfactory performance for many years after installation and is a requirement of NFPA 70E and NERC. All equipment is subject to gradual degradation over time, and because a protection scheme only operates under fault or other abnormal conditions, defects may not be revealed until such an event occurs. With proper maintenance and regular testing you can identify and correct problems that would otherwise go undetected. You are better able to avoid potential equipment damage or downtime, and ensure the safety of your personnel.

Only qualified and experienced personnel should perform maintenance and testing on your critical protection system. If maintenance is not done properly, problems may be introduced as a direct result of the remedial work. Our power system engineers and testing technicians have been performing testing and maintenance on all makes and models of protection components, as well as all types including generation, transmission, and distribution protection systems. We ensure the highest levels of efficiency and flexibility in testing by using state-of-the art test equipment from Manta, Doble, Megger, OMICRON and AVO; and software tools such as Enoserv RTS, Doble ProTest and PowerDB. Our power system engineers possess a thorough knowledge and understanding of electric power systems and have the vast field experience required to properly maintain today’s complex and multi-functional relays within your protection system.

Our power system protection maintenance and testing services include:
- Inspection, cleaning and calibration
- Maintenance and performance testing (including current injection testing)
- Grounding, ground grid, and soil resistivity testing
- Troubleshooting and fault analysis

**Compliance Audit Services**

Staying abreast of the changes in regulatory requirements and understanding how those changes impact your business may require assistance from an external resource. The experts at Vertiv's Electrical Reliability Services have extensive experience in the power industry, working with both industrial and utility clients. Field engineers undergo rigorous training that incorporates the latest in regulatory guidelines from NERC, NFPA and more. With a compliance audit, we help you avoid the fines, penalties, and dangers of non-compliance. Using information from an audit ensures your system is optimized while meeting applicable regulatory requirements.

**Life-Extension Services**

When your aging infrastructure has obsolete equipment that needs to be replaced but you cannot take on massive capital expenditures, we can help with upgraded and retrofitted equipment. This equipment is often available at a savings of up to two-thirds the cost of new replacements. Life-extension services are ideal for circuit breakers and relays. They deliver enhanced digital communication and safety capabilities available with today’s latest protection devices and component upgrades. Our life-extension services include the following:
**POWER SYSTEM PROTECTION**

**Relay Upgrades & Replacements**
By working with our team to upgrade outdated protective systems from electromechanical to digital processing, you’ll achieve better system protection flexibility, more independent function availability, real-time metering and system monitoring, and reduced maintenance and calibration costs.

**Circuit Breaker Retrofits**
Upgrade your low-voltage circuit breakers with new technology for improved protection, monitoring, and energy management capabilities. For medium-voltage circuit breakers, upgrade to vacuum and SF6 technology for improved interrupting, momentary, and continuous current ratings. These upgrades effectively extend the life of the equipment while improving performance and safety.

**Direct Replacement Breakers**
Extending the life of breakers means replacing old technology with new, fully engineered and tested direct replacement breakers. These replacements are designed to fit into the existing switchgear cell requiring little to no modification. They will interface with the existing switchgear structure and maintain safety interlocks inherent in the original design.

**Comprehensive Reports**
With all power system protection services, you’ll receive detailed reports with infrastructure data and clear recommendations for improving safety and reliability. Included with each report are the physical test data sheets, which include information on each asset’s location, defined maintenance period, test dates and results. These reports help with compliance as they meet the NFPA 70E and NERC requirements for documentation.

**Summary**
Managing the complexities of your power system protection and ensuring safe, reliable operation can be a difficult challenge that requires multi-discipline expertise. In addition to designing the scheme; installing the infrastructure assets specific to your needs; properly programming protective devices; and executing ongoing system testing and maintenance; you must also comply with multiple, changing industry standards and regulatory requirements. It’s not always easy or even efficient to do it all yourself. However, you don’t have to do it alone. Trust Vertiv’s Electrical Reliability Services, an experienced partner with comprehensive resources to help you with your power system protection challenges. Our team has the specialized skills you need for all phases of your infrastructure’s lifecycle: design, deployment, and operation or optimization. With exceptional employees, and advanced tools and technology, you can trust us to deliver the most complete power protection solutions.

**Ordering Information**
To learn more about this service and other Vertiv solutions, please contact your local sales representative office for Vertiv’s Electrical Reliability Services or visit VertivCo.com. In the United States, call 1-877-468-6384.

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