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PSEG
Nuclear LLC

10 CFR 50.90

MAR 29 2010

LR-N10-0098
LAR S10-03

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Salem Generating Station –Unit 2
Facility Operating License No. DPR 75
NRC Docket No. 50-311

Subject: **License Amendment Request – One-Time On-Line Safety-Related Battery Replacement**

In accordance with the provisions of 10 CFR 50.90, PSEG Nuclear, LLC (PSEG) hereby requests an amendment of the Technical Specifications (TS) for the facility operating license listed above.

This license amendment request proposes changes to TS Surveillance Requirements (SR) to allow a one-time replacement of the Salem Unit 2 2C 125VDC battery while at power. Specifically, SR 4.8.2.3.2 f and g would be revised, on a one time basis, to permit battery testing in a non-shutdown condition. The proposed one-time change is necessary to support the on-line replacement of the existing 2C battery with a new battery tested in accordance with the SR 4.8.2.3.2 f and g.

During Refueling Outage 2R17 the Unit 2 2C 125VDC Battery discharge test, performed on November 2, 2009, identified a battery degradation; a capacity of 88.2% was measured when tested per TS requirements. The battery is operable in accordance with Technical Specification 3/4.8.2.3, since the capacity is greater than 80%. However, since the measured capacity is less than 90%, the 2C 125VDC battery is considered degraded. TS SR 4.8.2.3.2.h states that the battery must be tested 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 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 the previous performance test, or is below 90% of manufacturer's rating.

Since the 2C 125VDC battery discharge test performed on November 2, 2009, identified a battery degradation, the next surveillance test is due within 12 months and is required to be performed during shutdown. To avoid a mid-cycle shutdown for this surveillance testing, PSEG proposes to replace the 2C battery (note that by replacing the battery SR 4.8.2.3.2h

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will no longer be applicable; instead the replacement (new) battery will need to be tested to SR 4.8.2.3.2 f and g). To accomplish the battery replacement on-line, PSEG proposes to install a temporary 125VDC battery that meets the requirements for TS operability, including all required surveillance testing. During the currently Allowed Outage Time (AOT) of TS 3.8.2.3 ACTION a, the temporary battery would be placed in service. The existing 2C battery would then be replaced with all new cells that have been tested in accordance with the required TS surveillances, and then returned to service during a subsequent AOT of TS 3.8.2.3 ACTION a. To perform the required surveillances for TS operability of the batteries (temporary and replacement), SR 4.8.2.3.2 f and g need to be revised, on a one time basis, to permit testing in a non-shutdown condition. Note that the batteries will not be connected to the safety related vital bus during the required testing.

PSEG has determined that this LAR does not involve a significant hazard consideration as determined per 10 CFR 50.92. PSEG's technical and regulatory evaluation of this LAR and the TS changes are provided in Attachments 1 and 2. There are no regulatory commitments in this submittal.

PSEG requests approval of this LAR no later than September 1, 2010. Once approved, the amendment will be implemented within 30 days from the date of issuance.

These proposed changes have been reviewed by the Plant Operations Review Committee. In accordance with 10 CFR 50.91, "Notice for Public Comment; State Consultation," a copy of this application, with attachments, is being provided to the designated State Official.

Should you have any questions regarding this submittal, please contact Mr. Jeff Keenan at (856) 339-5429.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 3/29/2010
(Date)

Sincerely,

Carl J. Fricker
Site Vice President - Salem

Attachments (3)

CC

S. Collins, Regional Administrator - NRC Region I
R. Ennis, Project Manager - USNRC
NRC Senior Resident Inspector - Salem
P. Mulligan, Manager IV, NJBNE
Commitment Coordinator – Salem
PSEG Corporate Commitment Manager

Salem Generating Station –Unit 2
Facility Operating License No. DPR 75
NRC Docket No. 50-311

License Amendment Request (LAR) S10-03
One-Time On-Line Safety-Related Battery Replacement

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1.0 DESCRIPTION

This license amendment request proposes changes to Technical Specification (TS) Surveillance Requirements (SR) to allow a one-time replacement of the Salem Unit 2 2C 125VDC battery while at power. Specifically, SR 4.8.2.3.2 f and g would be revised, on a one time basis, to permit battery testing in a non-shutdown condition. The proposed one-time change is necessary to support the on-line replacement of the existing 2C battery with a new battery tested in accordance with the SR 4.8.2.3.2 f and g.

During Refueling Outage 2R17 the Unit 2 2C 125VDC battery was determined to be degraded by the discharge testing performed on November 2, 2009; a capacity of 88.2% was measured when tested per TS requirements. The battery is operable in accordance with Technical Specification 3/4.8.2.3, since the capacity is greater than 80%. However, since the measured capacity is less than 90%, the 2C 125VDC battery is considered degraded. TS SR 4.8.2.3.2h states that the battery must be tested 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 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 the previous performance test, or is below 90% of manufacturer's rating.

Since the 2C 125VDC battery was determined to be degraded by the discharge testing performed on November 2, 2009, the next surveillance test is due within 12 months and is required to be performed during shutdown. To avoid a mid-cycle shutdown for this surveillance testing, PSEG proposes to replace the 2C 125VDC battery[1]. Note that by replacing the battery SR 4.8.2.3.2.h will no longer be applicable; instead the replacement (new) battery will need to be tested to SR 4.8.2.3.2 f and g. To accomplish the battery replacement on-line, PSEG proposes to install a temporary 125VDC battery that meets the requirements for TS operability, including all required surveillance testing. During the currently Allowed Outage Time (AOT) of TS 3.8.2.3 ACTION a, the temporary battery would be placed in service. The existing 2C battery would then be replaced with all new cells that have been tested in accordance with the required TS surveillances, and then returned to service during a subsequent AOT of TS 3.8.2.3 ACTION a. To perform the required surveillances for TS operability of the batteries (temporary and replacement), SR 4.8.2.3.2 f and g need to be revised, on a one time basis, to permit testing in a non-shutdown condition. (Note that all other required TS testing will also be completed before either the temporary or new 2C battery is declared operable, and that the batteries will not be connected to the safety related vital bus during the required testing.)

2.0 PROPOSED CHANGE

SR 4.8.2.3.2 f and g will be revised, on a one time basis, to permit testing in a non-shutdown condition by addition of an explanatory note (*):

f. At least once per 18 months, **during shutdown***, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

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1 PSEG intends to complete the battery replacement by November 2, 2010. However, as a contingency, the allowances of TS 4.0.2 may be utilized (allowing a 25% extension to the SR 4.8.2.3.2.h due date), which would allow completion of the replacement to be extended until February 1, 2011.

g. At least once per 60 months, **during shutdown***, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. Satisfactory completion of this performance discharge test shall also satisfy the requirements of Specification 4.8.2.3.2.f if the performance discharge test is conducted **during a shutdown*** where that test and the battery service test would both be required.

This battery surveillance may be performed, as required, associated with a one-time replacement of station battery 2C when the unit is not shutdown. This testing shall be done when the battery is disconnected from the 2C DC bus. This testing must be completed by February 1, 2011.

3.0 BACKGROUND

3.1. 125VDC Battery Design / Fall 2009 Testing

Three 125VDC batteries (2A, 2B and 2C) are provided for Salem Unit 2 to supply an independent source of control power for each of the three 4160-V and 460-V vital buses and for the 125VDC distribution cabinets. The station DC systems provide a continuous source of power for operation of circuit breakers, valve controls, inverters, etc. No initiation or control is required to connect the batteries to the DC buses. Each 125VDC battery is connected to its associated switchgear through a disconnect switch and protective fuses. A static battery charger is provided for each battery, and a ground detection system and undervoltage alarm relay for each bus. Each charger maintains a floating charge on its associated battery, and is capable of supplying the required equalizing charge when necessary.

The batteries are mounted on corrosion-resistant, seismically designed steel racks in separately ventilated and isolated areas. The 125VDC batteries are rated 2320 ampere hours, respectively, at the 8-hour rate of discharge. Each battery consists of 60 cells contained within two racks (30 cells per rack).

During normal operation, the DC load is fed from the battery chargers with the batteries floating on the system. Upon loss of DC power from a battery charger, the DC load is drawn from the batteries. The batteries are sized for 2 hours of operation after a Loss of Offsite Power (LOOP) concurrent with a LOCA, based upon the required operation of the DC emergency equipment. The batteries are also sized for 4 hours of operation following a Station Blackout (SBO). If offsite power is lost, the battery chargers are energized from the emergency diesel generators and resume their function automatically.

The Unit 2 2C 125 VDC Battery, located in the Unit 2 Elevation 64 foot Switchgear room, showed signs of degradation when tested during the Fall 2009 Refueling Outage (2R17). The 2C battery was tested twice during the outage, per SR 4.8.2.3.2g, a 60 month performance test. The first test, performed on October 15, 2009, achieved a capacity of 85.3%. Following the first test 28 cells were replaced (the maximum number of cells that could be procured) and a second test was performed on November 2, 2009, resulting in a measured a capacity of 88.2%.

The battery is operable in accordance with Technical Specification 3/4.8.2.3, since the capacity is greater than 80%. However, since the measured capacity is less than 90%, the

2C 125VDC battery is considered degraded per Salem TS and IEEE Standard 450. TS SR 4.8.2.3.2 h states that the battery must be tested 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 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 the previous performance test, or is below 90% of manufacturer's rating. Since the 2C 125VDC battery was determined to be degraded by the discharge testing performed on 11/2/09, the next surveillance is due within 12 months and is required to be performed during shutdown per the current SR requirements.

3.2. TS Amendment Options

Even though 28 cells were replaced during 2R17, battery capacity could not be increased to 90% or greater that would have permitted continued testing per the 60 month SR requirement (SR 4.8.2.3.2g). PSEG evaluated two possible licensing options to avoid an unscheduled shutdown of Unit 2 (within 12 months of November 2, 2009) to perform the required 12 month surveillance:

1. Request relief from the 12 month testing requirement (i.e., an extension to 18 months coincident with the next refueling outage)

Since the 12 month test requirement is contained in IEEE 450, and the 2C battery meets the technical specification definition of degraded, and the nature and magnitude of degradation cannot be demonstrated through any other testing, relief from the 12 month test requirement was not considered a viable solution. No regulatory precedent could be found of this type of relief being granted by the NRC.

2. Request relief from the requirement of testing only during shutdown, permitting on-line replacement

The NRC has granted relief on previous occasions to perform on-line battery replacement and testing. Precedents include Braidwood Amendment 99 (ADAMS ML021820479), Indian Point Unit 3 Amendment 208 (ADAMS ML011990082), and Duane Arnold Amendment 247 (ADAMS ML022280041). The PSEG proposed methodology for accomplishing the battery replacement and testing, discussed below and in Section 4, provides for a fully tested and Technical Specification operable temporary battery thereby precluding the need to perform a PRA analysis if a non-Technical Specification operable (i.e., only 'available') temporary battery were used.

3.3. Testing / Replacement Proposed Course of Action

PSEG evaluated several options for testing and replacing the 2C battery. To ensure that the process was done with the highest level of safety and lowest risk it was concluded that all the cells of the 2C battery should be replaced. Replacing all the cells with fully qualified, fully tested new cells all at one time ensures the new battery capacity and battery cell parameters will be known prior to installation. This method will require a 60 cell temporary battery (see discussion below). Two entries into the two hour AOT of TS 3.8.2.3 ACTION (a) will be required. This approach (replacing all cells in the battery at one time) provides assurance that the replacement battery will meet capacity requirements and technical specification battery cell parameter requirements.

The on-line replacement and testing the 2C battery will require a temporary battery to be connected to the 2C 125VDC bus. Temporary battery chargers will also be required to recharge and maintain both the temporary battery and the replacement 2C battery prior to placing either in service. Due to the compressed time schedule for obtaining a license amendment, providing backup power to the 2C 125 VDC bus with a fully qualified, fully tested, TS operable temporary battery (versus an 'available' battery) was considered the safe, prudent option. Use of a non-Technical Specification operable battery (i.e., 'available') would require a PRA evaluation for the period when the available battery was in service. The temporary battery will be designed and installed to meet the existing 2C battery design requirements.

4.0 TECHNICAL ANALYSIS

The temporary 2C 125VDC battery will be installed on the west side of the Unit 2 Elevation 64' 4160 Volt Switchgear Room, between the existing 2C 125VDC Battery Room and west wall. Due to physical constraints, the temporary battery will be set with the two racks next to each other instead of facing each other as is the configuration for the existing 2C 125VDC battery in the 2C battery room. The existing 2C 125VDC battery cells are arranged in two tiers of 30, with the upper tier behind the lower tier. The same two tier arrangement will be used for the temporary battery. In order to connect the temporary battery to the 2C 125VDC Bus, temporary cables will be connected from the temporary 2C 125VDC Battery to the permanent cables feeding the 2C 125VDC Battery. A temporary battery charger will be placed and secured on the north-west corner of the Unit 2 Elevation 64' 4160 Volt Switchgear Room, to recharge and maintain the charge of the temporary 2C 125VDC battery until the battery is connected to the 2C 125VDC bus (See Figure 1 below).

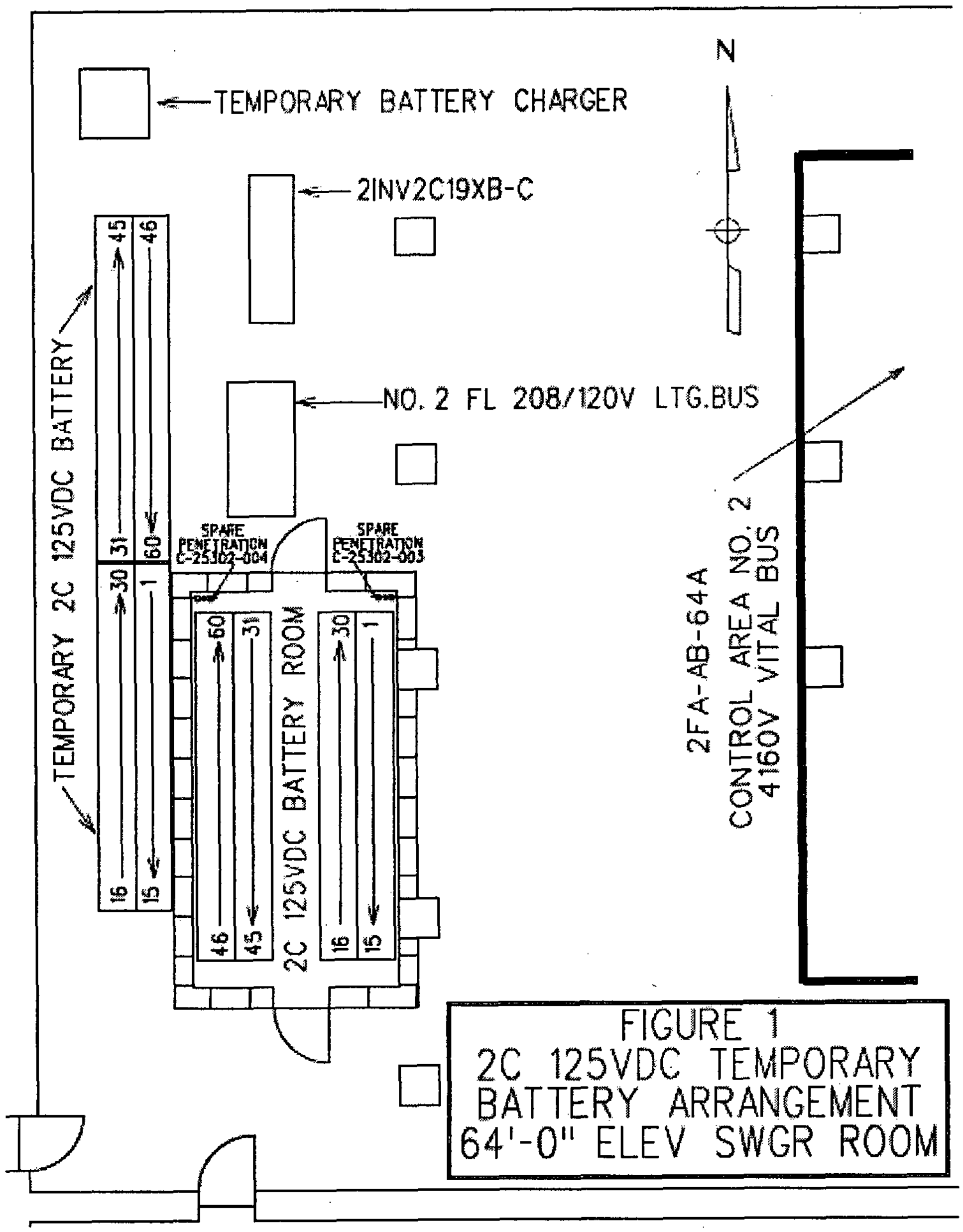
TEMPORARY BATTERY CHARGER
2INV2C19XB-C
N
NO. 2 FL 208/120V LTG.BUS
TEMPORARY 2C 125VDC BATTERY
SPARE PENETRATION
SPARE PENETRATION
2C 125VDC BATTERY ROOM
2FA-AB-64A
CONTROL AREA NO. 2
4160V VITAL BUS
FIGURE 1
2C 125VDC TEMPORARY
BATTERY ARRANGEMENT
64'-0" ELEV SWGR ROOM

Figure 1

During the currently Allowed Outage Time (AOT) of TS 3.8.2.3 ACTION (a), the TS operable temporary 2C 125VDC battery would be connected to the 2C 125 VDC bus. The existing 2C battery would then be replaced with all new cells, and tested in accordance with the required TS surveillances. Then the 2C 125VDC battery will be returned to service during a subsequent AOT of TS 3.8.2.3 ACTION (a).

To ensure the temporary battery and the overall replacement process comply with the necessary requirements, the following areas were evaluated to support the proposed change (note: each sub-section below has its own list of references).

4.1. Design Parameters – Temporary Battery

The satisfactory operation of the 125VDC system during operation with the temporary battery depends upon the temporary battery meeting the same parameters as the existing 2C 125VDC battery. These parameters are as follows:

Capacity

The temporary 2C 125VDC battery will be sized to the requirements of the existing 2C 125VDC battery per PSEG calculations ES-4.003 (Reference 1), ES-4.004 (Reference 2) and ES-4.006 (Reference 3). This will ensure that the temporary battery is sized in accordance with IEEE standards IEEE-308 (Reference 4) and IEEE-485 (Reference 5). Thus, the capacity of the temporary battery is large enough to handle the maximum design loads for design basis events such as Loss of Coolant Accident (LOCA) concurrent with a LOOP, and a Station Blackout (SBO). This also ensures that the temporary battery meets NRC regulations, industry standards and site Technical Standards. Key design elements of the temporary battery are:

1. The temporary 2C 125VDC battery will be type LCR-33 manufactured by C&D Power Systems. The existing 2C 125 VDC battery is also type LCR-33 manufactured by C&D.

2. The C&D LCR-33 batteries have sixteen positive plates per cell and have 60 cells.

3. The internal resistance of the temporary battery is 0.006 ohms.

4. The load values used to determine the load profiles are from calculation ES-4.006

5. The design margins of 7.5% and 5% are applied to LOCA/LOOP and SBO battery profiles respectively.

6. The minimum allowable electrolyte temperature is 65°F, which corresponds to a correction factor of 1.08 per IEEE-485. Assumption 5.4 of calculation ES-4.004 assumes the Battery room temperature remains above 65°F during the postulated events (including SBO). This assumption is also valid for the 4160 Volt Switchgear Room temperature, since the minimum temperature is 65°F as maintained by the Switchgear and Penetration Area Ventilation (SPAV) System (see Section 4.4).

7. Although the temporary battery will be installed for a limited period, the battery is sized with a 1.25 capacity factor, which is normally used to account for aging.

8. The duty cycle for the temporary battery, from PSEG Calculation ES-4.003, is identical to the existing 2C 125VDC battery and addresses loading during Normal Operation, LOCA/LOOP, and SBO load profiles.

Maximum and Minimum Voltage

The existing 2C 125VDC Battery charger maintains the 125VDC System float voltage between 132VDC and 135VDC, such that the maximum and minimum voltage at the load terminals is within the design rated voltage per calculation ES-4.006. The available voltage at each panel during various periods of battery duty cycle is lower than the calculated voltage from PSEG calculation ES-4.003 due to the addition of the temporary 500 MCM cable to the temporary 2C 125VDC battery. However, this is acceptable since the length of the temporary cable will be sized to ensure that the available voltages at the DC panels are still higher than the required voltages per calculation ES-4.003 with the exception of circuit 36 of Panel 2CCDC. This is an existing condition, which was previously determined to be acceptable in the calculation as this circuit is for annunciation only and is not a safety function.

The battery voltage profile is based on calculation ES-4.003 section 3.2, which addresses Normal Plant Operation, LOOP, LOCA and SBO in accordance with IEEE-308, Reg Guide 1.155 (Reference 6) and NUMARC 87-00 (Reference 7).

Short Circuit Current

Calculation ES-4.003 evaluates the short circuit (SC) currents on the 125VDC System and ensures that the available fault currents do not exceed the design interrupting rating of the protective devices. The SC currents are calculated for faults from the battery down three levels or to the load, whichever occurs first. Level 1 being the 2C 125VDC bus (fault #1); Level 2 is the 125 VDC Distribution Cabinets 2CCDC (fault #2) and 2CDC (fault #3); and Level 3 being Distribution Cabinets 2CDCDG (fault #4) and 2ASDS (fault #5). The fault currents past this level are below 3,000 Amps and well within the interrupting rating of the protective devices, which the minimum interrupting rating is 10,000A. Battery contribution is based on an internal voltage of 2.00 Volts Per Cell (VPC) per IEEE-946 (Reference 8).

Calculation ES-4.003 indicates that the maximum short circuit currents are well within the interrupting capacity of the interrupting devices. The fault current values will be further reduced with the added impedance of the temporary 500 MCM cable to the temporary 2C battery.

Conclusions

The temporary battery will meet the requirements of calculations ES-4.003, ES-4.004 and ES-4.006. This ensures that the temporary battery meets NRC regulations, industry standards and PSEG Technical Standards.

Section 4.1 References

1. ES-4.003, 125 Volt DC Short Circuit And System Voltage Drop Calculation
2. ES-4.004, 125V DC Battery and Battery Charger Sizing Calculation
3. ES-4.006, 125 Volt DC Component Study and Voltage Drop Calculation
4. IEEE-308, IEEE Standard Criteria for Class 1E Power Systems for Nuclear

power Generating Stations
5. IEEE-485, IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications
6. Reg Guide 1.155, Station Blackout
7. NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors.
8. IEEE-946, IEEE Recommended Practice for the Design of DC Auxiliary Power Systems for Generating Stations.

4.2. Connection - Temporary battery

The cables and conduits used to connect the temporary batter to the 2C 125VDC bus will be seismically installed, meet the Salem electrical separation criteria and Appendix R separation requirements and account for voltage drop as discussed below:

1. The temporary 2C 125VDC battery cable and raceway installation will ensure there is physical separation in order to minimize the probability of simultaneous failure of redundant onsite power circuits as required under 10CFR50 General Design Criteria (GDC) 17 (Reference 1), Regulatory Guide 1.32 (Reference 3) and IEEE-308 (Reference 2). This is accomplished through the implementation of the following PSEG Technical Standards:

   1.1. SC.DE-TS.ZZ-2032, Physical Separation Requirements (Reference 4)
   1.2. NC.DE-TS.ZZ-2043, Cable Management System (Reference 5)
   1.3. SC.DE-TS.ZZ-2034, Technical Requirements for Construction of Electrical Installation (Reference 6)

2. The temporary cable to the temporary 2C battery will be 2-1/C 500 MCM in order to match the current configuration. The temporary cable will also be designed in accordance with E-1000-01 (Reference 7) and specification A-0-ZZ-EDS-0227 (Reference 8).

3. The location of the temporary battery will allow the temporary cable length to be minimized to ensure acceptable voltage drop as discussed in Section 4.1 (Reference 9 and 10).

4. Temporary cable will be routed in rigid metal conduit through existing penetrations in the 2C 125VDC battery room and connected to the permanent battery cables.

5. The installation will be in accordance with PSEG Technical Standards to ensure proper installation and design considerations (Reference 11, 12, 13 and 14)

The temporary 2C 125VDC battery cable and raceway will be installed in accordance with PSEG Technical Standards, to meet design requirements and to ensure the requirements under General Design Criteria (GDC) 17, Regulatory Guide 1.32 and IEEE-308 are met.

Section 4.2 References

1. 10CFR50, General Design Criteria (GDC) 17
2. IEEE-308, IEEE Standard Criteria for Class 1E Power Systems for Nuclear power Generating Stations
3. Regulatory Guide 1.32,
4. SC.DE-TS.ZZ-2032, Physical Separation Requirements
5. NC.DE-TS.ZZ-2043, Cable Management System
6. SC.DE-TS.ZZ-2034, Technical Requirements for Construction of Electrical Installation
7. E-1000-01 Sheet 13, Salem Cable Designation List
8. A-0-ZZ-EDS-0227, Class 1E 600V Power Cable For Use At SNGS & HCGS
9. ES-4.003, 125 VOLT DC SHORT CIRCUIT AND SYSTEM VOLTAGE DROP CALCULATION
10. ES-4.006, 125 VOLT DC COMPONENT STUDY AND VOLTAGE DROP CALCULATION
11. SC.DE-TS.ZZ-4706, Design Analysis for New and Modified Electrical Raceway Supports using SQUG GIP Methodology
12. ND.DE-TS.ZZ-2022, Power Cable Ampacity
13. ND.DE-TS.ZZ-2908, Electrical Load Control
14. SC.DE-TS.ZZ-2039, Cable Termination Methods Salem Generating Station

4.3. Seismic Installation - Temporary Battery

The temporary 2C 125VDC battery, with 60 cells (C&D LCR-33), and two battery racks will be designed, constructed and installed to the same seismic requirements of the existing 2C 125VDC battery and battery rack.

The existing 2C 125VDC Battery is Seismic Class 1 and safety-related. It is located in the Switchgear room on floor elevation 64' of Salem Unit 2 Auxiliary Building. Seismic qualification for the existing 2C 125VDC battery was provided in the C&D Power Systems Report QR2-27504 as documented in PSEG Vendor Technical Document (VTD) 316921 (Reference 1). It was seismically tested and qualified to a conservative level (Zero Period Acceleration=1.4g) that is much higher than the Salem site requirement (Zero Period Acceleration=0.22g) (Reference 2). The Test Response Spectra (TRS) completely envelop the Salem Required Response Spectra (RRS) at all test frequencies. The anchorage for the existing 2C installed rack was installed to the requirements of Reference 3, meeting the required seismic criteria.

The temporary 2C 125VDC Battery will be located on the same floor elevation (64 foot) inside the 4160 Volt Switchgear Room between the existing battery room and the Auxiliary Building west wall. Seismic qualification requirements included in Reference 2 for the existing 2C 125VDC battery will be met for the temporary 2C 125VDC battery and racks.

The temporary 2C 125VDC battery/battery rack will be supplied and qualified to the same seismic qualification requirements and installed in accordance with approved procedures. The temporary battery/battery rack will meet the seismic design anchorage requirements of the existing 2C 125VDC battery. Therefore, the temporary battery/battery rack will meet the same seismic requirements of the existing 2C 125VDC battery.

Section 4.3 References

1. VTD 316921 (includes C&D Power Systems Report QR2-27504, June 15, 1984 and PSEG Equivalent Replacement Evaluation from DCP 1E0-2350).
2. Salem Technical Standard SC.DE-TS.ZZ-4201(Q), Rev. 2 "Salem Structural Design Criteria".
3. PSEG Technical Standard NC.DE-TS.ZZ-4502(Q), Rev. 0, "Technical Standard, Analysis and Design of Anchorages and Base Plates"

4.4. Ventilation – Temporary Battery

An evaluation of the ventilation for the Unit 2 Elevation 64' 4160 Volt Switchgear Room was performed to determine the hydrogen concentration with the temporary battery, and compare it to the maximum allowable concentration of 2% (Reference Branch Technical Position (BTP) APCSB 9.5-1 Appendix A – see Section 4.6). Additionally the room temperature was determined, and compared to the room and battery design limits.

Design and Operation Background

The Switchgear and Penetration Area (SPAV) System consists of three supply fans, two Switchgear exhaust fans, two Penetration Area exhaust fans and the Battery Room exhaust fan. Normally the following fans are running: two supply fans, one Switchgear exhaust fan, two Penetration Area exhaust fans and the Battery Room exhaust fan.

The existing 2C 125VDC Battery Room is an enclosed room within the 4160 Volt Switchgear Room. Air is supplied from the Switchgear Room, and is exhausted via an independent duct and fan, thus preventing hydrogen generated within the Battery Room from entering the Switchgear Room. The hydrogen concentration is less than the maximum allowable of 2%, based on the maximum hydrogen generation rate (Reference 3).

When the SPAV supply temperature is greater than or equal to 75°F, the system operates in a once-through mode, with air supplied from the outside, through the SPAV rooms, and back outside. The SPAV System has a recirculation path that opens when the supply air temperature falls below 75°F. The outside air supply dampers and recirculation dampers then modulate to maintain supply air temperature between 65°F and 75°F. At 65°F supply air temperature, the outside air supply dampers go closed, and the system is in 100% recirculation (Reference 7).

Reference 9 allows the removal of a SPAV fan from service at outside air temperatures less than or equal to 80°F, based on the analysis performed in Reference 2. Reference 2 includes "design" cases where a single failure of a fan or vital bus is postulated and "maintenance" cases where a fan out of service is postulated in addition to a single failure. The maintenance cases are the bases for the 80°F limit in Reference 9.

General Methodology

A GOTHIC model of the Elevation 64' 4160 Volt Switchgear Room and 2C 125VDC Battery Room was developed to perform the analysis, based on an existing model of the SPAV System (References 1 & 2). Limiting design and maintenance cases from Reference 2 were considered for this evaluation.

Key inputs and assumptions are as follows:

1. The analysis assumes the temporary battery is centered between the west wall of the Switchgear Room and the 2C 125VDC Battery Room. The actual location with the battery up against the 2C 125VDC Battery Room wall has insignificant impact on the results.

2. The room volume from the existing model was sub-divided to determine the hydrogen dispersion throughout the room, with fine noding in the area of the temporary battery. Physical objects that could potentially impede hydrogen flow from the battery were modeled as blockages.

3. The 2C 125VDC Battery Room was modeled to account for the flow path from the Switchgear Room to this room. This room was modeled the same as that in the existing model, and assumes the doors are closed with the temporary battery generating hydrogen. In actuality there will be periods of time when the doors will be open with both the temporary and existing battery generating hydrogen. Thus there is a potential for additional hydrogen flow into the Switchgear Room from the Battery Room. This will not challenge the 2% maximum allowable concentration based on the following:

   a. As discussed later in this section, the maximum hydrogen concentration in the Switchgear Room (with the Battery Room doors closed) is less than 1/100 of the 2% maximum allowable. Even if it was conservatively assumed that both batteries were at the maximum generation rate with the doors open and that all the hydrogen generated by the existing battery entered the Switchgear Room, the maximum hydrogen concentration in the Switchgear Room would still be well less than 2%.
   b. At least part of the hydrogen generated by the existing battery will be exhausted through the Battery Room exhaust duct.

4. The maximum hydrogen generation rate is conservatively assumed for the entire duration of the GOTHIC transient runs. Furthermore, since the hydrogen generation rate increases with increasing temperature, the generation rate at the design room temperature of 110°F is conservatively assumed (5.39 ft^3/hr) (Reference 3).

5. Heat loads in the room (Reference 4) are modeled similar to the existing model, with an additional heat load for the temporary battery (Reference 1).

6. As discussed above, a single failure of a SPAV fan or vital bus was postulated for the analysis for all cases, in addition to a SPAV fan out of service for the maintenance cases. The supply air flows from the existing model for the limiting design and maintenance cases were assumed (Reference 2).

7. For the design cases, the supply air temperature is conservatively assumed to be 95°F. This bounds the maximum historical outside air temperature for the period when the temporary battery will be installed with an allowance for supply fan heat. For the maintenance cases, the supply air temperature is conservatively assumed to be 85°F. This bounds the maximum outside air temperature allowed by Reference 9, with an allowance for supply fan heat.

8. The individual supply and exhaust air flow paths were modeled in the sub-volumes where the associated registers are physically located.

9. The GOTHIC analysis was performed for the SPAV once-through mode only.

10. Following a loss of offsite power (LOOP) or loss of coolant accident (LOCA) in conjunction with a LOOP, loads get stripped, and vital loads are sequenced back on once the Emergency Diesel Generators (EDGs) start. A conservative time to restart the SPAV fans that bounds the actual time was assumed. Note: With respect to SPAV operation, there is no difference between LOOP and LOCA/LOOP. As such, "LOOP" cases from this point forward refers to both LOOP and LOCA/LOOP.

Two design cases were performed with just the temporary battery generating hydrogen: (1) limiting case with continuous air flow, i.e. with SPAV fans continually running; (2) limiting LOOP case where the SPAV fans are stripped from the vital bus and sequenced back on after the EDGs start. The results found that the peak hydrogen concentration in the Elevation 64' Switchgear Room is well below the maximum allowable of 2%. With continuous air flow, the peak concentration is 0.0093% directly above the battery; for a LOOP or LOCA/LOOP, the peak concentration is 0.015% directly above the battery. With the LOOP design case having the higher peak hydrogen concentration, the corresponding limiting maintenance LOOP case was also performed with just the temporary battery generating hydrogen. The results found that the peak hydrogen concentration in the Elevation 64' 4160 Volt Switchgear Room is 0.019%, still well below the maximum allowable of 2%.

Since both the temporary and existing battery could generate hydrogen at the same time, and the 2C 125VDC Battery Room door(s) could be open, the peak concentration could be up to twice as high as the above values, but still well below the maximum allowable of 2%. Therefore, the conservative peak hydrogen concentration for each case is as follows: 0.0186% (design case with continuous air flow); 0.030% (LOOP design case); 0.038% (LOOP maintenance case).

The peak room temperature is below the maximum design limit of 110°F (Reference 6) for all cases. For the design case with continuous air flow, the peak temperature is 105.5°F; for the LOOP design case, the peak temperature is 106.9°F. For the LOOP maintenance case the peak room temperature is 104.5°F.

Conservatively assuming no fan heat load and no heat load in the Switchgear Room, the minimum room temperature is 65°F as the SPAV System goes on 100% recirculation when the supply air temperature falls to 65°F. This is greater than the vendor recommended minimum temperature for the battery of 60°F (Reference 5) and equals the assumed temperature in the battery calculation (Reference 8). Therefore the minimum design room temperature is satisfied.

Note that these results are based on the SPAV System operating in the once-through mode. Operation in the recirculation mode will result in a continuing increase in hydrogen concentration. No analysis was performed with the SPAV System in the recirculation mode. Regardless of the SPAV operating mode, periodic monitoring of the hydrogen concentration will be performed with appropriate contingency actions in place, as discussed in Section 4.6 and 4.7.

Section 4.4 References

1. S-2-CAV-MDC-1784, Revision 0, Salem Unit 2 - Switchgear and Penetration Area Ventilation System (SPAVS) - GOTHIC Model

2. S-2-CAV-MDC-1783, Revision 1, Maximum Temperature in Areas Served by SPAVS

3. S-2-CAV-MDC-0689, Revision 1, Unit 2 – Battery Room Hydrogen Generation/ Ventilation Calculation

4. ES-50.006, Revision 3, Electrical Heat Loads, Salem Unit 1, Vital Bus, Room, Elevation 64'.

5. VTD 309448, Revision 7, Standby Battery Flooded Cell Installation & Operating Instructions

6. S-2-E000-EEE-0891, Revision 4, Ambient Temperature in the Salem Unit 2 SPAV Areas

7. Technical Evaluation 70078698-0010, Update ICD for S1CAV-1TA7539C 1 Switchgear Room Ventilation Air Temperature Controller

8. ES-4.004, Revision 10, 125 Volt DC Battery and Battery Charger Sizing Calculation

9. Procedure S2.OP-SO.PC-0001, Revision 20, Switchgear and Penetration Areas Ventilation Operation

4.5. Missile Hazard – Temporary Battery

An evaluation was conducted of the missile hazards that could adversely impact the proposed temporary 2C 125VDC battery that will be located in the 4160 Volt Switchgear Room on the 64 foot elevation of the Salem Unit 2 Auxiliary Building. Potential missiles from rotating component overspeed failures, missiles originating from high-energy fluid system failures, and missiles caused by or as a consequence of gravitational effects were reviewed with respect to compliance with the 10 CFR 50, Appendix A, General Design Criterion (GDC) 4, which requires that structures, systems, and components (SSCs) important to safety "...shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit."

The results of the Internal Hazards Analyses (IHAs) of internally-generated missiles for SSCs in the original design of the Salem Auxiliary Buildings are documented in UFSAR Section 3.5.1 and in the Safety Evaluation Report (SER), Volume III, Section 3.5.1. Externally generated missiles are covered in UFSAR Sections 3.5.2, Tornado Missiles, and 3.5.4, Turbine Missile. Per the existing IHAs, external missiles cannot impact or impair the temporary 2C 125VDC battery in its proposed location in the 4160 Volt Switchgear Room inside the Auxiliary Building on the 64 foot elevation. Moreover, adverse gravitational effects due to falling objects are mitigated by the Seismic II/I design for SSCs inside the 4160 Volt Switchgear Room, which is located within the Seismic Category I Auxiliary Building. The light standards located above the temporary 2C 125VDC battery will be removed to prevent the possibility of their falling onto the battery.

The two rod control motor-generator sets, S2RCS-MG21 and S2RCS-MG22, are the only rotating components located inside the 4160 Volt Switchgear Room. They are situated approximately 50 and 70 feet distant from the proposed temporary 2C 125VDC battery location. Between the proposed temporary 2C 125VDC battery location and the two MG sets are two Marinite (calcium silicate) walls and the walls (concrete) of the existing 2C 125VDC Battery Room for approximately half the length of the proposed temporary 2C 125VDC battery. The angle of rotation for the two MG sets is 90 degrees from the direction of the proposed temporary 2C 125VDC battery. In addition, the MG sets are driven by synchronous motors. The Internal Hazards program specifically excludes synchronous motors from consideration of internally generated missiles (Reference 3). Ricocheting fragments are extremely unlikely to strike the temporary 2C 125VDC battery and, if they could, they would lack the energy to impart any damage. Missiles from the two rotating rod control MG-sets cannot damage or impair the temporary 2C 125VDC battery.

For Salem Unit 2, high energy piping systems are those that have a temperature above 200 degrees Fahrenheit or pressure above 275 psig during normal reactor operations. No high energy piping systems enter or pass through the 4160 Volt Switchgear Room located on the 64 foot elevation of the Auxiliary Building that will temporarily house the temporary 2C 125VDC battery. As such internally-generated missiles due to failures in high energy fluid systems cannot impact the 2C 125VDC battery in the 4160 Volt Switchgear Room. In addition, because there are no high energy piping systems within the 4160 Volt Switchgear Room, neither pipe whip nor jet impingement is of concern for the proposed temporary location of the temporary 2C 125VDC battery.

Moderate energy piping systems at Salem Unit 2 are those that are normally pressurized and have a maximum operating temperature of 200 degrees Fahrenheit or less and a maximum operating pressure of 275 psig or less. The only moderate energy piping systems located within the 4160 Volt Switchgear Room are (1) an alternate 12-inch Auxiliary Feedwater suction line from the Demineralized Water/Fire Protection system storage tanks that is dry, (2) a 1-inch Demineralized Water line that supplies an Eye Wash Station located just outside the south end of the 2C 125VDC Battery Room, and (3) Fire Protection (FP) preaction sprinkler piping that is dry and pressurized with air. In addition, a Fire Protection manual fire hose reel supply line (2FP229) is located at the southeast end of the 4160 Volt Switchgear Room. The FP piping is blocked along its full length by a metal L-shaped shroud. None of these moderate energy piping systems could generate an internal missile capable of damaging or impairing the temporary 2C 125VDC battery. Salem Design Change Package 80089591 (Reference 5) added floor drain piping (WD) and preaction sprinkler system (FP) piping to the 4160 Volt Switchgear Room as part of the Carbon Dioxide System Replacement project. The Internal Hazards Review did not consider WD piping as moderate energy piping because it flows by gravity and it is open to atmospheric pressure. The FP preaction sprinkler piping is also dry and is supervised with low air pressure so that if a head is damaged, the control room will be alerted and no water will be sprayed. The system is double interlocked to prevent spurious activation, requiring signals from both photoelectric (smoke) and thermal (heat) detectors for activation. Thus, neither the floor drain (WD) or the preaction sprinkler (FP) system piping can create internally-generated missiles that could impact or impair the proposed temporary 2C 125VDC battery.

In summary, there are no credible externally or internally-generated missiles that can damage or impair the temporary 2C 125VDC battery at its proposed location at the north end of the 4160 Volt Switchgear Room. The proposed temporary 2C 125VDC battery location is partially shielded by the walls of the existing 2C Battery Room to the east and by the 2-foot thick concrete boundary wall to the west on the 64 foot elevation of the Salem Unit 2 Auxiliary Building.

<u>Section 4.5 References</u>

1. Salem Generating Station UFSAR Section 3.5, Missile Protection
2. Salem Unit 2 Technical Specification 3/4.8.2.3
3. ND.DE-PS.ZZ-0010, Rev. 1, Internal Hazards Program
4. ND.DE-PS.ZZ-0010-A3, Rev. 0, Internally Generated Missile Methodology
5. Design Change Package 80089591, Rev. 2, Salem Unit 2 CO_2 Replacement

4.6. Fire Protection Temporary Battery

An evaluation was performed to ensure adequate fire protection requirements related to installation of the temporary battery supporting replacement of the 2C battery. Salem is committed to Appendix A to Branch Technical Position (BTP) APCSB 9.5-1 "Station Battery Rooms" which states:

> *"Battery Rooms should be protected against fire and explosions. Battery Rooms should be separated from each other and other areas of the plant by barriers having a minimum fire rating of three-hours inclusive of all penetrations and openings. Ventilation systems in the Battery Rooms should be capable of maintaining the hydrogen below 2%. Standpipe and hose, and portable extinguishers should be provided.*
>
> *Alternatives:*
>
> *(a) Provide a total fire rated barrier enclosure of the Battery Room complex that exceeds the fire load contained in the room.*
>
> *Or*
>
> *(b) Reduce the fire load to be within the fire barrier capability of 1-l/2 hours."*

Unlike the existing 2C 125VDC battery, it is not possible to place the temporary battery in a separate enclosed room that does not contain other plant equipment. The temporary battery will be located inside the 64 ft elevation 4160 Volt Switchgear room just outside the existing 2C battery room. The 2C battery room is inside the 4160 Volt Switchgear Room. The 4160 Volt switchgear room is separated from other areas of the plant by 3-hour fire walls and with fire doors that are rated at 1-1/2 hours. The 4160V Switchgear Room has a double-interlocked pre-action sprinkler system which provides full area coverage. The suppression system is actuated when a signal is received from an ionization (smoke) detector AND a thermal detector along with fused sprinkler heads. The suppression system will remain in service while the temporary battery is connected to the 2C 125VDC bus. In the event of an inadvertent actuation of the sprinkler system over the temporary battery, the temporary battery will be declared inoperable, and LCO 3.8.2.3 ACTION (a) would be applicable. The light standards located above the temporary 2C 125VDC battery will be removed to eliminate an ignition source. The installation of the temporary battery bank and temporary charger creates a slight increase in the combustible loading in the room but remains below 1-1/2 hours. The LCR-33 battery cells utilize a flame-retardant cover and a flame arrester vent which prevents external sparks from reacting with hydrogen inside the cells. Suspended positive plates permit free growth without pressure on the jar and cover. The location of the temporary battery within the 4160 Volt Switchgear Room does not alter the safe shutdown analysis. The existing safe shutdown analysis analyzes the 4160 Volt switchgear room with the assumption that the 2C 125VDC battery is lost due to a fire in the Switchgear Room. Therefore locating the temporary battery within the 4160 Volt Switchgear Room does not alter the safe shutdown analysis or operator response due to a fire in this area.

As discussed in the Section 4.4 of this LAR, a calculation was performed to determine the hydrogen concentration in the 4160 Volt Switchgear Room. This calculation determined that the maximum hydrogen concentration utilizing only the existing SPAV system would maintain the hydrogen concentration well below 2% when the SPAV system is operated in the once-through ventilation mode. As a conservative measure, administrative controls will be implemented consisting of periodic monitoring of local hydrogen concentration and ventilating the 4160 Volt Switchgear Room to reduce hydrogen concentration.

4.7. Operator Response

The replacement of the existing 2C 125VDC battery, and use of the temporary battery during the replacement to satisfy the 2C 125V distribution system operability, will have no adverse effects on operating the plant during normal or emergency operating conditions. Response time for implementation of any abnormal operating procedures or emergency operating procedures will not be impacted by the location of the temporary 2C 125VDC battery.

The temporary configuration change for the 2C battery replacement will provide guidance for operating the battery disconnect switch when connecting and removing the temporary 2C 125VDC battery.

The Switchgear and Penetration Area Ventilation (SPAV) system will be operated in its normal configuration during the 2C 125VDC battery replacement and use of the temporary 2C 125VDC battery. Due to the temporary battery being located outside the 2C 125V room and its exhaust system (see discussion in Sections 4.4 and 4.6), administrative controls will be established to monitor the 4160 Volt Switchgear area for hydrogen concentration to ensure the concentration remains less than 2%. Contingency actions will be established to block open doors and/or use additional ventilation if hydrogen concentration reaches 1%.

4.8. Installation and Testing

The 2C 125VDC performance discharge test must be performed on the replacement (new) 2C 125VDC battery and on the temporary battery while these battery banks are not connected to the 2C 125VDC bus. TS SR 4.8.2.3.2.f and 4.8.2.3.2.g will be satisfied by performing PSEG procedure SC.MD-FT.125-0003 (Reference 3) for the performance discharge test.

Initially when the two banks of new battery cells (120 cells) arrive at the site they will be staged temporarily in turbine building elevation 100' for inspection and performance discharge testing. One set of cells will be used as the temporary battery bank and one set of cells will be used as a replacement battery bank. Each 60 cell battery bank will be connected to a temporary battery charger.

A. While in the Turbine Building each bank will be tested as follows:

1. Each bank of cells will be inspected, measured for open cell voltage and connections will be checked by procedure SC.MD-ST.125-0005 (Reference 6) using a Digital Low Resistance Ohmmeter (DLRO) to ensure connection resistance satisfies SR 4.8.2.3.2.d.3.
2. The cells in each battery bank will be placed on float charge until each cells parameters meet the battery quarterly test procedure limits {Category B Limits of TS Table 4.8.2.3-1} as identified in SC.MD-ST.125-0003 (Reference 4) and as recommended in IEEE-450-2002.
3. Each battery will then be performance discharge tested independently in accordance with SC.MD-FT.125-0003 (Reference 3) to satisfy the requirements of SR 4.8.2.3.2.f and 4.8.2.3.2.g.
4. Following discharge testing each battery bank will be recharged and restored to operable conditions in accordance with SC.MD-FT.125-0003 to ensure SR 4.8.2.3.2.b and 4.8.2.3.2.c are met and as recommended in IEEE-450-2002.
5. The temporary battery bank and replacement bank will remain in the Turbine Building on float charge until ready to install in the 4160 Volt Switchgear Room.

B. The temporary battery will be re-located adjacent to the existing 2C 125VDC battery room in the 4160V Switchgear Room (see Figure 1 in Section 4.1) as follows:

1. The temporary battery will be installed in the seismically qualified racks (see Section 4.3).
2. The bus bar connections will be lubricated then connected to each cell in series and the tiers will be jumpered using appropriate sized jumpers. The connections will be torqued per Vendor Manual 309448 (Reference 1) and procedure SC.MD-CM.125-0004 (Reference 2).
3. Connections will be checked by procedure SC.MD-ST.125-0005 using a DLRO to ensure connection resistance satisfies SR 4.8.2.3.2.d.3.
4. The temporary battery will be re-connected to a temporary charger. The battery will be placed on float charge until stable and then the quarterly battery test will be performed per SC.MD-ST.125-0003 to ensure SR 4.8.2.3.2.b and 4.8.2.3.2.c are met and as recommended in IEEE-450-2002. Note: Completion of SC.MD-ST.125-0003 also satisfies SR 4.8.2.3.2.a

C. The temporary battery will be placed in service as follows (at no time will the 2C battery charger or bus be connected in parallel with the temporary battery charger):

1. Within the AOT of TS 3.8.2.3 ACTION (a), the existing 2C 125VDC battery will be isolated from the 2C 125VDC battery charger and bus by opening the disconnect switch between the bus and the 2C 125VDC battery.
2. The temporary battery will be disconnected from the temporary battery charger.
3. The leads from the existing 2C 125VDC battery will then be connected to the temporary cables connected to the temporary 2C 125VDC battery. A DLRO check will be performed on disturbed connections by performing SC.MD-ST.125-0005 to ensure connection resistance satisfies SR 4.8.2.3.2.d.3.
4. The temporary 2C 125VDC battery will then be connected to the 2C 125VDC battery charger and bus by closing the disconnect switch between the battery and the 125 VDC bus (See Section 4.2).
5. TS 3.8.2.3 ACTION (a) AOT will be exited.

D. At this point the temporary 2C 125VDC battery will be operable and the existing 2C 125VDC battery can be replaced as follows:

1. The existing 2C 125VDC battery (now disconnected) will be removed from the 2C Battery Room.
2. The replacement 60 cell battery will be relocated from the turbine building and installed in the 2C 125VDC Battery Room.
3. The bus bar connections will be lubricated then connected to each cell in series and the tiers will be jumpered using appropriate sized jumpers. The connections will be torqued per Vendor Manual 309448 (Reference 1) and procedure SC.MD-CM.125-0004 (Reference 2).
4. Connections will be checked by procedure SC.MD-ST.125-0005 using a DLRO to ensure connection resistance satisfies SR 4.8.2.3.2.d.3.
5. The replacement 2C battery will be re-connected to a temporary battery charger. The battery will be placed on float charge until stable and then the quarterly battery test will be performed per SC.MD-ST.125-0003 to ensure SR 4.8.2.3.2.b and 4.8.2.3.2.c are met and as recommended in IEEE-450-2002. Note: Completion of SC.MD-ST.125-0003 also satisfies SR 4.8.2.3.2.a

E. The replacement 2C 125VDC battery will then be placed in service as follows (at no time will the 2C 125VDC battery charger or bus be connected in parallel with the temporary battery charger):

1. Within the AOT of TS 3.8.2.3 ACTION (a), the temporary 2C 125VDC battery will be isolated from the 2C battery charger and bus by use of the disconnect switch between the bus and the temporary battery.
2. The replacement 2C 125VDC battery will be disconnected from the temporary battery charger, the leads will be disconnected from the temporary 2C 125VDC battery and the additional length of cable previously added will be removed.
3. The replacement 2C 125VDC battery will then be connected to the existing leads from the 2C 125VDC bus. A DLRO check will be performed on disturbed connections by performing SC.MD-ST.125-0005 to ensure connection resistance satisfies SR 4.8.2.3.2.d.3.
4. The disconnect switch between the battery and bus will closed connecting the replacement 2C 125VDC battery to the bus.
5. TS 3.8.2.3 ACTION (a) AOT will be exited.

At this point the replacement 2C 125VDC battery will be operable and the temporary battery will be removed from the 4160V Switchgear Room.

<u>Section 4.8 References</u>

1. VTD 309448 Standby Battery Flooded Cell Installation and Operating Instructions
2. SC.MD-CM.125-0004 Battery Terminal Post Resistance Measurements
3. SC.MD-FT.125-0003 125 Volt Station Batteries Performance Discharge Testing Using BCT-2000 with Windows Software and Associated Surveillance Testing
4. SC.MD-ST.125-0003 Quarterly Inspection and Preventive Maintenance of Units 1, 2 & 3 125 Volt Station Batteries
5. SC.MD-ST.125-0004, 125 Volt Station Batteries 18 Month Service Test and Associated Surveillance Testing Using BCT-2000

6. SC.MD-ST.125-0005 Annual Inspection and Surveillance of Unit 1 & 2 125 Volt Vital Batteries
7. SC.MD-ST.125-0006, 125 Volt Batteries 18 Month Service Test Using BCT-2000 with Windows Software and Associated Surveillance Testing

5.0 REGULATORY SAFETY ANALYSIS

This license amendment request proposes changes to TS Surveillance Requirements (SR) to allow a one-time replacement of the Salem Unit 2 2C 125V DC battery while at power. Specifically, SR 4.8.2.3.2 f and g would be revised, on a one time basis, to permit testing in a non-shutdown condition. The proposed one-time change is necessary to support the on-line replacement of the existing 2C battery with a new battery tested in accordance with the SR 4.8.2.3.2 f and g.

To accomplish the battery replacement on-line, PSEG proposes to install a temporary 125VDC battery that meets the requirements for TS operability, including all required surveillance testing. During the currently Allowed Outage Time (AOT) of TS 3.8.2.3 ACTION a, the TS operable temporary battery would be placed in service. The existing 2C battery would then be replaced with all new cells, tested in accordance with the required TS surveillances, and then returned to service during the AOT of TS 3.8.2.3 ACTION a. To perform the required surveillances for TS operability of the batteries (temporary and replacement), SR 4.8.2.3.2 f and g need to be revised, on a one time basis, to permit testing in a non-shutdown condition.

5.1 Significant Hazards Consideration

PSEG has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

During the replacement of the existing 2C 125VDC battery, a temporary, TS operable battery will provide the same function as the battery being removed. The temporary battery has been analyzed to comply with the required design functions of the existing 2C 125VDC battery. The temporary battery will be subjected to all required TS surveillance testing prior to being utilized to confirm operability. The temporary battery will be placed in service during the current TS AOT. The respective DC bus will be continuously energized by the existing battery charger. Consequently, the structures, systems, and components (SSCs) of the plant will continue to perform their design function. The proposed change will have no adverse affect on plant operations, or any design function or analysis.

The proposed change does not affect accident initiators or precursors, or design assumptions for the systems or components used to mitigate the consequences of an accident as analyzed in the UFSAR. The temporary battery will be operable while the permanent 2C 125VDC battery is replaced and the other divisions of DC power will also remain operable to support design mitigation capability.

Therefore, the proposed changes do not represent a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

During the replacement of the existing 2C 125VDC battery, a temporary battery will provide the same function as 2C 125VDC battery that is being replaced. This temporary battery possesses adequate capacity to fulfill the safety-related requirements of supplying necessary power to the associated 125VDC bus. Because the temporary battery will perform like the station battery that is currently installed, no new electrical or functional failure modes are created. Equipment will be operated in the same manner that is currently allowed and designed for. Consequently, there is no change to the design function or operation of the SSCs involved and no possibility of a new or different kind of accident due to credible new failure mechanisms, malfunctions, or accident initiators not previously considered in the design and licensing bases.

The proposed one-time change does not introduce any new accident initiators or precursors or any new design assumptions for those systems or components used to mitigate the consequences of an accident.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

During the replacement of the 2C 125VDC battery, a TS operable 125VDC battery will temporarily perform the same function. The temporary replacement 125VDC battery will be assembled from the same type and manufactured safety-related Class 1E cells. The temporary replacement 125VDC battery will meet all the design requirements as the 2C 125VDC battery that it replaces. It will possess adequate capacity to fulfill the requirements of the associated 125VDC bus. The proposed replacement activity will not prevent the plant from mitigating a Design Basis Accident (DBA) during the time the temporary battery is in service. Required DC power systems supporting the design mitigation capability will be maintained. The associated DC bus will always be supplied by either the temporary battery and/or the battery charger at all times. The proposed change does not alter a design basis or safety limit; therefore it does not significantly reduce the margin of safety. The 2C 125VDC bus will continue to operate per the existing design and regulatory requirements.

Therefore, this proposed change does not involve a significant reduction in a margin of safety.

Based on the above, PSEG concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

- 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 17, "Electric Power Systems." GDC 17 requires, in part, that "[t]he onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure."
- REGULATORY GUIDE 1.32, "CRITERIA FOR POWER SYSTEMS FOR NUCLEAR POWER PLANTS"

5.3 Precedent

The proposed change is similar to license amendment No. 247 issued to Duane Arnold on October 1, 2002 (ADAMS ML022280041), and to license amendment No.264 issued to Indian Point Unit 3 on September 9, 2001 (ADAMS ML011990082). The PSEG proposed methodology for accomplishing the battery replacement and testing provides for a fully tested and Technical Specification operable temporary battery thereby precluding the need to perform a PRA analysis if a non-Technical Specification operable (i.e., only 'available') temporary battery were used.

5.4 Conclusions

In conclusion, based on the considerations discussed above, (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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

PSEG has evaluated the proposed amendment for environmental considerations. The review has determined that the proposed amendment would change requirements with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, and would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

References are provided for each subsection under Section 4 and are specific to the various topics covered therein.

TECHNICAL SPECIFICATION PAGES WITH PROPOSED CHANGES

Facility Operating License DPR-75

Technical Specification	Page
4.8.2.3.2	3/4 8-11a

SURVEILLANCE REQUIREMENTS (Continued)

3. The connection resistance is:
≤150 micro ohms for inter-cell connections,
≤350 micro ohms for inter-rack connections,
≤350 micro ohms for inter-tier connections,
≤70 micro ohms for field cable terminal connections, and
≤2500 micro ohms for the total battery connection resistance which includes all inter-cell connections (including bus bars), all inter-rack connections (including cable resistance) all inter-tier connections (including cable resistance) and all field terminal connections at the battery.

e. At least once per 18 months by verifying that the battery charger will supply at least 170 amperes at 125 volts for at least 4 hours.

f. At least once per 18 months, during shutdown*, by verifying that the battery capacity is adequate to supply and maintain in OPERABLE status all of the actual or simulated emergency loads for the design duty cycle when the battery is subjected to a battery service test.

g. At least once per 60 months, during shutdown*, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. Satisfactory completion of this performance discharge test shall also satisfy the requirements of Specification 4.8.2.3.2.f if the performance discharge test is conducted during a shutdown* where that test and the battery service test would both be required.

h. At least once per 12 months, during shutdown, if the battery shows signs of degradation <u>OR</u> 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.

*This battery surveillance may be performed, as required, associated with a one-time replacement of station battery 2C when the unit is not shutdown. This testing shall be done when the battery is disconnected from the 2C DC bus. This testing must be completed by February 1, 2011.