

CHANGING THE UTILITY WAY OF DOING BUSINESS. AN UPDATE ON THE UPCOMING CHANGES OF NERC PRC-005.

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ABSTRACT

Anyone who has been doing business with the electrical utilities understands that the culture that drives the wheels of change moves very slowly. Changes that come up suddenly may cause some apprehension when it goes against the utilities “*we have always done it that way*” culture. The purpose of this and last years Battcon papers were to introduce some of the changes, and prepare the Bulk Electric Systems (BES) providers, for the new maintenance requirements for the batteries connected to the DC systems of the BES. Both of these papers were written referencing the current drafts of Protection and Control (PRC) – 005-02 that is still in draft form. There may still be some changes once the document is published as it relates to this paper. Since change in the utility culture takes time to develop, this paper should be considered a forerunner of what is coming on the horizon. This paper will be an update of the maintenance requirements as it relates specifically to batteries connected to the BES.

INTRODUCTION

The North American Electric Reliability Corporation (NERC) document PRC-005-2 is a control and protection document that includes the associated relay equipment such as trip coils etc. The battery maintenance requirements that are outlined in this document have been put into this paper for the ease of battery specific information. All of the bulleted items below are taken directly from the current draft of the document and have been written by the drafting team of PRC-005-2, and not the product of this author. I encourage any person who is a part of the BES to get informed, and engaged in the drafting process of these standards prior to the standard being finalized.

NERC’S HISTORY

NERC is an agency that was formed on June 1, 1968 under the name of National Electric Reliability Council in response to a series of blackouts that took place in 1965. At the start of the organization, the standards they produced were only voluntary and their recommendations were taken as such. In 1981 they changed the name to North American Electric Reliability Council because of Canada’s participation in NERC. Then on January 1, 2007 NERC became an electric reliability organization. This was after the Federal Energy Regulatory Commission (FERC), and The National Energy Board of Canada recognized and certified NERC. On June 18, 2007 the NERC Reliability Standards became mandatory and enforceable in the United States¹.

BULK ELECTRIC SYSTEM

NERC’s charter is to protect the Bulk Power System and defines it to be: The part of the overall electricity system that includes the generation of electricity and the transmission of electricity over high-voltage transmission lines to distribution companies. This includes power generation facilities, transmission lines, interconnections between neighboring transmission systems, and associated equipment. It does not include the local distribution of electricity to homes and businesses. NERC has established that any Substation with a primary voltage of 100 kV or greater and generation is considered part of the BES.

COMPLIANCE

Since 2007 NERC has the legal authority to enforce the compliance of all of its reliability standards. The fines issued by NERC can be as large as one million dollars per day and per incident. The amounts of the fines along with incident findings are posted on NERC's website. NERC uses the following eight regional agencies: Florida Reliability Coordination Council (FRCC), Midwest Reliability Organization (MRO), Northeast Power Coordinating Council (NPCC), ReliabilityFirst Corporation (RFC), Southeast Reliability Corporation (SERC), Southwest Power Pool, RE (SPP), Texas Regional Entity (TRE), and the Western Electricity Coordinating Council (WECC). With the help of these agencies, NERC prepares reports and records all disturbances on the BES. They will then investigate these event(s), and publish their findings in an effort to help prevent a reoccurrence. NERC has also instituted standards to help protect the electrical infrastructure from cyber and physical threats, and communicates them to other government agencies.

PROTECTION SYSTEM MAINTENANCE PROGRAM (PSMP)

Every transmission owner, generator owner, and distribution provider that has a facility that falls under the NERC umbrella will need to provide a PSMP to NERC. Part of this plan will include the maintenance requirements that are outlined later in this paper. The PSMP will need to have the details of your maintenance program including all of the activities listed by the different battery technologies. There are two different types of maintenance activities, the first being Time-Based and the second being Performance-Based. NERC has determined that all batteries will fall under Time-Based maintenance so the Performance-Based references have been edited from this paper. NERC has provided specific definitions in its latest draft for the various maintenance activities. There are more definitions in the latest draft than those listed here, but the ones specific to batteries are as follows:

- Verify — Determine that the component is functioning correctly.
- Monitor — Observe the routine in-service operation of the component.
- Inspect — Detect visible signs of component failure, reduced performance and degradation.
- Calibrate — Adjust the operating threshold or measurement accuracy of a measuring element to meet the intended performance requirement.

VENTED LEAD ACID (VLA) BATTERY MAINTENANCE REQUIREMENTS

The maintenance requirements in the upcoming draft can be found on Table 1-4(a). They are as follows:

Every 3 Calendar Months

Verify:

- Station dc supply voltage

Inspect:

- Electrolyte level
- For unintentional ground

Every 18 Calendar Months

Verify:

- State of charge of the battery system
- Float voltage of battery charger
- Battery continuity
- Battery terminal connection resistance
- Battery internal cell-to-cell (where available to measure) or unit-to-unit connection resistance

Inspect:

- Cell Condition of all individual battery cells where cells are visible – or measure battery cell/unit internal ohmic values where the cells are not visible
- Physical condition of battery rack

One of the following two requirements will need to be performed on the battery system. They both have different time intervals; however, only one will need to be included in a PSMP

Every 18 Calendar Months

- Verify that the station battery can perform as designed by evaluating the measured cell/unit internal ohmic values to station battery baseline

-Or-

Every 6 Calendar Years

- Verify that the station battery can perform as designed by conducting a performance, service, or modified performance capacity test of the entire battery bank.

VALVE REGULATED LEAD ACID (VRLA) BATTERY MAINTENANCE REQUIREMENTS

The maintenance requirements in the upcoming draft can be found on Table 1-4(b). They are as follows:

Every 3 Calendar Months

Verify:

- Station dc supply voltage

Inspect:

- For unintentional ground

Every 18 Calendar Months

Verify:

- State of charge of the battery system
- Float voltage of battery charger
- Battery continuity
- Battery terminal connection resistance
- Battery internal cell-to-cell (where available to measure) or unit-to-unit connection resistance

Inspect:

- Cell condition of all individual battery cells where cells are visible – or measure battery cell/unit internal ohmic values where the cells are not visible
- Physical condition of battery rack

One of the following two requirements will need to be performed on the battery system. They both have different time intervals; however only one will need to be included in your PSMP

Every 3 Calendar Months

- Verify that the station battery can perform as designed by evaluating the measured cell/unit internal ohmic values to station battery baseline

-Or-

Every 3 Calendar Years

- Verify that the station battery can perform as designed by conducting a performance, service, or modified performance capacity test of the entire battery bank.

NICKEL-CADMIUM BATTERY MAINTENANCE REQUIREMENTS

The maintenance requirements in the upcoming draft can be found on Table 1-4(c). They are as follows:

Every 3 Calendar Months

Verify:

- Station dc supply voltage

Inspect:

- Electrolyte level
- For unintentional ground

Every 18 Calendar Months

Verify:

- State of charge of the battery system
- Float voltage of battery charger
- Battery continuity
- Battery terminal connection resistance
- Battery internal cell-to-cell (where available to measure) or unit-to-unit connection resistance

Inspect:

- Cell Condition of all individual battery cells where cells are visible – or measure battery cell/unit internal ohmic values where the cells are not visible
- Physical condition of battery rack

Every 6 Calendar Years

- Verify that the station battery can perform as designed by conducting a performance, service, or modified performance capacity test of the entire battery bank.

EXCLUSIONS FOR MONITORING DEVICES AND SYSTEMS

If a monitoring device is connected to a battery system some of the maintenance requirements will not be required. The wording used in the draft is “*No periodic maintenance specified.*” When a monitoring device is connected to your battery system maintenance will need to be performed to the monitor. The maintenance activities for the monitoring system are as follows:

Every 12 Calendar Years

Verify:

- That the monitoring device will produce an alarm if the associated Protection System component is not functioning properly
- Verify that the alarm signals are conveyed to a location where corrective action can be taken

If a monitor is connected to a battery system Table 1-4(f) outlines the following maintenance activities are not required:

- Any station dc supply with voltage monitoring and alarming of the battery charger voltage, no periodic verification is required.
- Any battery based station dc supply with electrolyte level monitoring and alarming in every cell, no periodic verification is required.
- Any station dc supply with unintentional dc ground monitoring and alarming, no periodic verification is required
- Any battery based station dc supply with monitoring and alarming of the state of charge of the battery system, no periodic verification is required.

- Any battery based station dc supply with monitoring and alarming of battery string continuity, no periodic verification is required.
- Any battery based station dc supply with monitoring and alarming of the cell-to-cell and/or terminal connection detail, no periodic verification is required.
- Any lead acid battery based station dc supply with monitoring and alarming of internal Ohmic values of every cell (if available for measurements) of each unit, no periodic verification is required.

DATA RETENTION

Once this standard is published, NERC will be enforcing the maintenance of equipment outlined in the standard. It will be the responsibility of the BES providers to document and provide data proving the maintenance activities were performed at the proper time interval. The standard states *“The Transmission Owner, Generator Owner, and Distribution Provider shall each keep data or evidence to demonstrate compliance as identified... .. unless directed by it’s Compliance Enforcement Authority to retain specific evidence for a longer period of time as part of an investigation.”* The BES providers will need to keep its current dated PSMP and all associated documentation and present it to the Compliance Enforcement Authority. The current draft also states *“The Compliance Enforcement Authority shall keep the last periodic audit report and all requested and submitted subsequent compliance records.”*

SUMMARY

Today’s electrical environment is changing rapidly. Events such as the Northeast black out on August 2003, the threat of cyber terrorism, and the implementation of the Smart Grid have forced utilities to implement change more quickly. NERC is trying to be proactive in these areas by enforcing standards that will keep the BES safe. It is up to the BES providers to participate in developing these standards, and use the many years of experience in maintaining the equipment, to make a good working standard. With a cooperative environment, the NERC standard PRC-005 can be a good tool for a comprehensive maintenance program, and will improve the reliability of the BES. The providers to the BES need to be familiar with the current draft and prepare themselves to be compliant. It will be up to all of the BES to be proactive in the next round of editing of the document to create the changes necessary to make this document more technically sound. This is a starting point and the draft of this document is being prepared to be published, so I encourage everyone to get involved!

REFERENCE

¹ Web. <<http://www.nerc.com/page.php?cid=3|249>>.