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J.E. Pollock
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December 22, 2009

NL-09-170

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Response To Request for Additional Information Regarding Amendment Application for Battery Capacity Surveillance Requirement (TAC. NO. ME0985)
Indian Point Unit No. 2
Docket No. 50-247
License No. DPR-26

REFERENCE:
1. NRC letter to Entergy on Indian Point Nuclear Generating Unit No. 2 - Request for Additional Information Regarding Amendment Application for the Technical Specification on Battery Capacity (TAC. NO. ME0985), dated November 20, 2009
2. Entergy Letter to NRC, NL-09-001, Proposed Change to Indian Point 2 Technical Specifications Regarding Battery Capacity Surveillance Requirement, dated March 29, 2009

Dear Sir or Madam:

Entergy Nuclear Operations, Inc (Entergy) is hereby providing a response to the NRC request for additional information, Reference 1, associated with the proposed changes to Indian Point 2 Technical Specification for battery capacity requirements submitted in Reference 2 and supplemented September 21, 2009 by Letter NL-09-128. The response is provided in Attachment 1. A referenced Calculation is provided in Enclosure 1.

There are no new commitments identified in this submittal. If you have any questions or require additional information, please contact Mr. R. Walpole, Manager, Licensing at (914) 734-6710.

A001
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 22, 2009.

Sincerely,

D. M. Mayer
for J. Pollock

JEP/sp

Attachment: 1. Reply to NRC Request for Additional Information Regarding Proposed Changes to Battery Capacity Requirement

Enclosures: 1. Calculation FEX-00050, Revision 2, Indian Point - 125 VDC Battery Sizing Calculation

cc: Mr. John P. Boska, Senior Project Manager, NRC NRR
Mr. Samuel J. Collins, Regional Administrator, NRC Region I
NRC Senior Resident Inspectors Office
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA
Mr. Paul Eddy, New York State Dept. of Public Service

ATTACHMENT 1 TO NL-09-170

REPLY TO NRC REQUEST FOR ADDITIONAL INFORMATION

REGARDING

PROPOSED CHANGES TO BATTERY CAPACITY REQUIREMENT

ENTERGY NUCLEAR OPERATIONS, INC
INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
DOCKET No. 50-247

Response To Request For Additional Information

By letter dated March 29, 2009, Accession No. ML090980300, as supplemented by letter dated September 21, 2009, Accession No. ML093010534, Entergy Nuclear Operations, Inc, (Entergy) requested an amendment to revise the battery capacity acceptance criterion specified in TS Surveillance Requirement (SR) 3.8.6.6. Specifically, the proposed change would modify SR 3.8.6.6 by establishing a more restrictive acceptance criterion regarding periodic verification of battery capacity to ensure the IP2 batteries can perform their intended design functions. The Nuclear Regulatory Commission staff is reviewing the submittal and the following replies to a request for additional information, Accession No ML093230042, dated November 20, 2009:

Question 1

In response to the staff's July 23, 2009, request for additional information, the licensee provided calculation FEX-00062-01, "Minimum Operating Electrolyte Temperature for 125 V DC Batteries 21, 22, 23, and 24." On page 4 of 5 of this calculation, the licensee acknowledged that it was Con Edison's (the previous licensee) design philosophy to use a 25% aging factor, 5% design margin, and a 5% temperature correction factor. The licensee also stated that the 85% capacity parameter would provide an additional 5% margin that is not accounted for in their sizing and voltage profile calculations. The following questions pertain to calculation FEX-00062-01.

a. The licensee's previous battery sizing calculation (Cell Sizing Worksheet dated August 23,2005) applies an aging factor of 1.110 while your revised battery sizing calculation (Cell Sizing Worksheet dated March 6, 2008) applies an aging factor of 1.176 (i.e., 17.6%), discuss the apparent discrepancy between the design philosophy and the revised assumptions. Explain how these parameters are consistent with industry recommendations (i.e., those provided in the Institute for Electrical and Electronics Engineers (IEEE) Standard (Std.) 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," and IEEE Std. 485-1997, "IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications"). Furthermore, provide the Cell Sizing Worksheet that was used for procuring the existing batteries (i.e., the worksheet that includes the original aging factor, design margin, and temperature correction factor values) and the install date (i.e., the age) for the existing batteries.

b. The NRC staff does not understand the discussion on the additional 5% margin that is not accounted for in the sizing and voltage profile calculations. Describe the basis of the 5% margin in greater detail and show exactly how this margin is being credited (e.g., the difference between the existing 80% criteria and the proposed 85% limit or the difference between the 90% replacement criterion and the proposed 85% limit).

c. The licensee's analysis indicated that when a battery reaches 90% capacity they would replace that battery at the next refueling outage which occurs every 2 years. In delaying the battery replacement until the next refueling outage, the licensee is assuming that the battery capacity will not reach 85% capacity by the time they replace the battery. Describe the technical basis for this assumption.

d. A design margin factor of 1.00 was used on Cell sizing worksheet (Attachment KCMP22 of calculation FEX-00204-01, "Station Battery 22 System Calculation") and on the battery data sheet (Attachment HCMP22 of calculation FEX-0020401). However, a design margin factor 1.05 was used in this calculation to determine the minimum temperature of 59 degrees Fahrenheit (F). Using a design margin factor of 1.00 in lieu of 1.05 would result in a different temperature correction factor (T) and a different minimum electrolyte temperature. Explain why a design margin factor of 1.05 was used in lieu of 1.00.

Response

a. The previous battery sizing calculation, which used an aging factor of 1.110, is based on a draft calculation prepared by our vendor. This draft, which was not accepted by IP2, considered the 90% acceptance criteria as used in surveillance procedures for test acceptance rather than the 85% considered for operability. This factor was incorrectly used by the vendor since it does not consider that battery will not be replaced until the following refueling outage, and battery capacity may drop below the surveillance acceptance criteria.

Battery sizing parameters are consistent with the methodology as described in IEEE Std. 485, where battery capacity at end of life conditions is considered. IEEE considers the end of life condition as 80% of rated capacity, and applies a correction factor of 1.25 (100% / 80%). At IP2, with the existing battery surveillance testing and replacement criteria, end of life is considered as 85% capacity, and a correction factor of 1.176 is applied (100% / 85%). The actual aging correction factors are different, but we believe the methodology is consistent with IEEE. (Note: IEEE Std. 450-1995, paragraph 7, also refers to use of lesser aging factors and battery replacement before 80% capacity.)

Previous battery sizing worksheets are addressed in calculations FEX-00049-01, FEX-00050-02, FEX-00051-01, and FEX-00052-01 for Batteries 21, 22, 23 and 24 respectively. The calculation for Battery 22 is attached, Enclosure 1, for information (other calculations are similar). Existing batteries were installed March 2008 (21), October 2002 (22), April 2008 (23), and May 2000 (24).

b. The additional 5% margin is the difference between the 80% aging factor and the revised 85% factor. This margin was used to justify lower acceptable temperatures, and the temperature correction factor was adjusted upward from 1.05 to 1.117. Based on IEEE Std. 485 (temperature correction table attached to calculation), this equates to revising minimum electrolyte temperatures from approximately 69°F to 59°F. Design basis minimum battery temperature at IP2 is being maintained at 59°F.

c. The assumption was based on Exide's typical curves for battery life versus capacity for stationary lead-acid battery systems of the flooded type. Typical life curves were provided in manufacturer's catalogs which were available at the time calculation was prepared (1990's). Assumption also considered Con Edison's past experience with battery capacity tests, and observed capacity drop from test to test.

d. As re-stated in NRC Item 1, Con Edison's design philosophy considered a design margin of 5% along with a temperature correction factor of 5%. This temperature correction factor equates to approximately 69°F, but in the past, IP2 did not maintain battery temperatures at this value or above which led to numerous questions on prior NRC inspections. The intent of calculation FEX-00062 was to determine new minimum electrolyte temperatures based on the existing design and replacement philosophy at the time, and took credit for Con Edison's early replacement of batteries (estimated at 85% capacity). The calculation maintained the 5% design margin philosophy, and established a new minimum design basis temperature of 59°F.

Present battery sizing calculations (e.g. FEX-00204-01) use the same minimum design basis temperature, and apply a design margin factor of 1.00. Calculations determine the actual design margin available rather than applying an arbitrary 5% factor.

Question 2

In proposing to revise Surveillance Requirement (SR) 3.8.6.6 to require verification that battery capacity is greater than or equal to 85% of the manufacturer's rating as opposed to greater than or equal 80%, describe the impact of this change on the expected life of Indian Point Unit 2 batteries (e.g., conclusions drawn from the battery life versus performance curve for GN23 batteries). Also provide the results (i.e., capacity value only) of the previous three performances of SR 3.8.6.6 for each safety-related battery at Indian Point Unit 2 (Le., batteries 21, 22, 23, and 24).

Response

IP2 safety-related Batteries 21 & 22 are Enersys (Exide) models GN-17 and GN-23, and Batteries 23 & 24 are C&D model KCR-13. All batteries are qualified for 20 years of life when aged to 80% of rated capacity. Based on the standard battery life versus capacity curves, which indicate average cell performance, aging to 85% of rated capacity would indicate an expected battery life of approximately 18 years. Discussions with both battery manufacturers indicate a number of factors affect battery life (e.g. maintenance, discharge cycling), but in general they agree with the standard industry accepted battery life curve for flooded type cells. C&D also indicated that the standard curve is conservative, and actual battery performance for average cells should be better than 20 years.

Previous capacity test results are as follows;

	2008	2006	2004	
Battery 21	101.3	100.0	100.0	battery installed 03/08.
Battery 22	106.1	100.0	100.0	battery installed 10/02.
Battery 23	100.6	94.2	99.3	battery installed 04/08.
Battery 24	107.4	100.0	100.0	battery installed 05/00.

Tests in 2006 and earlier were terminated when criteria for minimum voltage or rated discharge time had been reached. As a result, these tests did not record battery capacity higher than 100% since the rated time interval was reached first. This inconsistency between surveillance testing and IEEE 450 requirements was corrected in 2007.

Question 3

The following questions pertain to calculation FEX-00204-01, which the licensee provided in response to the staff's July 23, 2009, request for additional information.

a. During its review of this calculation, the NRC staff noticed that the available (i.e., excess) capacity of Battery 22 decreased from 57.1% to 12.9% (page 33 of 34). The staff's understanding is that the licensee primarily revised this calculation to address the change in minimum design temperature (I.e., 60 degrees F to 59 degrees F).. The staff is concerned with the significant change in capacity margin as a result of a one degree change in temperature. Provide a detailed discussion on why the available capacity significantly decreased.

b. Section 3.1.12 of this calculation states, in part, that in order to compensate for intercell connection resistance above the manufacturer's expected values, additional cable length is added. Provide the technical justification for using intercell connection resistance higher than the manufacturer's battery design value.

c. Section 3.2.3 of this calculation states, in part, that the maximum float voltage (135.5 volts (V) direct current) will be used when performing short circuit calculation. The battery data on Attachment HCMP22 also reflects a float voltage of 135.5 V. However, based on the battery catalog sheet (Attachment W Page 4 of 5), the acceptable battery float voltage range is 2.17 to 2.26 V per cell which results in maximum of 131.08 V (i.e., 2.26 V x 58 battery cells). Provide a detailed technical justification for exceeding the battery manufacturer's recommended battery float voltage value.

d. Section 6.3.6 of this calculation states, in part, that the emergency diesel generator (EDG) is assumed to fail to start with the field flash energized until the start sequence is terminated by detection of the EDG failure to start. The generator field flash is conservatively modeled to be energized for the first minute of the event. The staff is concerned that this assumption is not conservative since the EDG may try to energize and fail to start again with the field flash energized at the end of duty cycle. Provide a detailed technical justification for not also modeling the energization of the generator field flash at the last minute of the event.

Response

a. Available excess capacity decreased due to changes in minimum design temperature (60°F to 59°F), end of life battery capacity (90% to 85%), and the additional loading to account for automatic transfer switches. The biggest change was due to additional loading, followed by an aging factor increase from

11% to 17.6%.

b, IP2 is committed to battery monitoring and maintenance in accordance with IEEE Std. 450-1995 as stated in Tech Spec 5.5.15. The standard references a 20% increase in connection resistance above baseline values as the basis for corrective action. Our surveillance procedures (2-PT-A035 series) allow this 20% increase before corrective action is required (reference IEEE 450, paragraph 4.4.1.c, and Annex D.2).

c. Maximum float voltage referenced in Section 3.2.3 is actually the battery equalizing voltage, as this presents the worst case voltage for short circuit calculations. Battery is equalized at approximately 2.33 volts per cell in accordance with manufacturer's instructions, and has a maximum value of 135.5 V per IP2 surveillance procedures (135.0 to 135.5 V, 2-PT-Q001 series).

d. This section is for a station blackout scenario, and IP2 is committed to a one hour coping duration with AC power restored at the end of this period. When the calculation was prepared, an offsite gas turbine was credited as the alternate AC supply for SBO, and was provided with its own DC supply. Since then, IP2 design was changed to add an Appendix R/ Station Blackout diesel generator as the alternate AC supply, and this also has its own battery independent of the safety related station batteries. A second failure to start is not in accordance with design bases.