



## Optimized Power Performance Requires AC and DC Power System Reliability

Electrical power is the force that drives your business. It ensures the continuous flow of operations, production processes, and service delivery. The reliability of that power is dependent on the health and maintenance of both the AC and DC supply systems of your power chain. From the transformers, switchgear, relays, circuit breakers, and motor controls to the batteries, chargers, and uninterruptible power supply (UPS) your systems depend on the optimal performance of each piece of equipment. In the event of a power failure, it is the coordination between these two systems that maintains critical loads where needed.

### DC Power Performance Ensures Operational Dependability

The DC power system's UPS and batteries are your last line of defense. They are the most critical and vulnerable set of components in the power distribution chain. Yet, the DC power system often receives secondary consideration when it comes to regular maintenance and upgrades. As DC power has become increasingly important to operations, regulating bodies including the North American Electric Reliability Corporation (NERC), Institute of Electrical and Electronics Engineers (IEEE), National Fire Protection Association (NFPA), and Occupational Safety and Health Administration (OSHA) have increased their specifications for installation and maintenance. This, along with the advancement of technology, is making it increasingly difficult to manage DC power systems of varying sizes and configurations across facilities.

### Invest in DC Power Expertise for Improved Availability

Studies show that the DC power system is a leading cause of unplanned downtime and that the high rate of UPS battery failure is responsible for load loss 50 percent of the time. For operations that require emergency power and uninterrupted power, load drops, or even current fluctuations, can have serious consequences, such as production disruption, chemical instability, critical service interruption, damage to processing equipment, or in some cases, the complete shutdown of a facility. Even a single misoperation can cost millions of dollars in lost productivity, infrastructure damage, and regulatory fines.

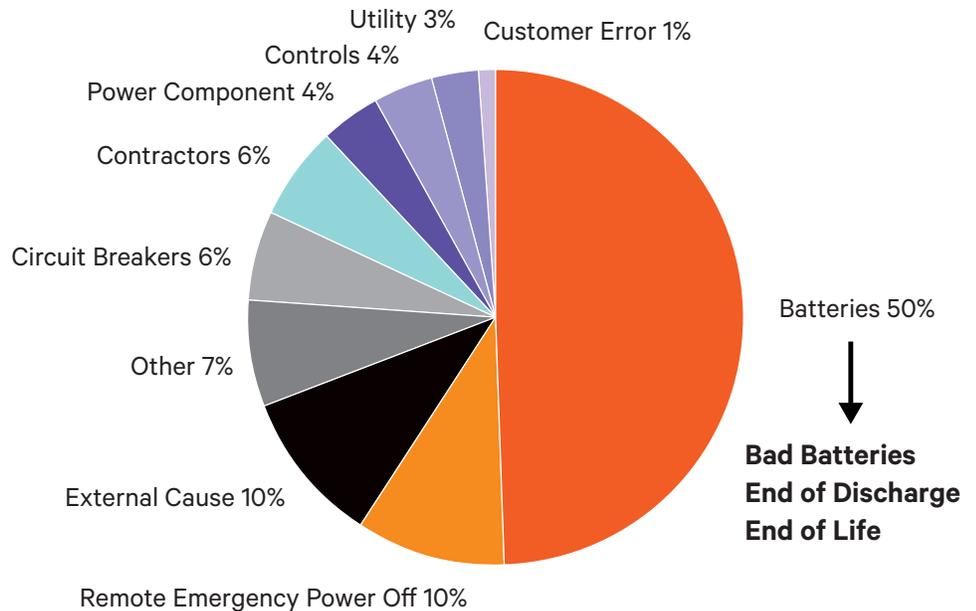
The odds are high that your business will experience a power failure and unplanned downtime this year. Among U.S. industrial

businesses, the average cost per hour of downtime ranges from \$30,000 to \$250,000. With annual downtime averaging 15 hours per company, DC power maintenance is a wise investment.

With so much at stake, it's important to protect your power by performing routine maintenance and upgrades to your DC power system. Facilities that add a DC power preventive maintenance program to their power chain management plan have the highest assurance of operational reliability. A routine maintenance plan will maximize performance and increase the mean time between failures, while maintaining a safe work environment for personnel. Equally important is choosing the right partner with the knowledge and expertise to perform maintenance and upgrades and get the longest service life out of your DC power system.

## DC power systems are a leading cause of unplanned downtime.

Graph: Causes of UPS system failures.



## Services and Expertise

High Voltage Maintenance (HVM) drives innovation, best practices, and industry-leading solutions through our specialized Centers of Excellence. These Centers of Excellence bring together dedicated experts, proven processes, and investment in the right technologies to deliver smart, powerful solutions that drive world-class satisfaction.

Our Centers of Excellence are comprised of cross-functional teams who work together to meet your specific power challenges in all stages of your facility's life cycle.

### DC Power Services Are Critical to Total Power System Management

Our DC power specialists are uniquely qualified to support your operation's standby, emergency, and uninterrupted power needs. They have the technical training and field experience that is needed to ensure the maximum reliability of your DC power battery systems. This highly qualified team is comprised of battery specialists and technicians certified by the InterNational Electrical Testing Association (NETA). They have the experience and knowledge to coordinate a comprehensive DC power system maintenance program with your total power maintenance plan.

As a NETA accredited company, HVM provides unbiased testing services that ensure your compliance with regulatory requirements from IEEE, NERC, and NETA. We lead the industry in designing battery maintenance plans that meet or exceed these requirements, including the first-ever required testing protocol on batteries and battery chargers for utilities, in compliance with the NERC PRC-005 standard.



### Rely on Dependable, Quality Service from a Dedicated Team of Experts

As your DC power system management partner, HVM is committed to providing the most experienced technicians and highest quality service possible. We believe that being an effective partner means understanding your toughest challenges and determining the best ways to address them through a focused approach. For each customer, we assign a dedicated team, outfitted with the latest test equipment and proprietary data collection system, to safely and accurately deliver customized services based on your facility's needs.

With access to proprietary product information and industry trends, our DC specialists can better anticipate product issues and address them before they become problems. They are up to date on the newest technologies and understand when and how to integrate them when it is time for system upgrades and modernization.

## Maximize Operational Goals by Utilizing a Comprehensive Portfolio of DC Power Services

*Ensuring business continuity, operational efficiency, and improved safety starts with design engineering and installation — selecting the right DC power system configuration and choosing the right batteries to support the needs of your facility. This is followed by customized routine preventive maintenance with ongoing replacement and upgrade services, creating a strong life cycle management program.*

HVM offers a broad set of DC power design engineering, installation, maintenance, and replacement services and will partner with you in managing your power chain. We offer a high level of availability and scheduling flexibility to readily meet your timelines and emergency needs.

### Design Engineering and Installation

Designing the right DC power system and choosing the right battery equipment are critical to providing optimal support for your facility. Engaging our design engineers when you are considering expanding your DC power system will ensure you have the right configuration to maximize system reliability. We will leverage our strong relationships with battery manufacturers and draw on our expertise with multiple brands to install and commission the best system for your facility's budget, space, and growing power needs.

Our design engineering and installation services include:

- System planning and design
- System evaluation
- Application engineering
- Battery installation
- Acceptance testing
- Startup and commissioning
- Removal and recycling

### Preventive Maintenance Services

To develop the right maintenance strategy for your DC power system, our DC power specialists consider environmental conditions, operating frequency, and the criticality of the equipment and operations your system supports. We offer a variety of maintenance plans to ensure compliance with industry standards.

Our services include:

- Regular inspections
- Battery and charger maintenance
- Capacity testing
- Mobile DC power services
- Battery monitoring
- Equipment rental

### Replacement and Upgrade Services

Adopt a proactive battery replacement plan. Based on our experience and extensive industry data, we know that the actual life of your batteries is almost always shorter than the design life. Our replacement and upgrade services are centered around assessing the health of your components and replacing batteries before they fail, ensuring your system will always deliver.

Our technicians have the knowledge and the tools to evaluate where your system is in its life cycle. Our engineers will work with you to establish proactive upgrade and modernization timelines for better management and budget planning.

Our replacement and upgrade services include:

- Application engineering and evaluation
- End-to-end battery replacement
- Cell change-outs
- Battery installation
- Startup and commissioning
- Removal and recycling

## Mobile DC Power Services Unit

When facilities can't afford to compromise critical power, a mobile power solution that is safe and secure is ideal for performing DC system maintenance and capacity testing. With our Mobile DC Power Services Unit, our DC power specialists can confidently perform all required battery inspections, tests, and replacement services without risk of power dips or load drops.

Our mobile unit includes the following equipment:

- State-of-the-art power and ancillary safety equipment
- DC battery strings and a universal charger
- Albér® test set, load bank, sensor lead cables and monitor
- Power transfer cable system
- AC and DC circuit protection
- Voltage selectors support multiple power requirement ranges
- Diesel generator



## Battery Monitoring

Using the Albér monitoring system and qualified battery monitoring specialists to assess your battery strings around the clock, increases mean time between failures by more than double compared to preventive maintenance alone.

Our 24/7 remote monitoring services help you detect and diagnose problems that may otherwise go undetected, such as leaking water, failing batteries, and more. Our services also include emergency service for rapid incident response, as well as monthly trending and reporting for better battery management.





## Why HVM?

As your DC power services partner, we are committed to delivering unmatched expertise, the highest level of safety, regulatory compliance, and quality service.

### Technical Experience

- DC power specialists
- NETA-certified technicians
- NETA accredited company
- Testing compliance with IEEE, NERC, and NETA
- Multiple brand knowledge and experience
- Access to proprietary industry data on all brands and operating trends
- Unbiased, third-party testing

### Unmatched Safety and Compliance

- Excellent company track record of low OSHA Incident Ratings
- Adherence to safety regulations, OSHA, NFPA, and Environmental Health and Safety (EHS)
- NFPA 70E technical training
- Certifications in cardiopulmonary resuscitation (CPR), automated external defibrillator (AED) and first aid

- Documented safety programs for each project
- Semi-annual safety audit program

### Quality Service Delivery

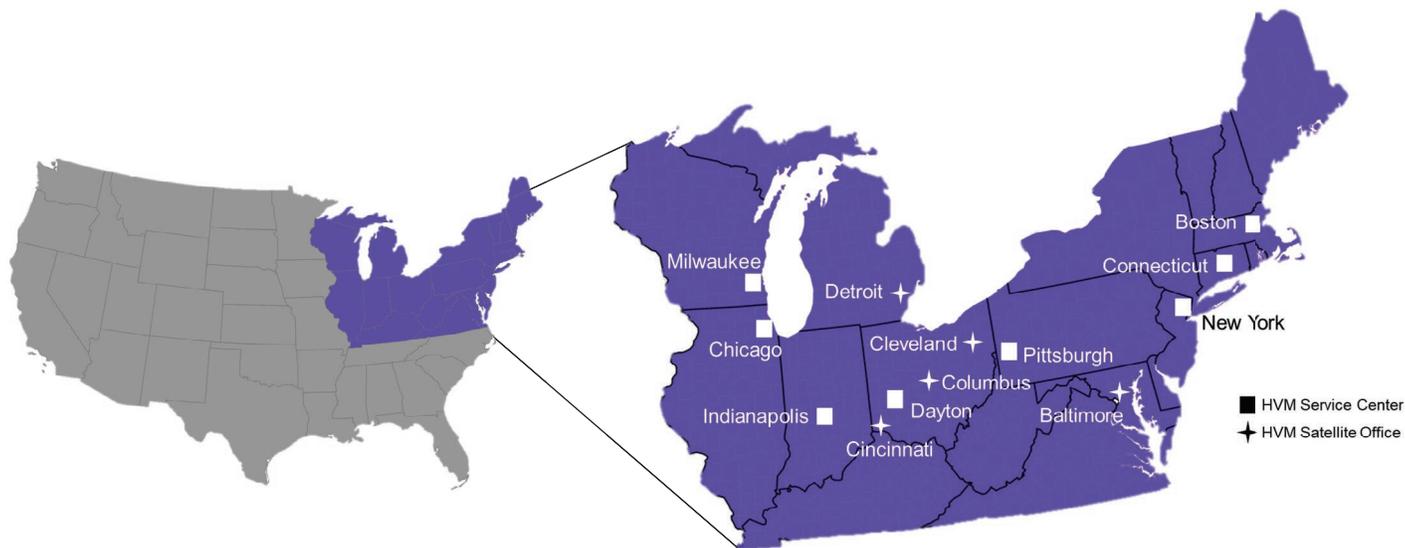
- AC and DC total system knowledge and experience
- Dedicated team of DC power technicians assigned to every customer
- Preventive and proactive maintenance services
- Proactive replacement and upgrade planning and installation
- Excellent track record in meeting timelines
- Regular communication and scheduling updates throughout the project
- Standardized analytical reporting, supported through PowerDB systems
- Acceptance and maintenance test data management software system

## Expertise You Can Trust

### Active Memberships

HVM actively participates in numerous national organizations to assist in the development of standards important to our industry. With more than 50 years of experience in electrical testing, maintenance, and engineering, we are a trusted partner in promoting safety and reliability management. Below are some of the organizations in which our managers, specialists, field technicians, and engineers are involved:





## Directory of Locations

Rely on High Voltage Maintenance's team to deliver the most complete solutions for electrical system reliability and safety. From testing for problems that could disable your system, to complete turnaround execution, you'll quickly understand how we are your single source solution for all your electrical reliability needs. With a network of 13 locations, High Voltage Maintenance's electrical service team puts experienced professionals where you need them, when you need them.

### Connecticut

Connecticut Area Service Center  
29 Diana Court  
Cheshire, CT 06410  
PH: (203) 949-2650

### Illinois

Chicago Area Service Center  
941 Busse Road  
Elk Grove, IL 60007  
PH: (847) 640-0005  
FAX: (847) 640-0004

### Indiana

Indianapolis Area Service Center  
1052 S.Greenwood Springs Blvd.  
Suite E  
Greenwood, IN 46143  
PH: (317) 322-2055  
FAX: (317) 322-2056

### Maryland

Baltimore Area Satellite Office  
PH: (410) 309-5970  
FAX: (410) 309-0220

### Massachusetts

Boston Area Service Center  
24 Walpole Park South, Suite 3  
Walpole, MA 02081  
PH: (508) 668-9205  
FAX: (508) 668-2142

### Michigan

Detroit Area Satellite Office  
PH: (248) 305-5596

### New York

New York Area Service Center  
1 Penn Plaza, Suite 1500  
New York, NY 10119  
PH: (718) 239-0359

### Ohio

Cincinnati/Kentucky Satellite Office  
PH: (859) 371-5355  
FAX: (859) 371-5399

Columbus Area Satellite Office  
PH: (614) 807-3408

Cleveland Area Satellite Office  
PH: (440) 951-2706

Dayton Area Service Center  
5100 Energy Drive  
Dayton, OH 45414  
PH: (937) 278-0811  
FAX: (937) 278-7791

### Pennsylvania

Pittsburgh Area Service Center  
355 Vista Park Drive  
Pittsburgh, PA 15205  
PH: (412) 747-0550  
FAX: (412) 747-0554

### Wisconsin

Milwaukee Area Service Center  
3000 S. Calhoun Road  
New Berlin, WI 53151  
PH: (262) 784-3660  
FAX: (262) 784-5124



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