September 5, 2001

MEMORANDUM TO: James Clifford, Section Chief
Project Directorate I-2
Division of Licensing Program Management

FROM: Cornelius F. Holden, Section Chief ***(/RA by CFHolden)***
Electrical Engineering Section B
Electrical & Instrumentation and Controls Branch
Division of Engineering

SUBJECT: REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS
28 VOLT D.C. DISTRIBUTION - OPERATION
SALEM GENERATING STATION UNITS 1 AND 2
TAC NOS. MB2042 & MB2043

Plant Name:	Salem Generating Station
Docket Nos.:	50-272 and 50-311
Operating Licenses:	DPR-70 and DPR-75
Licensee:	PSEG Nuclear LLC
Project Directorate:	PD-1
Project Manager:	Robert Fretz
Review Branch:	EEIB
Review Status:	Complete

By letter dated April 16, 2001, PSEG Nuclear LLC requested an amendment of the Technical Specification (TS) of Salem Generating Station Units 1 and 2. The proposed TS changes modify the requirements in the TS regarding the operation of the 28 Volt D.C. Batteries.

Subsequently, PSEG Nuclear LLC submitted a follow up letter dated July 5, 2001, revising attachment 1 of the April 16, 2001 letter.

The staff of the Electrical & Instrumentation and Controls Branch has reviewed the licensee's submittals. On the basis of our review, we find the proposed technical specification changes acceptable as discussed in the attached safety evaluation.

Attachment: As stated

Contact: Saba N. Saba
415-2781

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DISTRIBUTION
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ADAMS/ACCESSION #: ML012480260

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DATE	08/30/01	09/05/01	09/05/01

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
TECHNICAL SPECIFICATION CHANGE
28 VOLT DC DISTRIBUTION OPERATION
SALEM GENERATING STATION UNIT Nos. 1 AND 2
PSEG NUCLEAR LLC
DOCKET Nos. 50-272 and 50-311
TAC Nos. MB 2042/MB2043

1. INTRODUCTION

By letter dated April 16, 2001, PSEG Nuclear LLC, (Licensee), requested an amendment of the technical specification (TS) of Salem Generating Station Units 1 and 2. Subsequently, the licensee submitted a follow up letter dated July 5, 2001, revising attachment 1 of the April 16, 2001 letter as some of the TS references were incorrectly identified. These are editorial corrections and no changes to the technical justification.

The proposed TS changes modify the requirements contained in the TS regarding the operation of the 28 Volt D.C. batteries. The changes will provide the flexibility needed to address changes in individual battery cell performance over the battery's life while assuring that overall battery performance meets or exceeds minimum design requirement.

2. BACKGROUND

The 28 Vdc Control Power System at Salem provides electrical power for (a) communications from the Control Room console to auxiliary control system relay cabinets for both normal and emergency operations, (b) the operation of Solid State Protection System (SSPS) interface cabinets, Fire Alarm System, Mimic Bus, Power Range Recorders and (c) other miscellanous equipment.

The 28 Vdc system consists of two trains; each train consisting of a 28 Vdc bus, 28 V battery, a battery charger and a back up charger. During normal operations the 28 Vdc loads are powered by the battery chargers with the battery floating on the system. In case of loss of the charger, the dc loads are automatically fed from the battery.

The batteries are sized with a design margin of 5%, an aging margin of 25% and the appropriate temperature marging associated with the minimum TS temperature. The design limit of each cell is 2.13 volts which corresponds to a total battery voltage of approximately 28 volts. Each charger has ample capacity for the steady-state operation during normal operation while at the same time maintaining its battery fully charged. Each battery charger will be able to recharge its connected battery from the design minimum charge to its fully charged state within 12 hours while supplying the normal steady-state loads.

The proposed revisions of TS 3.8.2.5/4.8.2.5.2 for Salem 1 and Salem 2 will include the battery acceptance criteria, corresponding allowed outage times and additional surveillance requirements recommended in NUREG-1431 Standard Technical Specifications - Westinghouse Plants, Revision 1, dated April 1995.

ATTACHMENT

3. EVALUATION

The staff reviewed and evaluated the proposed changes to the TS as follows:

Change 1 TS Action Statement b. to LCO 3.8.2.5 is deleted and replaced with new actions "c" through "f" as follows:

c. With one or more 28-volt D.C. batteries with one or more battery cell parameters not within the Category A or B limits of Table 4.8.2.5-1:

1. Verify within 1 hour, that the electrolyte level and float voltage for the pilot cell meets Table 4.8.2.5-1 Category C limits, and

2. Verify within 24 hours, that the battery cell parameters of all connected cells meet Table 4.8.2.5-1 Category C limits, and

3. Restore battery cell parameters to Category A and B limits of Table 4.8.2.5-1 within 31 days, and

4. If any of the above listed requirements cannot be met, comply with the requirements of action f.

d. With one or more 28-volt D.C. batteries with one or more battery cell parameters not within Table 4.8.2.5-1 Category C values, comply with the requirements of action f.

e. With average electrolyte temperature of representative cells less than 65°F, comply with the requirements of action f.

f. Restore the battery to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

The above Action Statements require that the pilot cell electrolyte level and float voltage are verified within one hour and are within the limits of Category C of Table 4.8.2.5-1 "BATTERY CELL PARAMETER REQUIREMENTS". The one hour period is a reasonable amount of time to perform the required verification.

In addition verification of Category C limits within 24 hours and restoring the battery parameters to Category A and B limits within 31 days are reasonable time limits to assure that the battery capacity is sufficient to allow it to perform its intended function. If the battery is not restored to within Category A and B limits within 31 days, the battery should be declared Inoperable. This is acceptable as it allows continued operation even though the battery is degraded but have sufficient capacity to stay OPERABLE till it is restored to Category A and B.

Change 2 TS Action Statement c. is renumbered as b. This is acceptable as being an editorial correction.

Change 3 TS Surveillance Requirements 4.8.2.5.2 parts a.1 through a.4 which states that:

1. The electrolyte level of the pilot cell is between the minimum and maximum level indication mark.

2. The pilot cell specific gravity, corrected to 77°F, and full electrolyte level, is greater than or equal to 1.200.

3. The pilot cell voltage is greater than or equal to 2.08 volts.

4. The overall battery voltage is greater than or equal to 27 volts.
are deleted and replaced by:

1. The parameters in Table 4.8.2.5-1 meet Category A limits.

2. The overall battery voltage is greater than or equal to 27 volts on float charge.

Category A cell parameters are related to the limits for each designated pilot cell and the surveillance requirements meet the intent of the IEEE 450 "Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications."

The verification that the overall battery voltage has been modified to be done while the battery is on float charge help to ensure the effectiveness of the charging system. The battery charger is supplying the loads and the battery is on a float charge condition fully charged ready to supply the loads in case the charger is inoperable. The voltage measurement of the battery on float is acceptable being specific to reflect the status of the system.

Change 4 TS Surveillance Requirements 4.8.2.5.2.b which states that:

At least once per 92 days by verifying that:

1. The voltage of each connected cell is greater than or equal to 2.13 volts under float charge and has not decreased more than 0.27 volts from the value observed during the original acceptance test.

2. The specific gravity, corrected to 77°F and full electrolyte level of each connected cell is greater than or equal to 1.200 and has not decreased more than 0.02 from the value observed during the previous test.

3. The electrolyte level of each connected cell is between the minimum and maximum level indication marks.

are deleted and replaced by:

b. At least once per 92 days and once within 24 hours after a battery discharge less than 25.7V and once within 24 hours after a battery overcharge greater than 35V by verifying that the parameters in Table 4.8.2.5-1 meet the Category B limits.

The quarterly and once within 24 hours after a battery discharge or overcharge surveillances

are related to verification that each connected cell is meeting the limits of Category B of Table 4.8.2.5-1. These limits are consistent with the recommendations of IEEE-450 and are acceptable being in conformance with industry practice and manufacturer recommendation.

Change 5 TS Surveillance 4.8.2.5.2.c which states that:

c. At least once per 18 months by verifying that:

1. The cells, cell plates and battery racks show no visual indication of physical damage or abnormal deterioration.

2. The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material.

3. The battery charger will supply at least 150 amperes at 28 volts for at least 4 hours.

is deleted and replaced by:

c. At least once per 92 days by verifying that:

1. There is no visible corrosion at terminals or connectors or the connection resistance is:

≤50 micro ohms for inter-cell connections,
≤200 micro ohms for inter-tier connections,
≤70 micro ohms for field cable terminal connections, and
≤500 micro ohms for the total battery connection resistance which includes all inter-cell connections (including bus bars), all inter-tier connections (including cable resistance) and all field terminal connections at the battery.

2. The average electrolyte temperature of the representative cells is ≥ 65°F.

The change is to verify, at least once per 92 days, that there is no visible corrosion at battery terminals and connectors or to verify connection resistance values for inter-cell, inter-tier, terminal, and total battery connections. The restricted value for the maximum total battery connection resistance assure that the required loads will have adequate terminal voltage under blackout, blackout plus accident, and station blackout (SBO) conditions.

This quarterly surveillance is acceptable as it can detect conditions that can cause power losses due to resistive heating and the frequency of this verification is acceptable based on industry practice and operating experience.

The second new quarterly surveillance to verify the average electrolyte temperature of representative cells to be ≥ 65°F is consistent with IEEE 450. This minimum temperature is assumed in Salem's Station Blackout (SBO) coping time calculations and is acceptable as it is more conservative than the recommendation of the manufacturer.

Change 6 TS surveillance requirements in section 4.8.2.5.2.d is renumbered as 4.8.2.5.2.f. This is acceptable as it is an editorial change.

A new section 4.8.2.5.2.d is inserted as follows:

d. At least once per 12 months by verifying that:

1. The cells, cell plates and battery racks show no visual indication of physical damage or abnormal deterioration.

2. Remove visible terminal corrosion and verify cell-to-cell and terminal connections are coated with anti-corrosion material.

3. The connection resistance is:
   ≤50 micro ohms for inter-cell connections,
   ≤200 micro ohms for inter-tier connections,
   ≤70 micro ohms for field cable terminal connections, and
   ≤500 micro ohms for the total battery connection resistance which includes all inter-cell connections (including bus bars), all inter-tier connections (including cable resistance) and all field terminal connections at the battery.

The annual verification which consist of visual inspection of the cells, cell plates, battery racks removal of corrosion and coating with anti-corrosion material are industry practices for operating, inspection and maintenance of batteries. These are as recommended by IEEE 450 to confirm that the battery is OPERABLE. Verification of the connection resistance as formulated in Change 5 is a confirmation that any corrosion trend is detected and corrected. The staff finds it acceptable.

Change 7 TS surveillance requirements 4.8.2.5.2.e is renumbered as 4.8.2.5.2.g and a new section 4.8.2.5.2.e is inserted as follows:

e. At least once per 18 months by verifying that the battery charger will supply ≥ 150 amperes at ≥ 28 volts for ≥ 4 hours.

This is acceptable as the rating of the charger exceed the load profiles of Salem 1 and Salem 2 by about 25 amp allowing to recharge and keep the battery on float fully charged.

Change 8 This change of TS surveillance 4.5.2.5.2.g (old 4.8.2.5.2.e) is revised to reflect the renumbering of TS 4.8.2.5.2.d to new TS 4.8.2.5.2.f. This is acceptable as it is an editorial change. It is to be noted that the old 4.8.2.5.2.e states that the satisfactory completion of the performance test shall also satisfy the requirement of the service test. This is acceptable as the performance discharge test of 275 amps envelops the service test rates for Salem 1 and Salem 2.

Change 9 TS 4.8.2.5.2.h and TS 4.8.2.5.2.i are added to TS requirements contained in section 4.8.2.5.2 as follows:

h. At least once per 12 months, during shutdown, if the battery shows signs of degradation OR has reached 85% of the service life with a capacity less than 100% of manufacturers rating, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. Degradation is indicated when the battery capacity drops more than 10% of rated

capacity from its capacity on the previous performance test, or is below 90% of the manufacturer's rating.

i. At least once per 24 months, during shutdown, if the battery has reached 85% of the service life with capacity greater than or equal to 100% of manufacturers rating, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test.

The new surveillance requirements are added to reflect the degradation or reaching 85% of the service life of the battery. The frequency of the performance discharge test is based on available capacity of the battery i.e. less than 100% or greater or equal to 100% of the rating of the manufacturer. These frequent surveillance requirements are acceptable as they are consistent with the recommendation of IEEE 450 and give reasonable confidence that the battery is OPERABLE.

Change 10 Footnote to Technical Specification Surveillance requirements contained in section 4.8.2.5.2, for Unit 1 only, is deleted. This footnote referred to a specific event, 1R13, which has now been completed making the note moot.

Change 11 The licensee is proposing to add a table (Table 4.8.2.5-1). BATTERY CELL PARAMETERS REQUIREMENTS to the TS. These battery cell parameters are the acceptable limits to ensure that the battery is OPERABLE. The limits are for electrolyte level, float voltage and specific gravity for three different categories: Category A defines the acceptable limits for each designated pilot cell; Category B defines the acceptable limits for each connected cell; and Category C defines the allowable limits for each connected cell. In addition, Table 4.8.2.5-1 has three footnotes as follows:

(a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum level during equalizing charge provided it is not overflowing.

(b) Corrected for electrolyte temperature and level. Level correction is not required, however, when battery charging is < 2 amps when on float charge.

(c) Or battery charging current is < 2 amps when on float charge. This is acceptable only during a maximum of 7 days following a battery recharge.

The staff has reviewed the proposed parameter values of each category and the associated footnotes and find them acceptable as they are based on the recommendations of IEEE 450 and the battery manufacturer. However if a battery parameter is outside the category C allowable limits, the battery will be declared inoperable.

4. CONCLUSION

Based on the above, the proposed TS will improve the means of monitoring and evaluation of the batteries to establish the battery operability and assure that the overall battery performance meet the minimum design requirements. The staff therefore recommend that the PSEG Nuclear LLC request for amendment of the Technical Specification be approved.