



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NOS. 177 AND 158 TO FACILITY OPERATING

LICENSE NOS. DPR-70 AND DPR-75

PUBLIC SERVICE ELECTRIC & GAS COMPANY

PHILADELPHIA ELECTRIC COMPANY

DELMARVA POWER AND LIGHT COMPANY

ATLANTIC CITY ELECTRIC COMPANY

SALEM NUCLEAR GENERATING STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-272 AND 50-311

1.0 INTRODUCTION

By letter dated January 21, 1994, as supplemented June 28 and, September 13, 1994, and April 4, 1995, the Public Service Electric & Gas Company (the licensee) submitted a request for changes to the Salem Nuclear Generating Station, Unit Nos. 1 and 2, Technical Specifications (TS). The requested changes would revise TS 3.8.2.3, "125-Volt D.C. DISTRIBUTION - OPERATING". The June 28 and September 13, 1994, and April 4, 1995, letters provided clarifying information that did not change the initial proposed no significant hazards consideration determination, nor go beyond the scope of the Federal Register notice.

The proposed changes include the addition of a table giving the specific battery cell parameters and revision of the limiting condition for operation (LCO) and surveillance requirement (SR) in accordance with the recommendation in NUREG-1431, "Westinghouse Owner's Group Improved Standard Technical Specifications" (WOG STS). The licensee also proposes a revision to eliminate the differences between the Salem Unit 1 TS and the Salem Unit 2 TS, thus bringing both TS into agreement.

With the use of battery cell parameters as recommended in the WOG STS, the licensee believes that it can establish overall battery acceptability and provide the flexibility needed to address changes in individual battery cell performance over the battery's life, while ensuring that overall battery performance meets or exceeds minimum design requirements. It also provides additional SRs to allow for improved monitoring of battery capabilities and status.

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2.0 EVALUATION

The staff has reviewed the proposed changes in TS 3.8.2.3 and the battery cell parameter requirements shown in Table 4.8.2.3-1. The staff's evaluation of each proposed TS amendment for Salem Units 1 and 2 is as follows:

2.1 Modification of LCO 3.8.2.3 for Unit 1

Under current LCO 3.8.2.3 for Unit 1, each of three dc trains, which consists of 125-V dc bus, battery, and at least one full battery capacity charger, must be energized and operable for normal plant operation. Each dc bus can be powered by two battery chargers: the primary charger from the 230-V ac vital system within the same train, and the backup charger from a different 230-V ac vital system train.

In proposed LCO 3.8.2.3, specific battery chargers are identified for each train (i.e., 1A1 for train 1A, 1B1 for train 1B, and 1C1 for train 1C) for Unit 1; the licensee believes that this will eliminate the ambiguity in the current LCO phrase "at least one full capacity charger" and also will prevent the plant from operating indefinitely with a dc bus on the backup battery charger.

Since the primary battery chargers already have been identified as 2A1 for train 2A, 2B1 for train 2B, and 2C1 for train 2C in a similar LCO for Unit 2, the staff concurs with the licensee's rationale that proposed LCO 3.8.2.3 for Unit 1 will automatically limit plant operation with the backup battery charger and finds it to be more restrictive. This change brings both units' LCO into agreement. On this basis, the staff concludes the licensee's proposed LCO 3.8.2.3 for Unit 1 is acceptable.

2.2 Modification of Action Statement (AS) 3.8.2.3.a for Unit 2

Current AS 3.8.2.3.a for Unit 2 reads "With one 125-volt D.C. bus inoperable or not energized, restore the inoperable bus to OPERABLE and energized status within 2 hours or..." To make the AS consistent with that for Unit 1, the licensee proposes to delete the above underlined wording from AS 3.8.2.3.a for Unit 2.

Since a similar AS (i.e., AS 3.8.4.A) in the WOG STS does not contain the above wording and the deletion brings the ASs for both units into agreement, the proposed change to AS 3.8.2.3.a for Unit 2 is acceptable.

2.3 Modification of AS 3.8.2.3.b for Units 1 and 2

The licensee proposes to modify AS 3.8.2.3.b as follows: (1) for Unit 1, by changing "battery and/or charger" to "battery charger" and limiting the use of the backup battery charger to 7 days by adding an appropriate

clause "OR connect the backup charger for no more than 7 days OR..." and (2) for Unit 2, by changing AS 3.8.2.3.c to AS 3.8.2.3.b by removing current AS 3.8.2.3.b.

The 125-V dc power system provides motive and control power to valves, instrumentation, emergency diesel generators, and many other components and systems during all phases of plant operation. At Salem, any dc component (e.g., dc bus, battery, and battery charger) is vulnerable to a single failure when a dc bus is on the backup charger that could prevent the dc system from performing its intended safety function. The staff was concerned about this single failure vulnerability during the Unit 2 licensing stage and raised many questions about the independence and redundancy of the backup battery charger. In Supplement 4 of the Salem Unit 2 safety evaluation report (NUREG-0517), the staff agreed to allow the use of the backup battery charger for 7 days per AS 3.8.2.3.c of the TS. In the current amendment request, the licensee asks that the same provision be extended for Unit 1 because the dc and ac power distribution systems at Salem Units 1 and 2 are identical. In addition, the licensee asks that the battery inoperability provision for Units 1 and 2 in AS 3.8.2.3.b be addressed separately in other parts of the TS.

The staff concurs with the licensee that the proposed changes bring the TS for both units into agreement, that is (1) for Unit 1, limiting the use of the backup battery charger to 7 days in AS 3.8.2.3.b, and changing the wording in AS 3.8.2.3.b; and (2) for Unit 2, changing AS 3.8.2.3.c to AS 3.8.2.3.b by removing the current AS 3.8.2.3.b. The staff concludes that the proposed changes are acceptable.

2.4 Addition of Table 4.8.2.3-1, "Battery Cell Parameter Requirements," for Units 1 and 2

Since battery cell parameters must be within acceptable limits to ensure that the required dc power is available to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated design basis accident, the licensee proposes to add Table 4.8.2.3-1, "Battery Cell Parameters Requirements," for both units. The table gives the limits for electrolyte level, float voltage, and specific gravity for three different categories: Category A which defines the normal parameter limits for each designated pilot cell in each battery; Category B, which defines the normal parameter limits for each connected cell; and Category C, which defines the allowable limits for each connected cell.

The staff has reviewed each parameter value proposed for electrolyte level, floating voltage, and specific gravity for all three categories and the associated footnotes in Table 4.8.2.3-1 and compared them with those of Table 3.8.6-1 in the WOG STS and finds them to be identical except for the following:

1. The floating voltage in Category C is greater than or equal to 2.07 V rather than greater than 2.07 V.
2. The specific gravity values for all three categories are lower by five points (0.005).
3. The battery charging current when on float charge shown in footnotes b and c is 3 amps rather than 2 amps.

Although cell voltage is not by itself an indication of the state of charge of the battery, Appendix C (Section Ci. Low-Voltage Cells) of IEEE Std 450-1993, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells and a cell voltage of 2.07 V or below under float conditions will indicate internal cell problems and may require cell replacement. Thus, the float voltage level should be greater than 2.07 V. By letter dated June 28, 1994, the licensee agreed to revise the float voltage level to greater than 2.07 V.

During a teleconference on May 11, 1994, the staff expressed concern about the low specific gravity values for each category and the high battery charging current. The licensee contends that the values in Table 3.8.6-1 of the WOG STS for specific gravity and for floating charge current are bracketed values that require plant specific information and that they were furnished by the battery manufacturer (C&D) as typical values for the batteries installed at Salem (LC/LCR-33 with 1.215 specific gravity cells).

By letter dated September 13, 1994, the licensee submitted its supporting document for the above parameters obtained from the battery manufacturer, in which it stated that the reduced specific gravity values by five points in each category would not affect operability unless the battery design and aging margins were compromised. The basis for the licensee's recommendation is that a fully charged battery with all cells having a measured specific gravity of 1.190 (licensee's proposed value) will have approximately 93 percent of the performance capability, while the same battery with 1.195 (WOG STS value) specific gravity will have approximately 94 percent. The manufacturer also stated that 1.190 specific gravity in all cells, nominal floating voltages, and a charging current less than 3 amps would indicate that the battery has sufficient capacity to meet its design loads. Regarding the staff's concern whether the batteries at Salem have enough design and aging margins, the licensee confirmed that its batteries are sized based on the basis of IEEE Std 485-1983 with appropriate margins (i.e., 145 percent battery capacity) to meet their required duty cycles.

Considering the licensee's confirmation of its battery margins and supplemental information provided by the battery manufacturer, the staff finds that the battery cell parameters proposed by the licensee are comparable with the parameters shown in Table 3.8.6-1 of the WOG STS. Therefore, addition of Table 4.8.2.3-1 in the TS for Units 1 and 2 is acceptable.

2.5 Addition of ASs 3.8.2.3.c, d, e, and f for Units 1 and 2

With the addition of Table 4.8.2.3-1, which gives battery cell parameter requirements, the licensee proposes to address battery inoperability for both units in ASs 3.8.2.3c, d, e, and f as follows:

2.5.1 AS 3.8.2.3.c

With one or more 125-volt D.C. batteries with one or more battery cell parameters not within the Category A or B limits of Table 4.8.2.3-1:

1. Verify within 1 hour, that the electrolyte level and float voltage for the pilot cell meets Table 4.8.2.3-1 Category C limits;
2. Verify within 24 hours, that battery cell parameters of all connected cells meet Table 4.8.2.3-1 Category C limits;
3. Restore battery cell parameters to Category A and B limits of Table 4.8.2.3-1 within 31 days; and
4. If any of the above listed requirements cannot be met, comply with the requirements of AS 3.8.2.3.f.

2.5.2 AS 3.8.2.3.d

With one or more 125-volt D.C. batteries with one or more battery cell parameters not within Table 4.8.2.3-1 Category C values, comply with the requirements of AS 3.8.2.3.f.

2.5.3 AS 3.8.2.3.e

With average electrolyte temperature of representative cells less than 65 °F, comply with the requirements of AS 3.8.2.3.f.

2.5.4 AS 3.8.2.3.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 staff has reviewed ASs (i.e., 3.8.6.A and B) in the battery cell parameter section of the WOG STS that are similar to the ASs proposed by the licensee. The staff finds that proposed ASs 3.8.2.3.c, d, e, and f are consistent with ASs 3.8.6.A and B of the WOG STS in determining the operability of the battery except for the difference in temperature in AS 3.8.2.3.e. Proposed AS 3.8.2.3.e requires the average temperature of representative cells to be less than 65 °F; the similar AS (i.e., 3.8.6.B) in the WOG STS requires a temperature of less than 60 °F. With battery temperature below 65 °F, the licensee contends that the capacity to supply the maximum expected load requirement is not ensured, thus making the corresponding dc electrical power subsystem inoperable. Since 65 °F is more limiting and restrictive than 60 °F, the staff finds 65 °F to be acceptable. The staff concludes that proposed ASs 3.8.2.3.c, d, e, and f are acceptable.

2.6 Modification of Surveillance Requirement (SR) 4.8.2.3.2.a for Units 1 and 2

As a part of weekly (i.e., 7 day) battery surveillance, there are four SR provisions (i.e., SR 4.8.2.3.2.a.1-4). The licensee proposes to delete the first three of the four existing SR provisions (i.e., SR 4.8.2.3.2.a.1-3) and to replace them with SR 4.8.2.3.2.a.1 and to change SR 4.8.2.3.2.a.4 to SR 4.8.2.3.2.a.2. With the addition of the new battery cell parameter requirements table, proposed SR 4.8.2.3.2.a.1 states that "The parameters in the Table 4.8.2.3-1 meet Category A limits." while SR 4.8.2.3.2.a.2 remains the same.

The staff has compared the proposed SR provisions with similar provisions in the WOG STS and finds that proposed SRs 4.8.2.3.2.a.1 and 4.8.2.3.2.a.2 are identical to SRs of the WOG STS, respectively. Therefore, proposed SRs 4.8.2.3.2.a.1 and 4.8.2.3.2.a.2 are acceptable.

2.7 Modification of SR 4.8.2.3.2.b for Units 1 and 2

The licensee proposes to replace SR 4.8.2.3.2.b.1-3 with SR 4.8.2.3.2.b, which states, "At least once per 92 days AND once within 24 hours after a battery discharge < 110 V AND once within 24 hours after a battery overcharge > 150 V by verifying that the parameters in Table 4.8.2.3-1 meet the Category B limits." The staff has compared proposed SR 4.8.2.3.2.b with SR 3.8.6.2 in the WOG STS and finds it to be identical. The staff concludes that the modification of SR 4.8.2.3.2.b for Units 1 and 2 is acceptable.

2.8 Addition of SRs 4.8.2.3.2.c.1 and 2 for Units 1 and 2

The licensee proposes to add two more battery SRs, 4.8.2.3.2.c.1 and 2:

2.8.1 SR 4.8.2.3.2.c.1

SR 4.8.2.3.2.c.1 is being added to verify that there is no visible corrosion at battery terminals and connectors or to verify connection resistance values for inter-cell, inter-rack, inter-tier, terminal, and total battery connections. This SR can indicate physical damage or abnormal deterioration that could potentially degrade battery performance. The licensee states that the specific resistance value limits in the SR are based on not exceeding the ceiling values established by the manufacturer.

Because proposed SR 4.8.2.3.2.c.1 format agrees with SR 3.8.4.2 in the WOG STS and this surveillance can detect conditions that can cause power losses due to resistive heating, the staff finds that the proposed SR 4.8.2.3.2.c.1 is acceptable.

2.8.2 SR 4.8.2.3.2.c.2

SR 4.8.2.3.2.c.2 is being added to verify that the average electrolyte temperature of representative cells is above 65 °F, instead of 60 °F as prescribed in SR 3.8.6.3 of the WOG STS. The licensee states that the 65 °F limit is based on the minimum temperature to ensure that the required loads will have adequate terminal voltage under the station blackout (SBO) coping time calculations. Since lower than normal temperature inhibits or reduces battery capacity, the licensee believes that the higher temperature proposed in the SR will ensure that the operating temperature remains within an acceptable operating range.

The staff finds that the licensee's proposed change (i.e., 65 °F) is more restrictive than the manufacturer's recommended temperature of 60 °F. Proposed SR 4.8.2.3.2.c.2 is, therefore, acceptable.

2.9 Modification of SRs 4.8.2.3.2.d.1, 2, 3, and 4 for Units 1 and 2

With the addition of SRs 4.8.2.3.2.c.1 and 2, the licensee finds it necessary to change three SRs 4.8.2.3.2.c.1, 2, and 3 to SRs 4.8.2.3.2.d.1, 2, and 3, and to change SR 4.8.2.3.2.c.4 to SR 4.8.2.3.2.e. In addition, it proposes to reduce the surveillance frequency from 18 months to 12 months. The licensee contends that the proposed 12 month testing frequency is consistent with the guidance of IEEE Std 450-1987. Specific SR changes requested are as follows:

1. The current SR 4.8.2.3.2.c.1 should be changed to SR 4.8.2.3.2.d.1.
2. The current SR 4.8.2.3.2.c.2, which states, "The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material." should be modified to state "Remove visible terminal corrosion and verify cell-to-cell and terminal connections are coated with anti-corrosion material." The change is the removal of the words "clean and tight". SR 4.8.2.3.2.c.2 should be changed to SR 4.8.2.3.2.d.2.

3. The current SR 4.8.2.3.2.c.3, which requires that only the resistance of each cell-to-cell and terminal connection be measured, should be expanded to include resistances for inter-cell, inter-rack, inter-tier, field cable, and total battery connections. SR 4.8.2.3.2.c.3 should be changed to SR 4.8.2.3.2.d.3.
4. The current SR 4.8.2.3.2.c.4 should be changed to SR 4.8.2.3.2.e.

The staff has reviewed the following proposed changes: (1) changing the surveillance frequency from 18 months to 12 months, (2) removing the words "clean and tight," and (3) expanding resistance measurements of various additional connections and components. In addition, the staff compared the proposed SR provisions with the guidance given in IEEE standards on batteries and manufacturer's recommendations, and finds the following:

1. IEEE Std 450-1987 recommends that these inspections be performed on a yearly basis instead of every 18 months. The proposed (12 month) testing frequency is consistent with this guidance.
2. The reason for the removal of the requirement to verify that the terminal connections are clean and tight from SR 4.8.2.3.2.c.3 is to prevent overtightening of battery connections and removing the requirement is recommended by IEEE Std P1106, "IEEE Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications." In addition, the licensee believes that cleanness and tightness can be verified by measuring the resistance connections. The words "cleanness and tightness," therefore, are not necessary.
3. The resistance limits shown in SR 4.8.2.3.2.c.3 are based on the ceiling values provided by the battery manufacturer to ensure that the battery connection resistance does not exceed an established maximum value.

On the basis of the above findings, the staff concludes that the licensee's proposed changes are consistent with the SR provisions recommended in the WOG STS, the IEEE standards and manufacturer's recommendations, and are, therefore, acceptable.

2.10 Change SR 4.8.2.3.2.d to SR 4.8.2.3.2.f and SR 4.8.2.3.2.e to SR 4.8.2.3.2.g for Units 1 and 2

As a result of the renumbering of SRs in various sections of the TS, the licensee finds it necessary to change SRs 4.8.2.3.2.d and 4.8.2.3.2.e to SRs 4.8.2.3.2.f and 4.8.2.3.2.g. Since this change does not involve any changes in content, the staff finds it to be acceptable.

2.11 Additions of SRs 4.8.2.3.2.h and 4.8.2.3.2.i for Units 1 and 2

2.11.1 SR 4.8.2.3.2.h

The licensee proposes to add SR 4.8.2.3.2.h, which states, "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 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 the rated capacity from its capacity on the previous performance test, or is below 90% of the manufacturer's rating."

The staff has reviewed a similar provision (i.e., SR 3.8.4.8) in the WOG STS, which requires that the performance discharge test be conducted every 12 months if the battery shows degradation or has reached 85 percent of its expected life. According to IEEE Std-450, the battery has degraded if its capacity has dropped more than 10 percent relative to its capacity on the previous performance test or when it is below the manufacturer's rating. On this basis, the staff finds that proposed SR 4.8.2.3.2.h is consistent with the recommendations of the WOG STS and IEEE Std-450 and, therefore, its addition is acceptable.

2.11.2 SR 4.8.2.3.2.i

The licensee also proposes to add SR 4.8.2.3.2.i, which states, "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."

Although this provision is not yet in the WOG STS, it is in accordance with the latest (1993) version of IEEE Std-450 recommendation. Also, in the EELB's memorandum dated June 16, 1993, from C. H. Berlinger to C. I. Grimes, EELB concurred with the Technical Specification Branch on the addition of the above TS provision in the future WOG STS as it may help to lengthen the life of batteries while still providing a timely warning of approaching end of battery life. Therefore, the staff concludes that the addition of SR 4.8.2.3.2.i is acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State official was notified of the proposed issuance of the amendments. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and change the Surveillance Requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (59FR22012). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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