

A Response to “A Utility Perspective of Substation Battery Maintenance and NERC PRC –5”

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Recently, a paper was published on www.powerqualityadvisors.com website titled “A Utility Perspective of Substation Battery Maintenance and NERC PRC-5,” by Paul Grogan. Mr. Grogan provides us with an interesting perspective, but some corrections are in order to clarify certain statements made in the paper.

In the Abstract the statement “This included non-valued activities such as specific gravity measurements and periodic discharge testing which is costly or degraded the equipment’s performance”; this is a mixture of partially valid combined with erroneously leading declarations. While specific gravity measurements are of little to no value for lead-calcium batteries; they are of value for Lead-anatomy and low anatomy/selenium batteries. Periodic discharge/ performance tests (as recommended by IEEE450 present and past revisions) have in no way degraded the capacity or performance of healthy cells. Performance/discharge testing is at present the only way to determine capacity of a battery.

Although, in 1972 IEEE 450, initially started by a small group with members from battery manufactures, regulatory agency and nuclear power generating stations, to address an absence of guidance in the industry. It has been well over a decade since the ‘Nuclear’ emphasizes has been removed and its recommendation and practices were expanded to include all industries and applications. IEEE450, in its current revision represents the consensus of multiple user industries, manufactures, academia and regulatory agencies best maintenance practices and recommendation available and verified available to lead-acid battery users.

In IEEE 450 includes different triggers for corrective maintenance, many of which rely on the trending of cell and system parameters that effect cell life and performance (condition base); this being the basis for corrective maintenance. All measurements of these parameters must be made in a consistent and precise manner and the data corrected to standard temperature for comparison and analysis.

In addressing the ‘Historical use of specific gravity... as a primary tool for state of charge’ again we have a mixture of half truths and misleading statements. Specific gravity is still an accurate and appropriate measure of state of charge for lead-antimony cells. It is correct to state, that for lead-calcium cells specific gravity is an imprecise and meaningless measurement for state of charge determination. Since the mid 1990’s IEEE450 has diminished and removed the use of specific gravity’s use as state of charge indicator for lead- calcium cells, it has been kept at the annual/detail inspection, due to manufacture’s requirement for warranty claims.

While lead-calcium batteries are design for true float service in stationary application and therefore, are not intended to be repeatedly cycled throughout its life. It is incorrect to state that exceeding two (2) ‘deep discharge’ per year will degrade and adversely affect the life of the battery. Most lead-calcium designs will tolerate several deep discharges per year without affecting its design life. Nowhere in IEEE450 do we suggest testing performance testing at a frequency that will degrade any battery.

A battery's capacity is a comparison of its actual performance against the manufacture's rating adjusted for temperature for a specific rate and duration. The duration and rate of the test varies and should be as close to the actual/design use for the installed battery as practical.

Also, in IEEE450, states that the battery must have been sized per 485, in order for (requirements and statements) in IEEE450 section 6.2 Performance section to apply. Many installations are not sized per 485 or may not have documentation to determine the methodology and reason for their present size, thus the recommendation may have to be modified accordingly.

The correlations identified by EPRI's report 1002925 was/is not, a one to one linear relationship. No capacity determination can be or could be assigned or associated with any particular ohmic value. This correlation is to large degree dependent on the particular instrument used and the values taken on one instrument cannot and should not be intermixed, compared with or against measured values taken on a different manufactures' instrument for the same battery or identical cells in another battery. Additionally, any comparison of data taken with different version, model or revision of the same instrument; may not correlate or be possible.

It did identify a general correlation for smaller vented lead acid cells and is better behaved, more consistent correlation for VRLAs, but still no way to determine capacity. EPRI's report 1002925 suggested ohmic measurement to be used as tool to determine when to perform a capacity test on a particular battery.

The EPRI report cited does not provide a basis to eliminate so called 'non value activities' especially in the case for specific gravity since specific gravity measurement, when appropriate, are used for state of change determination and ohmic measurements cannot be used for this.

EPRI's report 1002925 does suggest that ohmic measurements, for small vented and VRLA cells can be used as an additional tool to determine when a performance (capacity) test should be performed. Although, predicting rate of degradation may become difficult. Additionally, under certain conditions a basis for the replacement of cells/batteries (especially VRLA's) using ohmic measurements could be developed. This methodology does not provide for a determination of the capacities of the cells being replaced.

Only for small Amp-HR and VRLAs cells/batteries should a model (case) be developed for replacing them, based on ohmic measurements. This use must be coupled with baseline data that includes performance testing at installation/commissioning and consistent and periodic measurements of the same parameters taken during the initial installation/commissioning (baseline) excluding performance test. All this data must be adjusted for temperature trended and analyzed, to allow for a valid evaluated, prediction/determination of replacement.

In summary:

Ohmic measurements are one essential component to proper and effective battery maintenance and testing program.

Capacity values cannot be determined from ohmic measurements and are not a replacement for capacity testing.

Ohmic measurements when used appropriately in conjunction with other measured performance parameters can be used as a precursor to the need of a performance (capacity) test. This is especially valid for smaller Amp-HR and VRLAs cells/batteries.

Only for small Amp-HR and VRLA cells/batteries can a model (case) using ohmic measurements as its base be developed for their replacement.

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