IEEE CREDENTIALING PROGRAM

NERC Compliant Battery Maintenance for Utilities

This course has been developed as an introduction to the long-established IEEE maintenance procedures required to ensure the reliability of any Lead-Acid or Nickel-Cadmium battery. It will specifically cover the specific maintenance practices that will ensure compliance with the NERC maintenance requirements as documented in NERC Standards PRC-005-6 and TPL-001-5.

The subjects covered will include:

Day 1

Introduction to Lead Acid and Nickel Cadmium Batteries

Understanding the basics is the key to success so we will start by learning all about the basic chemistry and construction of both Lead-Acid and Nickel-Cadmium Batteries.

Battery-Backed DC Power Systems

All batteries are in some way part of a DC Power System which will power the critical loads in the event of a utility failure. The possible configurations of a typical DC Power System will be covered, as will all the other components that are required to fully implement such a system.

Battery Failure Mechanisms

Like humanity, all batteries have a finite life due to the aging mechanism that is inherent in the electrochemical reactions that are fundamental to a battery's operation. As with the human body, the individual cells that make up a battery have many potential failure mechanisms that can end the operational life of the battery prematurely. This includes the impact of both environmental and operational reasons, all of which will be covered.

DC Power System Maintenance

If you want to have the most reliable car or truck, you will have it regularly serviced and the same applies to a battery. There are IEEE Recommended Maintenance Practices that cover all types of Lead-Acid and NiCd batteries. All these documents cover the required calendar-based inspections, during which a defined list of parameters is measured and recorded. How to measure these parameters and their importance in determining the health of the battery will be covered.

Discharge Testing

While all the data collected will identify cells or units within the battery that may be failing prematurely and require replacement, the only way to establish a loss of capacity due to aging is to carry out a test discharge of the battery under specified conditions. There are multiple forms of the discharge test to accommodate the specific objective of a test. These will be covered, and the differences explained.

Who are FERC and NERC?

As the dependence on electricity has grown, so too has the importance of maintaining the availability of the service, irrespective of the operational challenges. FERC and NERC are the government bodies responsible for developing and implementing the rules and standards under which the utility companies operate. The reasons for establishing this governing body will be explained, and the standards that control the maintenance requirements for a DC Power System within the bulk electricity supply will be introduced.

Day 2

Introduction to NERC Standards PRC-005-6 and TPL-001-5

These are the two standards that specify the design, maintenance, and operations of the DC Power System within the Bulk Electricity Supply. There are a number of requirements within the standards that identify the required documentation that describes how the maintenance will be carried out and the planned inspection schedule. The importance of this documentation and how it should be implemented will be covered.

PRC-005-6 Compliant Maintenance Table 1-4 (a-e)

Table 1-4, sections (a-e) in the standard specify the frequency of the maintenance visits and the mandatory tests required at each visit. Each one will be covered and the method by which the measurements should be collected will be covered.

PRC-005-6 Compliant Maintenance Table 1-4 (f)

Although the standard specifies that the maintenance is based on calendar-based visits to site, in recognition of the move to the automation of data collection, Table 1-4 (f) defines the parameters that can be collected remotely to minimize the number of site visits required. Each entry in the table will be discussed and the method by which compliance can be achieved will be explained.

Making Sense of the Collected Data

In order to fully benefit from the effort of performing data collection, it is essential that the data is analyzed, and the failing cells or units are identified and changed. Contrary to popular belief, no single measured parameter will establish the battery's ability to operate as required. The ways to use the data to provide a more accurate assessment of a batteries condition will be explained.

Understanding TPL-001-5 Compliance

Unlike PRC-005-6, which is aimed at establishing network reliability by improving maintenance practices, TPL-001-5 is a planning standard that improves network reliability by removing single points of failure by introducing redundancy into the network infrastructure. In the -5 release of the standard, the single charger, single battery-based DC Power System was identified as a single point of failure. Because many of the legacy buildings do not have space to add additional batteries and chargers, there are some monitoring requirements that can be implemented to qualify as meeting the standard. How to implement these monitoring requirements will complete the course.