

Dear Mr. Cantor:

The NERC Protection System Maintenance and Testing Standard Drafting Team (PSMTSDT) for NERC Project 2007-17 (PRC-005-2) appreciates your remarks and the comments of the IEEE Stationary Battery Committee Task Force regarding its review of the battery maintenance activities described in the latest versions of PRC-005-2 and its supporting Supplementary Reference and FAQ document.

Your comments and those of the IEEE Task Force reflect the valid concerns of industry experts relative to language in the Supplementary Reference and FAQ document that, in their opinion, seems to imply that periodically reviewing and trending the results of inter cell/unit ohmic tests is equivalent to periodic performance of capacity tests. Based on this valuable feedback, the PSMTDT has modified the Supplementary Reference document to eliminate this misconception by stating that capacity testing is the only industry approved method of determining the true capacity of lead acid and nickel–cadmium station batteries. In the revised language, the Supplementary Reference further expresses that, while it has been stated in the EPRI reports (EPRI TR-108826 and 1002925) cited by the IEEE task force’s report that there is a definite relationship between internal ohmic measurements and cell capacity of lead acid batteries, the PSMTSDT believes that an accurate determination of a battery’s exact capacity cannot be attained by measuring its cell’s internal ohmic values alone.

However, the PSMTSDT feels that both Maintenance Activities listed in tables 1-4(a) and 1-4(b) for lead acid batteries are appropriate for verifying “that the station battery can perform as designed.” The PSMTSDT defines this as the process of determining when the station battery must be replaced or when an individual cell or battery unit must be removed or replaced.

In the mid 1990’s, several large and small utilities began developing maintenance and testing programs for Protection System station batteries using a condition based maintenance approach of trending internal ohmic measurements to each station battery cell’s baseline value. Battery owners use the data collected from this maintenance activity to determine (1) when a station battery requires a capacity test (instead of performing a capacity test on a predetermined, prescribed interval), (2) when an individual cell or battery unit should be replaced, or (3) based on the analysis of the trended data, if the station battery should be replaced without performing a capacity test.

As noted by a major manufacturer of lead acid batteries that conducted aging tests on various, similar battery products, some of the trending of ohmic readings from testing conducted on some manufacturers batteries “clearly would have resulted in the rejection/replacement of cells well before the end of their useful life...” This battery manufacturer sums up the methodology most experienced users of periodic trending of ohmic measurements apply when determining that the station battery can perform as designed by saying, “users and manufacturers need to use judgment and experience to analyze the data, and then supplement the data with additional measurements – including capacity testing – when deciding whether to replace product in the field.”

Since 2006, when NERC standard PRC-005-1 was adopted by the NERC Board of Trustees, those large and small utilities who put into practice the ohmic measurement condition based maintenance and testing programs for Protection System station batteries, have become NERC-registered Transmission Owners,

Generation Owners and Distribution Providers subject to the requirements of PRC-005-1. This mandatory and enforceable standard requires those owners to have “a Protection System maintenance and testing program” that “shall include maintenance and testing intervals and their basis” along with “a summary of their maintenance and testing procedures.” Through the successful performance of ohmic trending that began in the mid 1990’s and over 6 years of applying this method in their maintenance programs required by PRC-005-1, the PSMSDT believes Protection System equipment owners have, effectively, established an acceptable maintenance practice (supported by EPRI technical references) and maximum maintenance interval, for verifying that a station battery can perform as designed.

Historically, Transmission Owners, Generator Owners, and Distribution Providers have not considered the insignificant power requirements of their Protection Systems (several hundred amperes for duration of less than 0.5 seconds and for not more than 10 amperes of continuous protective relay load when the station battery charger is out of service) when sizing batteries used for station dc supply. Instead, these entities have sized their station batteries for other significantly larger dc loads and duty cycles such as those for inverters, heaters, telecommunication equipment, emergency lighting, load profile of emergency bearing oil and seal oil pumps etc. Considering this factor, it would take a loss of battery capacity of well below 50% (which can be easily detected by ohmic trending) for a battery emergency to significantly affect the functioning of Protection System equipment powered from the station battery.

If the primary purpose of the station battery is to provide the instantaneous stored energy of several hundred amperes for extremely short durations (close to the short circuit duration for a station battery) and provide the minimal protective relay power supply load of not greater than 10 amperes whenever the dc station charger is out of service (which is the case for many Transmission Owners), then the minimum activity of evaluating the measured cell/unit internal ohmic values to station battery baseline to verify that the station battery can perform as designed will achieve the reliability purpose of PRC-005-2 and satisfy the risk-management requirements of the Protection System owner.

In contrast to the Transmission Owner battery design function, a Generator Owner's battery likely feeds other critical loads such as DC powered oil pumps, seal oil pumps, and other DC control power loads necessary to safely shutdown a power plant following a loss of AC power. In the case of nuclear plants, these DC loads could include motor operated valves and other loads related to nuclear safety. For the Generator Owner, the design load profile for the battery is a long duration, deep discharge of the battery. While a cell ohmic value trending program might be adequate to prove that the Generator Owners battery could fulfill its Protection System function, the Generator Owner might want to validate the deep discharge capability of the battery by routine periodic capacity testing to prove the battery's adequacy at providing power to those long duration loads critical for plant shutdown. The PSMTSDT believes that this deep discharge battery capacity test approach will prove the battery can meet its function relative to the plant Protection System without also having a trending program for cell ohmic values.

It is the intent of the PSMTSDT to provide Transmission Owners, Generator Owners, and Distribution Providers flexibility to employ testing methods already utilized in their program, and as appropriate for their facility type, in order to prove their battery's "ability to function as designed." The PSMTSDT agrees with the task force suggestion that entities should implement this flexibility with due consideration of the economic or risk-management decisions associated with choosing which minimum maintenance activity

is appropriate for battery systems at their facilities. However, the PSMTSDT also believes entities can achieve the reliability purpose of PRC-005-2 (“to document and implement programs for the maintenance of all Protection Systems affecting the reliability of the BES so that these Protection Systems are kept in working order.”) and thereby enhance the reliability of the BES, by using an ohmic value trending program, as described in Tables 1-4(a) and 1-4(b) of the standard, to provide an adequate indicator of battery health.

Again, the PSMTSDT is grateful to the IEEE Stationary Battery Committee’s task force for its review of the draft of the NERC standard PRC-005-2 and the accompanying draft Supplementary Reference and FAQ document. The insights of the task force’s experts have assisted the Drafting Team in revising statements in the Supplementary Reference. Furthermore, please accept the team’s apology for our oversight of leaving the IEEE Stationary Battery Committee off the list of references in our supplemental document. Our goal is to have the proper references attributed within the document that will go to the NERC Board of Trustees for approval.

Please bear in mind that PSMTSDT meetings, as all NERC Drafting Team meetings, are posted on the NERC web site and are always open to guests and observers. The PSMTSDT solicits the active participation of its guests in its meetings. In fact, significant contributions to the development of PRC-005-2 have been made by those who have attended the Drafting Team meetings as guests and observers. In that regard, should you or someone from your membership be interested in coming to any of the PSMTSDT meetings, we would welcome your attendance and participation.

Sincerely

Al McMeekin and Charles Rogers