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JUL 05 2001

LRN-01-0215
LCR S99-12

PSEG Nuclear LLC

United States Nuclear Regulatory Commission
Document Control Desk
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Gentlemen:

CORRECTION TO REQUEST FOR CHANGE TO TECHNICAL SPECIFICATIONS
28 VOLT D.C. DISTRIBUTION - OPERATION
SALEM GENERATING STATION
UNIT NOS. 1 AND 2
DOCKET NOS. 50-272 AND 50-311

On April 16, 2001, PSEG Nuclear submitted a Request to Change the Technical Specifications (TS) for Salem Generating Station Unit Nos. 1 and 2. This request proposed changes to the TS associated with the 28 Volt DC distribution.

In Attachment 1 of the April 16, 2001 request, some of the TS references were incorrectly identified. Instead of referencing section 4.8.2.5 of the TS, the submittal referenced section 4.5.2.5 of the TS in error. This submittal provides a revised Attachment 1 for the April 16, 2001 submittal correcting these errors with the changes identified by revision bars. There are no changes to the technical justification but only corrections to the errors in the referenced TS numbers.

Should you have any questions regarding this submittal, please contact Brian Thomas, at (856) 339-2022.

Sincerely,

G. Salamon
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Attachment (1)

A001

JUL 05 2001

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SALEM GENERATING STATION
UNIT NOS. 1 AND 2
FACILITY OPERATING LICENSES DPR – 70 AND DRP - 75
DOCKET NOS. 50-272 AND 50-311
CHANGE TO TECHNICAL SPECIFICATIONS
28 VDC DISTRIBUTION - OPERATION

DESCRIPTION AND JUSTIFICATION OF THE PROPOSED CHANGES

The 28 VDC Control Power System provides electrical power for communications from the control room console to auxiliary control system relay cabinets for both normal and emergency operations, for the operation of Solid State Protection System (SSPS) interface cabinets, Fire Alarm System, Mimic Bus, Power Range Recorders and other miscellaneous equipment. The 28 VDC system consists of two trains with each train consisting of a 28-volt DC bus, 28-volt battery, a battery charger and a back-up charger. During normal operations the 28 VDC loads are powered by the battery chargers with both of the batteries floating on the system. In case of loss of normal power to the battery charger, the DC loads are automatically fed from the station battery power.

The batteries are sized to produce the required capacity corresponding to the end-of-life design cycles and 100% design demand. Battery sizing is based on IEEE-485-1983 recommendations with 5% design margin, 25% aging margin, and the appropriate temperature margin associated with the minimum TS temperature. The voltage design limit is 2.13 volts per cell, which corresponds to a total output of approximately 28 VDC per battery (13 cells). Each battery charger has ample power output capacity for the steady-state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger has sufficient capacity to restore the battery bank from the design minimum charge to its fully charged state within 12 hours, while supplying normal steady-state loads.

The initial condition of Design Basis Accident (DBA) and transient analysis in the FSAR, Chapter 15, assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for control and switching during all MODES of operation from the control room consoles. The OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses, which are based upon: (1) maintaining the required DC power sources and associated distribution systems OPERABLE during accident conditions, (2) an assumed loss of offsite power, and (3) an additional single failure.

As detailed below, TS 3.8.2.5/4.8.2.5.2 for both Salem Unit 1 and Salem Unit 2 are proposed to be revised to 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.

Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. These specific battery cell parameters are included in Table 4.8.2.5-1 of the proposed TS. Electrolyte limits are conservatively established, allowing continued DC electrical system function even when Category A and B limits of Table 4.8.2.5-1 of the proposed TS are not met. The battery cell parameters are required solely for the support of the associated DC electrical power subsystems.

Change 1:

Technical Specification Action Statement b. to LCO 3.8.2.5 is being deleted and the requirements contained therein are incorporated into new actions c. through f. to provide additional guidance to determine the operability of the battery based on the battery cell parameters as listed in Table 4.8.2.5-1 of the proposed TS, 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 $65^{O}F$, 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.

This Action Statement requires that pilot cell electrolyte level and float voltage be verified to meet the Category C Allowable Limits within 1 hour. This check will provide a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cells. One hour is considered a reasonable amount of time to perform the required verification.

The Action Statement further requires verification that the Category C Allowable Limits are met. This provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the required verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable.

Continued operation is only permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. With the consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable prior to declaring the battery inoperable.

Change 2:

Technical Specification Action Statement c. to LCO 3.8.2.5 is being re-numbered as b.

Change 3

Technical Specification Surveillance requirements contained in section 4.8.2.5.2 parts a.1 through a.4 are replaced as follows:

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.

This surveillance requirement verifies that Category A battery cell parameters meet the intent of IEEE-450, which recommends regular battery inspections including voltage and specific gravity.

The requirement to verify terminal voltage has been modified to specify that the verification will be done while on float charge. Verifying the battery terminal voltage while on float charge helps ensure the effectiveness of the charging system and the ability of the battery to perform its intended function. Float charge is the condition where the charger is supplying the continuous charge

required to overcome the internal losses of a battery (or battery cell) and maintain the battery (or battery cell) in a fully charged state.

Change 4

Technical Specification Surveillance requirements contained in section 4.8.2.5.2 part b are replaced as follows:

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

This surveillance requirement, the quarterly inspection of specific gravity and voltage, is consistent with IEEE-450. In addition, requirements were added that within 24 hours of a battery discharge or a battery overcharge, the battery must be demonstrated to meet Category B limits. This inspection is also consistent with IEEE-450, which recommends special inspections following a severe discharge or overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such discharge or overcharge. Other requirements of the quarterly surveillance, which are not specifically required following battery discharge or overcharge conditions, have been split out into a separate 92-day surveillance requirement.

Change 5

Technical Specification Surveillance requirements contained in section 4.8.2.5.2 part c. is replaced as follows:

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 resistance limits established for this surveillance requirement and the requirement contained in Change 6 below are based on not exceeding the realistic values established by the battery manufacturer and PSEG Nuclear for any individual connection, while also ensuring that the total battery connection resistance does not exceed an established maximum value. The value for the maximum total battery connection resistance is restricted to assure that the required loads will have adequate terminal voltage under blackout, blackout plus accident, and station blackout (SBO) conditions. The total battery connection resistance is defined as the resistance of all inter-cell connections (including bus bars), all inter-tier connections (including cable resistances) and all field cable terminal connections at the battery. This surveillance, which can detect conditions that can cause power losses due to resistive heating, is to be conducted quarterly, a frequency which is considered acceptable based on operating experience related to detecting corrosion trends. The resistance measurement surveillance will also be performed at a 12-month interval.

Another new surveillance requirement, added to the quarterly surveillance, requires verification that the average temperature of representative cells is $\geq 65^0$F. This is consistent with a recommendation of IEEE-450, which states that the temperature of electrolytes in representative cells should be determined on a quarterly basis.

Lower than normal temperatures act to inhibit or reduce battery capacity. This Surveillance requirement ensures that the operating temperatures remain within an acceptable operating range. This limit is based on the minimum temperature assumed in Salem's Station Blackout (SBO) coping time calculations and is more conservative than manufacturer's recommendations.

Change 6

Technical Specification Surveillance requirements contained in section 4.8.2.5.2 part d is renumbered as f. and a new 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.

Change 7

Technical Specification Surveillance requirements contained in section 4.8.2.5.2 part e is renumbered as g. and a new 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.

Change 8:

New Technical Specification Surveillance requirement 4.8.2.5.2.g (old 4.8.2.5.2.e) is revised to reflect the renumbering of Specification 4.8.2.5.2.d to new Specification 4.8.2.5.2.f.

Change 9

Technical Specification Surveillance requirements contained in section 4.8.2.5.2 is amended by adding new sections h. and i. 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.

New surveillance requirements are added which require that the battery performance test be conducted at a 12 month interval if the battery shows degradation or has reached 85% of its expected life with a capacity less than 100% of manufacturer's rating. Degradation is indicated, according to IEEE-450, 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. However, if the battery shows no degradation but has reached 85% of its

expected life and still retains at least 100% capacity, then the frequency will be reduced to 24 months. The addition of these more frequent surveillance requirements is consistent with the recommendations of IEEE-450. These increased surveillance frequencies provide improved monitoring of battery performance and are sufficient to identify trends in battery degradation.

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

Table 4.8.2.5-1 is added and delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designated pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity are representative of the state of charge of the entire battery.

The Category A limits specified for electrolyte level are based on manufacturer's recommendations and are consistent with the guidance in IEEE-450, with the extra 1/4 inch allowance above the high electrolyte level indication for operating margin to account for temperatures and charge effects. In addition to this allowance, footnote (a) to Table 4.8.2.5-1 permits the electrolyte level to be above the specified maximum level during equalizing charge, provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions.

The Category A limit specified for float voltage is $\geq$ 2.13 V per cell. This value is based on the recommendation of IEEE-450, which states that prolonged operation of cells < 2.13 V can reduce the life expectancy of cells.

The Category A limit for specific gravity for each pilot cell is $\geq$ 1.195 (0.020 below the manufacturer fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity.

The specific gravity readings are corrected for actual electrolyte temperature and when electrolyte level corrections are performed, in accordance with IEEE-450. For each 3^{o}F (1.67 ^{o}C) above 77 ^{o}F (25 ^{o}C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3 ^{o}F below 77 ^{o}F. The specific gravity of

the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation. When water is added to a cell to correct for low electrolyte level, the specific gravity in the cell will decrease. Footnote (b) to Table 4.8.2.5-1 requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging is < 2 amps on float charge. This current is based on manufacturer's recommendations, and in general, provides an indication of overall battery charge.

Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. IEEE-450 recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours. A stabilized charger current is an acceptable alternative to specific gravity measurement for determining the state of charge of the designated pilot cell. This phenomenon is discussed in IEEE-450. Footnote (c) to Table 4.8.2.5-1 allows the float charge current to be used as an alternate to specific gravity for up to 7 days following a battery equalizing recharge.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any cell that may be bypassed.

The Category B limits specified for electrolyte level and float voltage are the same as those specified in Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.190 (0.025 below the manufacturer's fully charge, nominal specific gravity) with the average of all connected cells ≥ 1.200 (0.015 below the manufacturer's fully charged nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell will not mask overall degradation of the battery. Footnote (b) to Table 4.8.2.5-1 requires correction of specific gravity for electrolyte temperature and level. This level correction is not required when battery charging current is < 2 amps on float charge.

Category C defines the Allowable Limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety. When any battery parameter is outside the Category C Allowable Limit, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

The Category C Allowable Limit specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C Allowable Limit for float voltage is based on IEEE-450, which specifies that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, is indicative of internal cell problems and requires cell attention. The

Category C Allowable Limit of average specific gravity ≥ 1.190 is based on manufacturer recommendations (0.025 below the manufacturer's recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must not be more than 0.020 below the average of all connected cells. This limit ensures that the effect of a highly charged or new cell does not mask overall degradation applicable to Category A, B and C specific gravity.

REASON FOR THE PROPOSED CHANGES

NUREG-1431, Rev. 1 (Standard Technical Specifications Westinghouse Plants, April 1995) provides more specific battery cell parameters than the current Salem Technical Specifications, which can be used to establish overall battery acceptability. Use of these parameters provides 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 requirements. NUREG-1431 also provides additional surveillance requirements to allow for improved monitoring of battery capabilities and status. The improved monitoring will increase overall reliability and allow for more meaningful evaluation of battery condition. The proposed changes are consistent with a change previously granted to Salem Units 1 and 2 for the 125 VDC batteries. (Amendments Nos. 177/158)