Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

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10CFR50.90

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Resolution of Issues Regarding Proposed Amendment to
Technical Specification 3/4.8.2 to Modify Requirements Related to
Batteries and DC Systems (TAC Nos. MC5720 and MC5721)

References:

1) Letter, T. J. Jordan to Document Control Desk, "Proposed Amendment to Technical Specification 3/4.8.2 to Modify Requirements Related to Batteries and DC Systems," dated January 20, 2005 (ML050270145)
2) Letter, T. J. Jordan to Document Control Desk, "Response to Request for Additional Information: Proposed Amendment to Technical Specification 3/4.8.2 to Modify Requirements Related to Batteries and DC Systems (TAC Nos. MC5720 and MC5721)," dated October 17, 2005 (ML052970207)
3) Letter, T. J. Jordan to Document Control Desk, "Proposed Amendment to Technical Specification 3/4.8.2 to Modify Requirements Related to Batteries and DC Systems – Revised (TAC Nos. MC5720 and MC5721)," dated February 28, 2006 (ML062910349)

Pursuant to 10 CFR 50.90, the STP Nuclear Operating Company (STPNOC) requested Nuclear Regulatory Commission approval of an amendment to Unit 1 Operating License NPF-76 and Unit 2 Operating License NPF-80 (Reference 1). The request proposed changes to Technical Specification 3/4.8.2.1, "DC Sources – Operating," and 3/4.8.2.2, "DC Sources – Shutdown," with addition of a new Technical Specification 3/4.8.2.3,"Battery Parameters." Reference 3 is an updated request incorporating augmenting information from Reference 2. Generic issues have been the subject of discussion between the NRC staff and the TSTF-360 battery working group. STPNOC understands that those aspects of the proposed change that are purely generic in nature have been resolved. Consequently, this submittal provides responses to those issues that are specific to the South Texas Project.

This submittal includes the plant-specific information in responses (Attachment 1) to four questions provided previously via email. An updated licensee evaluation (Attachment 2) is provided to include the responses, as well as changes reflecting the revised source document, Standard Technical Specification Change Traveler TSTF-360, Revision 1, "DC Electrical Rewrite." Change bars in Attachment 2 indicate changes to the evaluation submitted in reference 3.

A001

STI: 32138623

New commitments created in this submittal and pre-existing commitments are listed in Attachment 8. These include a commitment to maintain a 5% design margin allowing use of 2 amps as the float current limit. This margin will be included in the Technical Specification Bases and in the battery sizing calculation.

Revisions and supplemental information provided in this submittal do not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

If there are any questions, please contact either Mr. P. L. Walker at 361-972-8392 or me at 361-972-7861.

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

Executed on 6 APR 2007.

David W. Rencurrel
Vice President,
Engineering & Strategic Projects

PLW

Attachments:
1) Resolution of Issues Regarding Proposed Amendment to Technical Specification 3/4.8.2 to Modify Requirements Related to Batteries and DC Systems
2) Updated Technical Analysis for Proposed Amendment to Technical Specification 3/4.8.2 to Modify Requirements Related to Batteries and DC Systems
3) Proposed Technical Specification Changes
4) Revised Technical Specification Pages
5) Supporting Technical Specification Bases Changes
6) Input for Technical Requirements Manual
7) Battery Vendor Correspondence
8) List of Commitments

cc:

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ATTACHMENT 1

RESOLUTION OF ISSUES REGARDING PROPOSED AMENDMENT TO TECHNICAL SPECIFICATION 3/4.8.2 TO MODIFY REQUIREMENTS RELATED TO BATTERIES AND DC SYSTEMS

South Texas Project
Units 1 and 2
Resolution of Issues Regarding Proposed Amendment to
Technical Specification 3/4.8.2 to Modify Requirements
Related to Batteries and DC Systems

1) Specific gravity monitoring is used to measure the strength of a battery cell's electrolyte, which is an important component of the battery's chemical reaction, and provides an indication of the battery's state-of-charge. Float current monitoring may or may not provide an accurate indication of the battery's state-of-charge. Float current monitoring is based on a calculation that is dependent on several variables. The staff has a concern with two variables of this calculation: the applied charging voltage, and cell resistance. A change in either of these variables may provide a false indication of the battery's state-of-charge. Please discuss how you can assure that float current monitoring will provide an accurate indication of the battery's state-of-charge.

RESPONSE

The STP Nuclear Operating Company (STPNOC) previously committed to incorporating a number of battery parameters into the Battery Monitoring and Maintenance Program. These parameters address:

- Electrolyte level;
- Cell temperature;
- Float voltage;
- Connection resistance; and
- Physical condition.

In addition, STPNOC will continue to use specific gravity monitoring to measure electrolyte strength in addition to float current monitoring. STPNOC will relocate the parameter for specific gravity from the Technical Specifications to the Battery Monitoring and Maintenance Program for monitoring at 18-month intervals and before each discharge test.

2) The battery pilot cell is representative of the average battery cell in the battery. Please discuss how you can assure that a battery with a battery pilot cell with a voltage of 2.07 volts or slightly greater will remain capable of performing its minimum designed function.

RESPONSE

The battery capacity has a 5% design margin. STPNOC will include the 5% design margin for the station batteries in the background information for Technical Specification Bases 3/4.8.2. The minimum established float voltage is currently tied to the manufacturer's recommendations in the Bases for Technical Specification surveillance requirement 4.8.2.1.a.

The time to return the battery to the fully charged state reflects the battery charger design capacity. Each battery charger can recharge the battery to the fully charged state within 12 hours while supplying the largest combined demands of the various continuous steady state loads following a battery discharge to the bounding design-basis event discharge state.

STPNOC will include the following wording for Technical Specification 6.8.3.p under "Procedures, Programs, and Manuals":

Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, which includes the following:

1. Actions to restore battery cells discovered with float voltage < 2.13 V;
2. Actions to equalize and test battery cells that are discovered with electrolyte level below the top of the plates;
3. Actions to verify that the remaining cells are >2.07 V when a cell or cells are found to be < 2.13 V; AND
4. Actions to ensure that specific gravity readings are taken prior to each discharge test.

STPNOC previously stated (Reference 3) that 10 CFR 50.59 and the STP Corrective Action Program would be applied to control changes to the Battery Monitoring and Maintenance Program. In addition, STPNOC commits to incorporate the Battery Monitoring and Maintenance Program into the STP Technical Requirements Manual. See Attachment 6.

3) As mentioned in question 2, the battery pilot cell is representative of the average battery cell. Please discuss how you can assure that a battery with a battery pilot cell with an electrolyte temperature slightly greater than or equal to the minimum established design limit will remain capable of performing its minimum designed function.

RESPONSE

The battery capacity has a 5% design margin. STPNOC will include the 5% design margin for the station batteries in the background information for Technical Specification Bases section 3/4.8.2. The revised page is provided in Attachment 5.

While battery capacity is degraded by a low temperature, the change is small even in a worst case scenario. Because the change is small, the other margins used in sizing normally ensure sufficient capacity is present to perform the intended function. Plant design and operating practices make the possibility of a battery actually reaching this limit very small. The 12-hour charging time provides a reasonable time to restore the electrolyte temperature within established limits and is a reasonable trade off in risk with a plant shutdown.

4) Consistency with the Institute of Electrical and Electronics Engineers (IEEE) Standard 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," was used throughout your submittal as the justification for approval. The most recent version of IEEE Standard 450 that has been endorsed by the NRC through Regulatory Guides (RGs) is IEEE Standard 450-1975. The RGs of mention are: RG 1.128, "Installation, Design, and Installation of Large Lead Storage Batteries for Nuclear Power Plants," and RG 1.129, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants."

   a) Provide a plant specific technical justification for each proposed change in lieu of referencing consistency with the IEEE Standard 450-2002.

b) Provide a copy of the proposed battery monitoring and maintenance program identified in TS 6.8.3.p.

RESPONSE

a) References to IEEE 450-2002 have been revised to IEEE-450 where appropriate. These changes are incorporated into the revised Technical Analysis of the proposed change provided here as Attachment 2. Implementation of IEEE 450 will be either in accordance with the revision endorsed by the NRC, or the revision applied by TSTF-360.

b) The Battery Monitoring and Maintenance Program will be incorporated into the South Texas Project Technical Requirements Manual. The insert for the Technical Requirements Manual is provided as Attachment 6.

ATTACHMENT 2

UPDATED TECHNICAL ANALYSIS FOR PROPOSED AMENDMENT TO TECHNICAL SPECIFICATION 3/4.8.2 TO MODIFY REQUIREMENTS RELATED TO BATTERIES AND DC SYSTEMS

LICENSEE EVALUATION

SOUTH TEXAS PROJECT

PROPOSED AMENDMENT TO TECHNICAL SPECIFICATION 3/4.8.2 TO MODIFY REQUIREMENTS RELATED TO BATTERIES AND DC SYSTEMS – Revision 2

1.0 INTRODUCTION

1.1 DESCRIPTION

The South Texas Project proposes to revise Technical Specification 3/4.8.2, "DC Sources," to incorporate revised criteria for battery maintenance and testing consistent with IEEE-450, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," and NUREG-1431, "Standard Technical Specifications Westinghouse Plants," Revision 2. Proposed changes provide:

- New conditions for inoperability and required actions that allow inoperable DC subsystem batteries and battery chargers to be addressed separately.
- New actions for restoration of inoperable battery chargers, as well as alternate battery charger test criteria.
- Changes revising the Technical Specifications associated with monitoring and maintaining station batteries.

The surveillance requirements are based on:

- Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler TSTF-360, Revision 1, "DC Electrical Rewrite," as incorporated in NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants" (June 2001), and
- IEEE 450, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications."

The South Texas Project proposes the following changes:

1. Provide new conditions and required actions specific to the battery chargers and batteries in each DC electrical power subsystem. These conditions and required actions will provide compensatory actions specific to the battery chargers and batteries in each DC electrical power subsystem.
2. Relocate preventive maintenance surveillance requirements to the Battery Monitoring and Maintenance Program to be controlled by the South Texas Project.
3. Provide alternate test criteria for battery charger testing.
4. Replace specific gravity monitoring with float current monitoring for weekly and quarterly testing.
5. Relocate battery cell operating parameter monitoring to the licensee-controlled Battery Monitoring and Maintenance Program.
6. Provide specific actions and increased completion times for out-of-limit conditions for battery cell float voltage, float current, electrolyte level, electrolyte temperature, and the associated surveillance requirements.
7. Provide enhanced Bases for the proposed changes.

8. Eliminate the "once per 60 months" restriction on replacing the battery service test with the modified performance discharge test.

In addition, a new paragraph 6.8.3.p is to be inserted into the Technical Specification administrative controls program description to describe actions for battery cell float voltage and electrolyte level and to reference the "Battery Monitoring and Maintenance Program." This program will provide for restoration and maintenance actions consistent with the recommendations of IEEE 450, or the battery manufacturer.

Proposed changes that reorganize and revise technical specifications associated with monitoring and maintaining station batteries include:

- Addition of required actions and surveillance requirements associated with conditions exceeding accepted limits for battery cell float voltage;
- Float current monitoring in lieu of weekly and quarterly specific gravity monitoring;
- Electrolyte level and temperature; and
- Relocation of battery maintenance and monitoring activities to owner-controlled programs based on the recommendations of IEEE 450.

Additional changes are to be made in battery performance discharge testing for consistency with regulatory requirements.

1.2 PURPOSE OF REVISION

The proposed changes provide new actions for restoration of an inoperable battery charger and an inoperable battery, as well as alternate battery charger testing criteria.

The proposed changes also provide for relocation of battery maintenance and monitoring activities to owner-controlled programs based on the recommendations of IEEE 450. This will:

- Provide for better control of these requirements;
- Assure that each battery is maintained at an acceptable level of performance;
- Allow flexibility to monitor and control these limits to values directly related to the battery's ability to perform its assumed function; and
- Allow the Technical Specifications to focus on parameter value degradations that approach levels that may impact battery operability.

Overall, these changes will increase operational flexibility and allow more efficient application of plant resources to more significant plant activities.

2.0 PROPOSED CHANGES

2.1 Limiting Condition for Operation Action 3.8.2.1 (Modes 1, 2, 3, and 4)

Proposed Change 1

Additional actions will specify the measures to be taken in the event a channel has no operable battery charger. With no battery chargers for a channel operable:

- Restore battery terminal voltage to greater than or equal to the minimum established float voltage within two hours, and

- Verify float current for the affected battery does not exceed 2 amps once per 12 hours, and
- Restore one battery charger to operable status within seven days.

An additional action is provided for one inoperable channel due to reasons other than an inoperable battery bank, or no operable battery chargers for a channel.

Editorial changes are included to promote clarity and ease of use.

Attachment 3 to this application depicts the specific changes proposed.

2.2 Surveillance Requirement 4.8.2.1 (Modes 1, 2, 3, and 4)

Proposed Change 2

Consistent with IEEE-450 practices, the following surveillance requirements are to be relocated to a licensee-controlled Battery Monitoring and Maintenance Program:

- (4.8.2.1.b) - At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery voltage above 135 volts, by verifying that:
  - There is no visible corrosion at either cell-to-cell or terminal connections, or the connection resistance of these items is less than or equal to 150x10-6 ohm; and
  - The average electrolyte temperature of six connected cells is above 65°F.
- (4.8.2.1.c) - At least once per 18 months, by verifying that:
  - The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.
  - The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material.
  - The resistance of each cell-to-cell and terminal connection is less than or equal to 150x10-6 ohm.

The battery voltage limits will be expressed in terms of volts per cell based on actual battery design criteria. The resistance limit will be revised to reflect actual maximums consistent with STP design.

Paragraph 4.8.2.1.d is a shutdown-related surveillance requirement. Consequently, it is to be relocated as Surveillance Requirement 4.8.2.2.c. Paragraphs 4.8.2.1.e and 4.8.2.1.f address monitoring battery parameters to assess battery capacity. Consequently, they are to be relocated as Surveillance Requirements 4.8.2.3.f.3 and 4.8.2.3.f.1, respectively. In addition, the 18-month interval specified in 4.8.2.1.f is reduced to 12 months.

Attachment 3 to this application depicts the specific changes proposed.

Proposed Change 3

Battery bank operability shall be demonstrated at least once per seven days by confirming the total battery terminal voltage is greater than or equal to the minimum established float voltage (4.8.2.1.a). This removes the specific minimum value of 129 volts and relocates it to the Bases, correcting it to 128 volts for a 59-cell battery, or to

2.17 volts per cell times the number of connected cells for configurations of less than 59 cells.

Alternate battery charger acceptance criteria are proposed (4.8.2.1.c) that will allow an actual in-service demonstration that the charger can recharge the associated battery, after a discharge to the bounding design-basis event discharge state, to the fully charged state within 12 hours. This occurs while the charger supplies the largest combined demands of the various continuous steady-state loads following a battery discharge to the bounding design-basis event discharge condition. This will be accomplished at least once per 18 months by verifying that each battery charger can:

- Supply ≥ 300 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours; or
- Recharge the battery to the fully charged state within 12 hours while supplying the largest combined demands of the various continuous steady-state loads after a battery discharge to the bounding design-basis event discharge state.

The specific minimum established float voltage of 128 volts is relocated to the Bases, section 4.8.2.1.c.

Each battery bank has the capacity to supply, and maintain in operable status, the required emergency loads when subjected to a battery service test during Modes 3, 4, 5, 6, or with core off-loaded (4.8.2.1.d). Surveillance requirement 4.8.2.1.d is shutdown-related; consequently, it is to be relocated as Surveillance Requirement 4.8.2.2.c. The modified performance discharge test in proposed surveillance requirement 4.8.2.3.f.3 (previously 4.8.2.1.e) may be performed in lieu of this requirement.

Attachment 3 to this application depicts the specific changes proposed.

Proposed Change 4

Battery status is monitored through implementing the battery surveillance requirements of Table 4.8-2. One of the parameters measured is the specific gravity of each cell. The proposed change replaces the specific gravity limits and allowable value with float current limits for weekly and quarterly monitoring.

The revised requirement is relocated as Technical Specification Action 3.8.2.3.b and surveillance requirement 4.8.2.3.a.

Attachment 3 to this application depicts the specific changes proposed.

Proposed Change 5

Technical Specification Table 4.8-2, "Battery Surveillance Requirements," specifies limits for electrolyte level and float voltage. This change proposes that surveillance requirements for float current, pilot and connected cell float voltage, electrolyte level, and pilot cell electrolyte values be relocated to Technical Specification 3/4.8.2.3, and references to Table 4.8-2 be deleted. The Battery Monitoring and Maintenance Program will incorporate the following:

- The limits for electrolyte level and float voltage for each designated pilot cell (Category A) and the limits for each connected cell (Category B);
- The allowable value for connected cell electrolyte level;

- The associated compensatory actions for battery cell electrolyte level, float voltage, and specific gravity not within limits;
- The allowable value for the minimum battery charging float voltage of each connected cell.

Reference to the Battery Monitoring and Maintenance Program is proposed as Technical Specification Administrative Requirement 6.8.3.p.

Attachment 3 to this application depicts the specific changes proposed.

Proposed Change 8

At least once per 60 months, during shutdown, each 125-volt battery bank and charger is demonstrated operable by verifying that the battery capacity is at least 80% of the manufacturer's rating. A modified battery performance discharge test may be substituted for the battery service test once per 60-month interval. This proposed change eliminates the "once per 60-month" restriction on substituting for the battery service test. The modified performance discharge test replaces the performance discharge test. Surveillance Requirement 4.8.2.1.e is being relocated as Technical Specification Surveillance Requirement 4.8.2.3.f.3.

Attachment 3 to this application depicts the specific changes proposed.

2.3 Limiting Condition for Operation Action 3.8.2.2 (Modes 5 and 6)

Proposed Change 1

There are no changes in the actions to be taken should one or more required DC electrical power subsystems become inoperable. Editorial changes are included to promote clarity and ease of use.

Additional actions (3.8.2.2.b) specify the measures to be taken if a channel has no operable battery charger. With no battery charger operable:

- Restore battery terminal voltage to greater than or equal to the minimum established float voltage within two hours, and
- Verify float current for the affected battery does not exceed two amps once per 12 hours, and
- Restore one battery charger to operable status within seven days.

If the battery charger is not restored to operability in the time allowed, operations with potential for draining the reactor vessel, core alterations, operations involving positive reactivity additions that could result in loss of required shutdown margin or required boron concentration, or movement of irradiated fuel assemblies, are to be suspended immediately.

Attachment 3 to this application depicts the specific changes proposed.

2.4 Surveillance Requirement 4.8.2.2 (Modes 5 and 6)

Proposed Change 3

Surveillance requirements are added that are consistent with the revised surveillance requirement 4.8.2.1. Surveillance requirement 4.8.2.2.c is relocated from surveillance requirement 4.8.2.1.d because it is applicable under shutdown conditions. Other

applicable surveillance requirements will be addressed in the licensee-controlled Battery Monitoring and Maintenance Program and Surveillance Requirement 4.8.2.3.

Attachment 3 to this application depicts the specific changes proposed.

2.5 Limiting Condition for Operation Action 3.8.2.3 (New)

Proposed Change 1

This technical specification addresses abnormal battery conditions and the associated required compensatory actions.

Attachment 3 to this application depicts the specific actions proposed.

Proposed Change 4

Proposed LCO Action 3.8.2.3.b specifies determination of battery condition using float current monitoring in place of specific gravity monitoring (from Table 4.8-2).

Attachment 3 to this application depicts the specific actions proposed.

Proposed Change 6

LCO Action 3.8.2.3 provides compensatory actions for specific abnormal battery conditions. The required actions and associated completion times addressing out-of-limit conditions are to be performed:

a. If a battery has one or more cells with float voltage <2.07 V;
b. If a battery has float current >2 amps;
c. If a battery has one or more cells with electrolyte level less than minimum established design limits;
d. If a battery pilot cell electrolyte temperature is less than 65°F, restore battery pilot cell electrolyte temperature to greater than or equal to 65°F within 12 hours;
e. If battery parameters are not within limits for 2 or more batteries; or
f. If a battery has one or more battery cells with float voltage <2.07 volts and float current > 2 amps, declare the associated battery INOPERABLE immediately.

Attachment 3 to this application depicts the specific actions proposed.

2.6 Surveillance Requirement 4.8.2.3 (New)

Proposed Change 4

Proposed surveillance requirement 4.8.2.3.a specifies determination of battery condition using float current monitoring in place of specific gravity monitoring (from Table 4.8-2).

Surveillance requirements will specify the parameters to be checked and the intervals at which the surveillances are to be performed. Surveillance requirements will be incorporated from Surveillance Requirement 4.8.2.1, as well as new surveillance requirements for battery float current, battery pilot cell voltage, battery connected-cell voltage, connected-cell electrolyte level, and battery pilot cell temperature.

Until sufficient justification for an 18-month interval is available, the revised surveillance requirement 4.8.2.3.f.1 will require performance tests every 12 months of batteries that show degradation or that reach 85% of the service life for the application.

Proposed surveillance requirement 4.8.2.3.f.2 will require modified performance discharge tests at least once per 24 months for any battery reaching 85% of the service life expected for the application and capacity is equal to or greater than 100% of the manufacturer's rating.

Surveillance requirement 4.8.2.3.f.3 is relocated from 4.8.2.1.e with an addition of using a modified performance discharge test in place of a battery service test.

Attachment 3 to this application depicts the specific surveillance requirements proposed.

2.7 Technical Specification 6.8.3.p (New)

A new Technical Specification administrative controls program requirement is added to reference actions for battery cell float voltage and electrolyte level and to create a Battery Monitoring and Maintenance Program. This program will provide for restoration and maintenance actions consistent with the recommendations of IEEE-450, or of the battery manufacturer.

Proposed Change 2

Proposed Technical Specification 6.8.3.p describes the Battery Monitoring and Maintenance Program. This Program will provide for restoration and maintenance of the 125-V batteries in accordance with IEEE-450, or with the manufacturer's recommendations, including:

- Actions to restore battery cells with float voltage <2.13 V;
- Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates;
- Actions to verify that the remaining cells are >2.07V when a cell or cells are found to be <2.13V; and
- Actions to ensure that specific gravity readings are taken prior to each discharge test.

Attachment 3 to this application depicts the specific changes proposed.

2.8 Technical Specification Bases

Proposed Change 7

The Technical Specification Bases will be revised for the changes to Technical Specifications 3/4.8.2.1. 3/4.8.2.2, and 3/4.8.2.3, as appropriate, and to incorporate the information and discussion presented in TSTF-360, Revision 1. Changes to the associated Bases will be implemented pursuant to Technical Specification 6.8.3.m, Technical Specifications Bases Control Program.

Attachment 5 to this application depicts the specific changes proposed. The revised Bases sections are provided for information only.

3.0 BACKGROUND

3.1 BASES FOR THE CURRENT REQUIREMENTS

The direct current (DC) power systems of Units 1 and 2 each consist of four Class 1E 125-vdc battery systems and Balance-of-Plant (BOP) battery systems including one 48-vdc, two 125-vdc, and one 250-vdc batteries. Separate batteries are provided for the

plant computer and other data acquisition systems that do not interface with the plant Class 1E DC power system and are not governed by the Technical Specifications

3.1.1 CLASS 1E BATTERY SYSTEM

The Class 1E 125-vdc Battery System of each unit consists of four independent, physically separate busses, each energized by one of two available battery chargers and one battery. Voltage on any separate bus varies between 105 and 137.5-vdc depending upon the operating mode of battery charging equipment and system loads.

During normal operation, the 125-VDC loads are powered from the battery chargers with the batteries floating on the system. In case of a loss of normal power to the battery charger, the DC load is automatically powered from the station batteries. Batteries supply emergency power required for plant protection and control without interruption when the power from AC sources is interrupted.

Upon loss of power from the AC System to the battery chargers, the batteries automatically assume the load without switching. In the event all off-site AC sources are lost, AC power is supplied to the battery chargers by the emergency diesel generators.

Each battery system also supplies power to its associated inverter system, which converts the DC power to AC power for the vital instrumentation and protection system. The ampere-hour capacity of each battery is sufficient to provide, for a minimum of two hours, the power required by emergency DC controls and the vital AC instrumentation and protection system. Only small DC loads and DC controls are supplied from the 125-vdc batteries.

The four 125-vdc batteries are each located in separate rooms in a seismic Category I building which inhibits propagation of fire and provides protection against missiles. Battery chargers and distribution panels associated with a given battery are located outside the battery room. HVAC ventilates each battery room using fans energized from the ESF busses. The Class 1E DC power systems are designed to withstand the effects of tornadoes, fires, and the safe shutdown earthquake without loss of function. The elevation and location of the battery rooms preclude flooding of the battery rooms.

Each DC electrical power subsystem has sufficient power output capacity for 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 from the design minimum charge to its fully charged state within 12 hours while supplying normal steady-state loads.

DC electrical power subsystems are required to be operable to ensure availability of the required power to shut down the reactor and maintain it in a safe condition after an Anticipated Operational Occurrence (AOO) or a postulated Design Basis Accident. Loss of any DC electrical power subsystem does not prevent the minimum safety function from being performed. An operable DC electrical power subsystem requires the battery and one associated charger to be operating and connected to the associated DC bus.

The Class 1E battery system is designed to comply with requirements of NRC Regulatory Guides 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between their Distribution Systems," and 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants."

3.1.2 CLASS 1E BATTERIES

The Class 1E 125 vdc batteries are of the 59-cell lead-calcium type, assembled in shock-absorbing, clear plastic, sealed containers. Spacers are provided between cells and cell clamps to prevent shifting during seismic events. The battery cells are mounted on seismic Category I, corrosion-resistant steel racks.

The batteries are sized to provide output at 80% of nameplate rating, corresponding to the expected capacity at end of life and 100% design demand. The minimum average limit for float voltage is 2.17 volts per cell, corresponding to a total minimum float voltage of 128 volts per battery. The batteries are sized in accordance with IEEE 485-1978, "Recommended Practice for Sizing Large Lead Acid Storage Batteries for Generating Stations and Substations."

The batteries are suitable for continuous float duty and are maintained in a nominally fully charged state by the battery chargers. Each battery is sized to provide a minimum terminal voltage of 106.79 vdc (channels A, B, and C) or 108.56 vdc (channel D) at the end of two hours. The batteries are sized to carry their connected ESF loads in the event of loss of AC power for two hours without power flow from the chargers.

3.1.3 BATTERY CHARGERS

There are two battery chargers associated with each of the four 125-vdc busses. These chargers are connected to their train-related AC busses. One charger is required for each of the four channels for operability.

The primary role of the battery charger is to support the operability of its associated battery. This is accomplished by using a charger of sufficient size to carry the normal steady-state DC loads, with sufficient additional capacity to provide some minimal over-potential to the battery. A secondary safety significant function is provided by carrying the post-accident DC load after restoration of AC power (typically 10 to 15 seconds – the time required for the emergency diesel generators to come on line). In analyzed post-accident scenarios, there is no safety-related criterion for recharging a fully discharged battery in any specific time period.

The most likely cause of a loss of all battery charging at the South Texas Project is a 4.16 kV bus failure. Under these conditions, the DC electric loading is the same as that experienced from a design-basis loss of offsite power with the exception of diesel generator field flash and control power.

Emergency procedures require that the battery breaker be opened before the battery reaches the minimum voltage required to start the associated diesel generator (107.5 vdc). Once the battery has reached this point, restoration to the fully charged state of 130 vdc will take less than 12 hours. In the event a battery is fully discharged, the battery chargers are sized to recharge the battery to a charging current that is stabilized at the charging voltage within 12 hours to accommodate the battery's 2-hour duty cycle. The batteries are floated at 2.22 VPC (131 +1/-2 vdc), and equalized at 2.31 ±1% VPC (137.5 vdc maximum).

The output voltage of each battery charger is adjustable ±10 percent of 141 vdc if required to allow an equalize charge to be performed when the battery is disconnected from the system. AC power to the Class 1E battery chargers associated with a given battery is supplied from independent motor control centers connected to double-ended sections of switchgear sections energized from the ESF busses and supplied with power from the emergency diesel generators when offsite sources are unavailable.

Independence of the four battery systems is achieved by separation of cables and equipment and by prohibiting crossties between load groups in different trains.

Each battery charger is equipped with a DC voltmeter and ammeter. Protection is provided against power feedback from the battery to the charger and AC source should the AC source be lost.

The current two-hour restoration time is based on Regulatory Guide 1.93, "Availability of Electric Power Sources," and has been applied equally to minimal reduction in battery charger design capacity (which may still support any and all post-accident assumed functions) as well as to a completely disconnected/de-energized DC subsystem. Restoration time for an inoperable battery charger is limited to the same amount of time as for an inoperable battery or a completely de-energized DC distribution subsystem.

3.1.4 ALARM AND MONITORING

The alarms and monitoring available in the control room are described in section 8.3.2.1.1 of the STP Updated Final Safety Analysis Report (UFSAR).

Each DC System is provided with an annunciator window having inputs from each of the two chargers and the switchboard. The Emergency Response Facility (ERF) computer may be used to identify which of the three inputs is being alarmed. ERF computer calculations are used to inhibit nuisance and/or duplicate alarms.

Each battery charger is provided with the following alarm circuits connected in common to the control room annunciator/ERF computer to indicate battery charger trouble:

1. Output under- and over-voltage (DC)
2. DC ground

Each 125 vdc switchboard has the following alarm circuits which are connected in common to the control room annunciator/ERF computer:

1. Input breaker position from battery charger (alarm when tripped)
2. Input breaker position from battery (alarm when tripped)
3. Output breaker positions of selected loads (alarm when tripped)
4. DC bus ground and over/under-voltage (combined)

In addition to these annunciator alarms, the ESF Status Monitoring System is used to indicate bypassed or inoperable status of the battery or battery chargers. Component level windows provided for the DC system indicate the following conditions:

1. Input under-voltage, charger output breaker open position, or charger input to switchboard breaker open position for each battery charger. (ERF computer is used to indicate which condition caused the window to light.) Since only one charger is required, a single window for both chargers is provided. This window is lit when both output breakers are open or when an inservice charger (indicated by closed output breakers) has an input under-voltage condition.
2. Battery output breaker open position.

Indicating instrumentation for each DC system is provided in the control room:

- Switchboard bus voltage
- Battery current

- Battery charger current from each charger

Setpoints for alarm activation are as follows:

- Charger Over Voltage 140 ± 1%
- Charger Under Voltage 117 ± 1%
- Switchboard Under Voltage 124 ± 2%
- Switchboard Over Voltage 140 ± 1%

Actuation of any component-level window also actuates the system level window for that system and affected systems.

Breaker alignments, voltages, and currents are monitored once per week in accordance with the surveillance test procedure for ESF Power Availability. Operator rounds are performed once per shift with two shifts per day. There is no collection of data. The acceptance criterion for battery voltage is 129.2 to 131.8 vdc. The chargers use potentiometers that are adjusted by the operators to maintain voltage within the desired range. These values are also used in the weekly battery surveillance and the weekly verification of electrical system alignment surveillance.

These alarms provide indication in the control room that the charger has failed. They are not intended to inform the operator when charger voltage drifts below the 128 vdc design limit. Use of different setpoints ensures the operators are notified when a charger failure occurs. The charger alarm at 117 vdc notifies the operator when the charger has failed. The bus voltage alarm provides a backup to this alarm.

STP does not use a conventional charger failure alarm based on low charger output current. Notification of charger failure is provided by the low-voltage alarms.

3.2 NEED FOR REVISION

The current Technical Specifications do not include separate LCO action statements for determining an inoperable battery. Instead, these action statements are notes to Table 4.8-2. The changes proposed in this amendment request are consistent with those provided in NRC-approved Industry/Technical Specifications Task Force (TSTF) Standard Technical Specification Change Traveler, TSTF-360, Revision 1, "DC Electrical Rewrite," and incorporated in NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants." The changes provide new actions for restoration of an inoperable battery charger and an inoperable battery, as well as alternate battery charger testing criteria.

The proposed changes also provide for relocation of battery maintenance and monitoring activities to owner-controlled programs based on the recommendations of IEEE 450.

This will:

- Provide for better control of these requirements;
- Assure that each battery is maintained at acceptable levels of performance;
- Allow flexibility to monitor and control these limits to values directly related to the battery's ability to perform its assumed function; and
- Allow the Technical Specifications to focus on parameter value degradations that approach levels that may impact battery operability.

Overall, these changes will provide increased operational flexibility and allow more efficient application of plant resources to safety-significant activities.

4.0 TECHNICAL ANALYSIS

4.1 ANALYSES OF THE PROPOSED CHANGES

These changes will enable better control of these requirements, assuring that each battery is maintained at acceptable levels of performance. The changes also allow flexibility to monitor and control these limits to values directly related to the battery's ability to perform its assumed function, allowing the Technical Specifications to focus on monitoring for changes in parameter values approaching levels that could impact battery operability.

4.1.1 NEW CONDITIONS AND REQUIRED ACTIONS

- **LCO Action 3.8.2.1 (Modes 1, 2, 3, and 4)**

  These changes add specific actions and increase completion times for inoperable battery chargers. Additional requirements specify the actions to be taken in the event a channel has no operable battery charger. The current Technical Specifications limit restoration for inoperable battery chargers to the same time as for a completely inoperable train. The proposed changes apply a more reasonable time for an inoperable battery charger, while focusing efforts on retaining battery capabilities. The LCO continues to maintain the 2-hour restoration time for an inoperable battery bank.

  The South Texas Project design includes standby chargers to support continued battery capability. Loss of both chargers would be a rare event, and would most likely be caused by loss of the associated 4.16 kV bus. In this event, the sequencer could be turned off, and the TMI inverters unloaded. Loads required for support of plant shutdown would be left on the bus. These actions are covered by procedure for responding to annunciator lampbox indications of battery function parameters.

  - The proposed new condition LCO Action 3.8.2.1.b.1 will allow a reasonable amount of time to restore the inoperable required battery charger in one DC electrical power subsystem to operable status. Full charger operability, based on the margin afforded in the design capacity of the battery charger and consistent with the current basis for charger operability, will continue to be required. A de-energized DC electrical distribution subsystem will be restored in the specified 2 hours. This time is contingent on a focused and tiered approach to assuring adequate battery capability is maintained.

    In the event a battery charger is inoperable, the first priority for the operator is to minimize the associated battery discharge. The proposed required Action ensures that the associated battery discharge is terminated within 2 hours by requiring that battery terminal voltage be restored to a value greater than or equal to the battery's minimum established float voltage within 2 hours. This assumes that the batteries are still capable of performing their required functions. If the affected train batteries are not capable of performing their required function during the 2 hours, the other trains should be available to perform their required function. This allows time for restoring the inoperable required battery or for providing an alternate means of restoring battery terminal voltage to a value greater than or equal to the minimum established float voltage.

- LCO Action 3.8.2.1.b.2 proposes that within 12 hours the associated battery be established as having sufficient capacity to perform its assumed duty cycle as measured by float current not exceeding 2 amps. This allows time for some recharging of lost capacity that may have occurred during the initial 2 hours. A discharged battery with terminal voltage at least the minimum established float voltage indicates that the battery is on the exponential charging current portion of its recharge cycle. The time to return a battery to its fully charged state under this condition is a function of the amount of the previous discharge and the recharge characteristic of the battery. In this condition, there is good assurance of fully recharging the battery within the proposed 12 hours. The affected battery float current would continue to be verified as being less than or equal to 2 amps every 12 hours until a required battery charger is restored to operable status.

  The minimum float voltage allowed per cell is 2.17 vdc. This gives a minimum battery float voltage of 128 vdc for a 59-cell string. STP has sufficient battery capacity to operate with one or more cells jumpered out of the string, depending on the battery's specific design margin. In these alternate configurations, the minimum float voltage would be the number of cells multiplied by 2.17 vdc.

- LCO Action 3.8.2.1.b.3 provides 7 days for a required battery charger in one DC electrical power subsystem to be restored to operable status. Since the focus of the proposed allowance is that battery capacity is preserved and assured, the means of accomplishing this is left to plant capabilities. In most cases, a spare battery charger could be employed during the initial 2 hours. Other means, even a degraded normally in-service battery charger, can continue to float the battery. Presuming that any associated battery discharge has been terminated, and the associated DC bus remains energized, there is reasonable basis for extending the allowed restoration time for a required inoperable battery charger beyond the 2-hour limit of the first tier action b.1 to the proposed 7 days.

- LCO Action 3.8.2.1.c expands the actions in response to inoperability of a required channel to any reason other than an inoperable battery bank or inoperable battery chargers to a channel inoperable for any other reason. The required restoration time of 2 hours is the same. This action is specified as a clarification.

- **LCO Action 3.8.2.2 (Modes 5 and 6)**

  LCO action 3.8.2.2.b is supported with the same justification as that supporting LCO action 3.8.2.1.b. The only differences are in the actions to be taken if the final conditions can not be met. Those actions are contingent upon the status of the plant at the time.

- **LCO Action 3.8.2.3 (New)**

  LCO Action 3.8.2.3 is a new section with specific required actions for parameters that have a unique impact on the battery and its continued operability. The proposed new section provides specific required actions and completion times for out-of-limit conditions for cell voltage, float current, electrolyte level, and electrolyte temperature. The allowed times recognize the margins available, the minimal impact on the battery capacity and the capability to perform its intended function, and the likelihood of achieving restoration in a timely fashion:

- Action 3.8.2.3.a addresses a condition in which a battery has one or more cells with float voltage less than 2.07 V. A battery cell with less than 2.07 V must be considered degraded. Cell voltage by itself, however, is not an indication of the state of charge of the battery. Battery operability is verified by monitoring the battery terminal voltage and determining the overall state of battery charge by monitoring the battery float charge current. Two hours is considered a reasonable allowed time to complete these actions and assure that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells being less than 2.07 V, and continued operation is permitted for a limited period up to 24 hours. Twenty-four hours is considered a reasonable time to correct the out-of-limit condition.

- Action 3.8.2.3.b addresses a condition in which a battery is found with a float current greater than 2 amps, indicating that the battery capacity has been partially discharged. Float current exceeding 2 amps may be due to temporary loss of a battery charger or possibly to low voltage in one or more battery cells. If the terminal voltage is less than the minimum established float voltage, the battery charger is either inoperable or is operating in the current limit mode. If the battery charger is inoperable, LCO Action 3.8.2.1.b applies. If the battery charger is operating in the current limit after 2 hours, the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of load on the associated DC system, the amount of previous discharge, and the recharge characteristic of the battery. Twelve hours is considered a reasonable time to correct the out-of-limit condition. If the battery cannot be recharged within the 12 hours allowed by action 3.8.2.3.b.2, the battery must be declared inoperable.

- Action 3.8.2.3.c addresses a condition in which the electrolyte level in one or more cells is less than the minimum design limit. If the level is still above the top of the battery plates, the battery still retains sufficient capacity to perform the required function. Therefore, the battery should not be considered inoperable solely as a result of a low electrolyte level. The margin would be restored within 31 days when the level is returned to the design specification limits.

  If the electrolyte level is below the top of the plates, dryout and plate degradation may result. Action c.1 and action c.2 ensure that the electrolyte is restored, and that any source of leakage from the casing is identified.

- Action 3.8.2.3.d addresses a condition in which a pilot cell electrolyte temperature is less than 65°F. Low electrolyte temperature limits the current and power available from a battery. However, design margin will enable a battery whose capacity has been degraded to have sufficient capacity to perform the intended functions. Therefore, low pilot cell electrolyte temperature does not require that a battery be considered inoperable. The proposed 12 hours provides a reasonable time to restore the temperature to within the established design limits.

- Action 3.8.2.3.e addresses a condition in which more than one battery is found with parameters not within design limits. Given that this condition affects batteries in redundant subsystems, the effect on overall battery capacity could

prevent the batteries from performing their required function, and could result in loss of function for multiple systems that rely upon the batteries. Consequently, the longer times for corrective actions for conditions affecting only one subsystem are not appropriate. All but one battery must be restored to design parameters within two hours if the condition of the remaining battery qualifies for a longer time for completion of associated response measures. Otherwise, the two-hour limit applies to all.

- Action 3.8.2.3.f addresses a condition in which one or more battery cells are discovered with float voltage less than 2.07 V and float current greater than 2 amps. Under these conditions, the battery capacity may not be sufficient for performing the intended functions, and the battery must be declared inoperable immediately.

4.1.2 BATTERY MONITORING AND MAINTENANCE PROGRAM

Surveillance requirements from Technical Specification 3/4.8.2.1 are to be relocated to a Battery Monitoring and Maintenance Program.

- **Surveillance Requirement 4.8.2.1 (Modes 1, 2, 3, and 4)**

  As stated in Surveillance Requirement 4.0.1, surveillance requirements shall be met for conditions specified for individual Limiting Conditions for Operation. The premise is that surveillance requirements represent the minimum acceptable requirements for operability of the required equipment. However, for certain of the current surveillance requirements, failure to meet the requirement does not necessarily mean the equipment is not capable of performing its safety function. The corrective action is generally a routine or preventive maintenance activity.

  Visual inspection for physical damage or deterioration that could potentially degrade battery performance is not required for the battery to perform its safety function; it reflects ongoing preventive maintenance activities. Maintenance activities prevent degradation that could affect battery operability. Resistance values verified are nominal and represent values at which action is needed, and do not necessarily mean that battery operability is in question.

  Such activities are inappropriate for operability-based surveillance requirements and are generally better controlled under the maintenance programs for batteries. Furthermore, these surveillances are recommended by IEEE-450 and, as such, will continue to be addressed by the plant program based on IEEE-450 practices.

  The proposed changes provide adequate assurance of system operability commensurate with the safety significance since the relocated surveillance requirements will continue to be performed, and any changes will be evaluated in accordance with 10 CFR 50.59.

- **Administrative Requirement 6.8.3.p (New)**

  This Battery Monitoring and Maintenance Program will include actions to: (1) restore battery cells with float voltage < 2.13 V; (2) equalize and test battery cells found with electrolyte level below the top of the plates; (3) verify that the remaining cells are >2.07 V if a cell or cells are found with voltage <2.13 V; and (4) ensure that specific gravity readings are taken prior to each discharge test. Manufacturer recommendations may also be applied.

4.1.3 ALTERNATE BATTERY CHARGER TEST CRITERIA

- **Surveillance Requirement 4.8.2.1 (Modes 1, 2, 3, and 4)**

  Current surveillance requirement 4.8.2.1.c.4 requires verification of specific parameters for battery charger performance testing. Verification is intended to confirm the charger design capacity. Alternate acceptance criteria are proposed to allow an actual in-service demonstration that the charger can recharge the battery to the fully charged state within 12 hours. This is demonstrated while supplying the largest combined demands of the various steady-state loads following discharge of the battery to the bounding design-basis event discharge state. This meets the intent of the existing test and allows for a normal in-place demonstration of the charger capability; this minimizes the time the charger is disconnected from the DC bus.

  Surveillance requirement 4.8.2.1.d is relocated as 4.8.2.2.c because it is performed during shutdown.

- **Surveillance Requirement 4.8.2.2 (Modes 5 and 6)**

  Alternate battery charger test criteria in Modes 5 and 6 are the same as those in Modes 1, 2, 3, and 4. The alternate criteria meet the intent of the existing test and allow for a normal demonstration of the charger capability.

4.1.4 SPECIFIC GRAVITY MONITORING / FLOAT CURRENT MONITORING

- **Surveillance Requirement 4.8.2.1 (Modes 1, 2, 3, and 4)**

  This change replaces the current requirements for battery specific gravity monitoring in Table 4.8-2, "Battery Surveillance Requirements," with surveillance requirements utilizing a suitable operability limit based on float current to ensure the battery state-of-charge is sufficient for its design duty cycle. TSTF-360 provides technical justification for using the replacement criteria. The requirements are relocated to Technical Specification Action 3.8.2.3.b and Surveillance Requirement 4.8.2.3.a.

  Float current monitoring will be used in place of specific gravity monitoring for tests performed weekly and quarterly. The battery manufacturer concurs with the use of float current monitoring for the purpose of determining the state-of-charge of the STP station batteries. More specifically, the battery manufacturer states (Attachment 7) that float current (Surveillance Requirement 4.8.2.3.a) is a reasonable parameter to use to confirm a state of full charge for the 125 V DC and the 250 V DC STP station batteries. The accuracy and reliability of this reading will hold true over the expected life of these batteries (i.e., 20 years). The accuracy and capability of the float current monitoring equipment will provide adequate assurance that the deletion of the requirement for specific gravity measurements will not have a significant impact on safety or the ability to accurately determine the operability of the station batteries. The 5% design margin reserved by STP ensures that the 2-amp limit is conservative for the life of the battery.

- **Surveillance Requirement 4.8.2.2 (Modes 5 and 6)**

  Surveillance requirements for battery specific gravity while in Modes 5 and 6 are revised using float current similar to those in Modes 1, 2, 3, and 4. Justification for replacement with float current monitoring is the same as that for Surveillance

Requirement 4.8.2.1. These requirements are to be located in Technical Specification Action 3.8.2.3.b and Surveillance Requirement 4.8.2.3.

- **Surveillance Requirement 4.8.2.3 (New)**

  Application of specific gravity monitoring to determine the battery state-of-charge is replaced by float current monitoring for weekly and quarterly testing. Due to the technical nature of the rationale for the change, justification is provided in attachments to TSTF-360, Revision 1. Details included in the revised Bases for the technical specification also provide justification supporting this change. The justification discusses use of battery float current as an indicator of full charge and the charging characteristics of lead-acid batteries. The conclusion is that measuring current at a specific voltage (typically the float voltage in normal operation) can be used to assess the level of charge. At low voltage, a current of 2 amps is appropriate for cells with 8-hour capacities of 1000 amp-hours or larger.

4.1.5 RELOCATION TO A BATTERY MONITORING AND MAINTENANCE PROGRAM

- **Surveillance Requirement 4.8.2.1 (Modes 1, 2, 3, and 4)**

  - Current Technical Specification Table 4.8-2 categorizes limitations on battery cell electrolyte level, float voltage, and specific gravity (to be replaced by float current). The limits in category A (limits for each designated pilot cell) and category B (limits for each connected cell) reflect nominal parameter values for a fully charged battery. The values represent appropriate monitoring levels and appropriate preventive maintenance levels for long-term battery quality and extended battery life. Significant margin is provided in these values above what is required for a battery to be considered operable. They do not reflect the criteria of 10CFR50.36, "Technical Specifications," for limiting conditions of operation of the "lowest functional capability or performance levels of equipment required for the safe operation of the facility." This change proposes that these values and the actions associated with restoration be relocated to a licensee-controlled Battery Monitoring and Maintenance Program under the control of 10CFR50.59, "Changes, tests, and experiments." This licensee-controlled program complies with the recommendations of IEEE 450.

    The battery parameters will continue to be controlled at an acceptable level, and necessary remedial actions will be implemented in accordance with the plant corrective action program. Furthermore, the batteries are maintained and monitored under the regulatory requirements of the Maintenance Rule, 10CFR50.65. Following relocation, batteries will continue to be maintained at acceptable levels of performance, and the Technical Specifications will focus on battery parameter degradation approaching levels that may impact battery operability.

  - Current Technical Specification Table 4.8-2 also lists the allowable value for each connected cell for electrolyte level, float voltage, and specific gravity (to be replaced by float current for weekly and quarterly testing). Current Surveillance Requirement 4.8.2.1.b.3 states the specific limiting value for average electrolyte temperature of six connected cells.

    This change proposes that surveillance requirements for float current, float voltage, electrolyte level, and pilot cell electrolyte values be relocated to

Technical Specification 3/4.8.2.3. The Battery Monitoring and Maintenance Program will incorporate the following:

- The limits for electrolyte level and float voltage for each designated pilot cell (Category A) and the limits for each connected cell (Category B);
- The allowable value for connected cell electrolyte level;
- The associated compensatory actions for battery cell electrolyte level, float voltage, and specific gravity not within limits;
- The allowable value for the minimum battery charging float voltage of each connected cell.

Reference to the Battery Monitoring and Maintenance Program is proposed as Technical Specification Administrative Requirement 6.8.3.p and Technical Requirements Manual section 6.14.

- This change proposes that these values be relocated to Technical Specification 3/4.8.2.3, and the compensatory actions be relocated to a licensee-controlled Battery Monitoring and Maintenance Program under the control of 10CFR50.59, "Changes, tests, and experiments." New Actions 3.8.2.3.c and 3.8.2.3.d will require electrolyte level and temperature to be at least equal to minimum established design limits. Depending on the available excess capacity of the associated battery, the minimum temperature necessary to support operability of the battery can vary. Consequently, these values do not reflect the 10CFR50.36 criterion for limiting conditions of operation for the lowest functional capability or performance levels of equipment required for safe operation of the facility. Relocation to a licensee-controlled program will allow the flexibility to monitor and control this limit at values directly related to the battery's ability to perform its assumed function.

- The specific value given in Table 4.8-2 for the minimum operating battery float voltage for each connected cell will be relocated to Technical Specification Bases Section 3.8.2. Similarly, the minimum battery terminal voltage "≥ 128 V on float charge," is relocated to Technical Specification Bases Section 3.8.2 as 128 V, equivalent to 2.17 volts per cell for a 59-cell battery. The surveillance requirement is revised to verify battery terminal voltage is at least equal to the minimum established float voltage. Technical Specification Action 3.8.2.1.b is revised to require the battery charger to supply battery terminal voltage at least equal to the "minimum established float voltage."

  The minimum cell float voltage allowed is 2.17 vdc/cell which results in an overall minimum float voltage of 128 vdc for a 59-cell string. STP has sufficient capacity in the existing batteries to operate with one or more cells jumpered out of the string. In these alternate configurations, the minimum float voltage is the number of cells multiplied by 2.17 vdc. This value will be included in the Bases as background information for 3/4.8.2, "DC Sources."

  Consistent with the recommendations of IEEE 450, the minimum established float voltage is established based on the battery manufacturer's recommendations to ensure the battery is maintained fully charged with sufficient over-potential to maintain the battery plates in a condition that supports maintaining the grid life of the battery cells. As such, the minimum established

float voltage does not meet the 10 CFR 50.36 criteria for LCOs of "the lowest functional capability or performance levels of equipment required for safe operation of the facility," and can be adequately controlled outside of the Technical Specifications.

- **Surveillance Requirement 4.8.2.2 (Modes 5 and 6)**

  Surveillance requirements for specific gravity while in Modes 5 and 6 are the same as those in Modes 1, 2, 3, and 4. Justification for replacing specific gravity with float current monitoring in Technical Specification 3/4.8.2.3 is the same provided in 4.1.4 (surveillance requirement 4.8.2.1).

- **Surveillance Requirement 4.8.2.3 (New)**

  LCO Actions 3.8.2.3.c, 3.8.2.3.d, and surveillance requirements 4.8.2.3.d and 4.8.2.3.e will require the electrolyte level and temperature to be at least equal to minimum established design limits. Depending on the available excess capacity of the associated battery, the minimum temperature necessary to support operability of the battery can vary. As such, these values do not reflect the 10CFR50.36 criteria for Limiting Conditions of Operation of "the lowest functional capability or performance levels of equipment required for safe operation of the facility." Relocation of specific temperatures to a licensee-controlled program will allow the flexibility to monitor and control this limit at values directly related to the battery's ability to perform its assumed function.

- **Administrative Requirement 6.8.3.p**

  Current Technical Specification Table 4.8-2 includes requirements to: (1) restore battery cells with float voltage <2.13 V; (2) equalize and test battery cells that had been discovered with electrolyte level below the top of the plates; and (3) monitor specific gravity. This change addresses these parameters under the Battery Monitoring and Maintenance Program described in TSTF-360 and implemented under proposed Administrative Control Section 6.8.3.p.

  The administrative controls program description provided in TSTF-360, Revision 1 is modified in this submittal for required actions for battery cells discovered with electrolyte level below the minimum established design limit. The phrase "below the top of the plates" is substituted for consistency with IEEE 450, Annex D, section D.1. This change is appropriate because IEEE-450 recommends performing an equalizing charge if the electrolyte level is below the top of the plates, while the minimum established design limit is a level above the top of the plates.

  The specific reference to the version of IEEE-450 is not included in the Technical Specification program description proposed in Section 6.8.3.p to allow future programmatic upgrades to approved standards without necessitating a License amendment. Changes to the Technical Specification Bases are evaluated in accordance with 10 CFR 50.59. This provides adequate control over changes in the implemented version of IEEE-450.

  Eliminating the reference to a specific year from the Technical Specifications and maintaining it in the Technical Specification Bases is consistent with similar changes previously approved by the NRC for other nuclear power facilities. Examples are:

  - Amendment 129 to Facility Operating License No. NPF-37, Byron Station Unit 1

- Amendment 124 to Facility Operating License No. NPF-72, Braidwood Station Unit 1

4.1.6 RESPONSES TO CONDITIONS OUT-OF-LIMITS

New Technical Specification 3/4.8.2.3 provides specific required actions for parameters that have a unique impact on the battery and its continued operability. The associated completion times for out-of-limit conditions recognize the margins available, the minimal impact on the battery capacity and the capability to perform its intended function, and the likelihood of achieving restoration in a timely fashion. Surveillance requirements are proposed for verifying that the batteries are maintained within the established limitations.

The bases for the specific required actions, completion times, and surveillance requirements are as follows:

- **New Action 3.8.2.3.a** addresses a condition in which a battery has one or more cells with float voltage less than 2.07 V. Such a battery cell must be considered degraded. This is consistent with the recommendations of IEEE-450 that such a degraded cell under float conditions and not caused by elevated temperature indicates internal cell problems and replacement may be required. However, cell voltage by itself is not an indication of the state of charge of the battery. A cell parameter slightly outside specification indicates an insignificant to small loss of capability and does not indicate battery inoperability. Verification within 2 hours that the battery charger is operable by monitoring the battery terminal voltage and determining the overall battery state of charge by monitoring the battery float charge current is considered a reasonable time limit to complete the actions and assure that battery capacity is still sufficient. Reduced cell voltage is not the sole reason for the affected battery to be considered inoperable, and continued operation is permitted for a limited period up to 24 hours. 24 hours is considered a reasonable time to effect restoration of the out-of-limit condition.

- **New Action 3.8.2.3.b** addresses a condition in which a battery is found with float current greater than 2 amps, which indicates that a partial discharge of the battery capacity has occurred. This may be due to temporary loss of a battery charger or possibly due to battery cells in a low voltage condition reflecting some loss of capacity. The required battery charger operability is verified within 2 hours by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage, either the battery charger is inoperable or it is operating in the current limit mode. If the battery charger is found to be inoperable, Action 3.8.2.1.b or Action 3.8.2.2.b is applicable. If the battery charger is operating in the current limit mode after 2 hours, this indicates that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery capacity, the loads on the associated DC system, previous discharge, and the recharge characteristic of the battery. Because charge time can be extensive, and there is no adequate assurance that it can be recharged within the allowed 12 hours, the battery must therefore be declared inoperable.

- **New Action 3.8.2.3.c** addresses a condition in which a battery has electrolyte level in one or more cells less than the minimum established design limits. With the electrolyte level above the top of the battery plates, but below the minimum established design limits, the battery will retain sufficient capacity to perform the intended functions. Therefore, considering the affected battery to be inoperable

solely as a result of the electrolyte level is not required. The minimum established design limits for electrolyte level must be restored in order to restore its margins within 31days.

With electrolyte level below the top of the plates, dryout and plate degradation may occur. This Action restores the level and ensures that the cause of electrolyte level reduction is not due to a leak in the battery casing. These actions are only required if the level in the battery is found below the top of the battery plates.

- **New Action 3.8.2.3.d** addresses a condition in which a battery is found with pilot cell electrolyte temperature less than the minimum established design limit. Low electrolyte temperature limits the current and power available from the battery. Although battery capacity may be degraded, since the battery is sized with margin, sufficient capacity exists to perform the intended functions. Therefore, low pilot cell temperature does not by itself require the affected battery to be considered inoperable. The proposed 12 hours provides a reasonable time to restore the temperature to within required limits.

- **New Action 3.8.2.3.e** addresses a condition in which parameters of batteries in redundant trains are not within established design limits. There is not sufficient assurance that overall battery capacity has not been affected to the degree that the batteries can still perform their required function. With redundant DC electrical power systems involved, this could result in total loss of function on multiple systems. The completion times given for battery parameters in which only one train is involved are not appropriate when multiple trains are involved. Therefore, the parameters must be restored to within limits in at least one DC electrical power subsystem within 2 hours.

- **New Action 3.8.2.3.f** addresses a condition in which a battery is found with float voltage less than 2.07 V and float current greater than 2 amps in one or more cells. This indicates that battery capacity may not be sufficient to perform the intended functions, and the corresponding battery must be declared inoperable immediately.

- **New Surveillance Requirement 4.8.2.3.a** will require verification every 7 days that float current for each battery is less than or equal to 2 amps, and is used to determine the state of charge of the battery. The float current requirements are based on the float current indicative of a charged battery. If battery float current is greater than 2 amps, the battery may not be fully charged. Use of float current to determine the state of charge of the battery and the 7-day cycle for verification is consistent with TSTF-360.

- **New Surveillance Requirement 4.8.2.3.b** will require verification that pilot cell voltages are equal to or greater than 2.07 V, the short-term absolute minimum voltage. Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to a minimum established float voltage, which is established by the battery manufacturer and controlled in accordance with the proposed Battery Monitoring and Maintenance Program. The proposed program will provide necessary actions if the battery is found at a float voltage less than the minimum established float voltage but greater than the short-term absolute minimum voltage of 2.07 V. The cycle for pilot cell voltage verification every 31 days is consistent with IEEE 450.

In addition, pilot cells will no longer be average cells. With this change, lowest voltage cells in the battery become the pilot cells. This ensures that all other cells are above the minimum voltage. Changing pilot cell rotation from annually to quarterly to enhance monitoring of cell output ensures timely identification of the cells with the lowest voltage.

- **New Surveillance Requirement 4.8.2.3.c** requires verification that connected cell voltage is equal to or greater than 2.07 V, the short-term absolute minimum voltage. Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to a minimum established float voltage, which is established by the battery manufacturer and controlled in accordance with the proposed Battery Monitoring and Maintenance Program. The proposed program will provide necessary actions if the battery is found at a float voltage less than the minimum established float voltage but greater than the short-term absolute minimum voltage of 2.07 V. The cycle for connected cell voltage verification every 92 days is consistent with IEEE 450.
- **New Surveillance Requirement 4.8.2.3.d** will require verification that the connected cell electrolyte level of each battery is greater or equal to minimum established design limits established in the proposed Battery Monitoring and Maintenance Program. Operation of batteries at electrolyte levels exceeding the minimum established design limit would help to ensure that the plates are not damaged, and adequate electron transfer capability is maintained. The 31-day verification cycle is consistent with IEEE 450.
- **New Surveillance Requirement 4.8.2.3.e** requires verification that the pilot cell temperatures are greater than or equal to the minimum established design limits established in the proposed Battery Monitoring and Maintenance Program. Temperatures lower than assumed in the battery sizing calculations act to inhibit or reduce the overall battery capacity. Maintaining the electrolyte temperature above this level ensures that the battery can provide the required current and voltage to meet the design requirements. The 31-day verification cycle is consistent with IEEE 450.
- **New Surveillance Requirement 4.8.2.3.f** requires verification of battery capacity either periodically, or in response to the battery's condition. This is mostly a relocated surveillance requirement from Technical Specification 3/4.8.2.1. Until sufficient justification for an 18-month interval is available, surveillance requirement 4.8.2.3.f.1 will require performance tests every 12 months of batteries that show degradation or that reach 85% of the service life for the application. Revision of battery performance test interval to 12 months from 18 months in 4.8.2.1.f (now 4.8.2.3.f.1) is a conservative change that is intended to ensure continued battery operability.

  A surveillance requirement will be added as 4.8.2.3.f.2 to require performance discharge tests at least once per 24 months for any battery reaching 85% of the service life expected for the application and capacity is equal to or greater than 100% of the manufacturer's rating. Surveillance requirement 4.8.2.3.f.2 is an additional criterion that supplements 4.8.2.3.f.1. Modified performance tests of batteries that have reached 85% of their service life are to be performed at 12-month intervals with capacity less that 100% of the manufacturer's rating, and at 24-month intervals if the

capacity is 100% or greater. These surveillance requirements are consistent with the requirements of IEEE-450.

Surveillance requirement 4.8.2.3.f.3 is to be moved from surveillance requirement 4.8.2.1.f.

4.1.7 ENHANCED BASES

The accompanying Bases sections for the proposed changes are provided in this submittal for information. The Bases have been revised to incorporate the information and discussion presented in TSTF-360, Revision 1, with the exceptions noted as described previously. Changes to the associated Bases will be implemented pursuant to TS 6.8.3.m, "Technical Specifications Bases Control Program."

4.1.8 MODIFIED PERFORMANCE DISCHARGE TEST

Surveillance Requirement 4.8.2.1 (Modes 1, 2, 3, and 4)

Each 125-volt battery bank is tested at least once per 60 months by applying a performance discharge test to verify that the battery capacity is at least 80% of the manufacturer's rating. Currently, this test may be performed in place of the battery service test required by surveillance requirement 4.8.2.1.e once per each 60-month interval (relocated as surveillance requirement 4.8.2.3.f.3). IEEE 450-2002 states that a modified performance test can be used in lieu of a service test at any time.

Relocation of requirements of battery service tests and performance discharge tests is consistent with the actual modes in which they are performed. Relocation does not change how or when the tests are actually performed.

4.2 SUMMARY

The proposed changes to Technical Specification 3/4.8.2 and addition of new administrative control program requirements are consistent with the considerations and proposed changes provided in Industry/TSTF Standard TS Change Traveler TSTF-360, "DC Electrical Rewrite." The proposed changes support performance of periodic on-line battery maintenance and post-maintenance testing, and will provide increased operational flexibility and allow more efficient application of plant resources to safety-significant activities. The proposed changes have been reviewed and determined to not adversely affect nuclear safety or continued safe plant operation.

5.0 REGULATORY ANALYSIS

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Pursuant to 10CFR50.91, this analysis provides a determination that the proposed changes to the Technical Specifications do not involve any significant hazards consideration as defined in 10CFR50.92, as described below:

- **The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.**

  The proposed change rearranges the Technical Specifications for the direct current electrical power system, and adds new Conditions and required actions with revised completion times to allow for battery charger inoperability. Neither the direct current electrical power subsystem nor associated battery chargers are initiators of an accident sequence previously evaluated. Performance of plant operational activities in accordance with the proposed Technical Specification changes ensures that the

direct current electrical power subsystem is capable of performing its function as previously described, even with extending restoration time to seven days. Therefore, the mitigating functions supported by the subject subsystem will continue to provide the protection assumed by the safety analysis.

Relocation of preventive maintenance surveillances and certain operating limits and actions to a "Battery Monitoring and Maintenance Program" will not challenge the ability of the subject subsystem to perform its design function. Maintenance and monitoring currently required will continue to be performed. In addition, the direct current electrical power subsystem is within the scope of 10CFR50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," which will ensure continued control of maintenance activities associated with the subject subsystem. Changes in and additions to surveillance requirements in 4.8.2.3 are conservative.

Float current monitoring will be used in place of specific gravity monitoring for tests performed weekly and quarterly. The battery manufacturer concurs with the use of float current monitoring for the purpose of determining the state-of-charge of the STP station batteries. The accuracy and capability of the float current monitoring equipment will provide adequate assurance that the deletion of the requirement for specific gravity measurements will not have a significant impact on safety or the ability to accurately determine the operability of the station batteries. The 5% design margin reserved by STP ensures that the 2-amp limit is conservative for the life of the battery.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

- **The proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.**

  The proposed change does not involve any physical alteration of the units. No new equipment is introduced, and installed equipment is not operated in a new or different manner. The proposed changes do not affect setpoints for initiation of protective or mitigating actions.

  Relocation of preventive maintenance surveillances and certain operating limits and actions to a "Battery Monitoring and Maintenance Program" will not challenge the ability of the subject subsystem to perform its design function. Maintenance and monitoring currently required will continue to be performed. Changes in and additions to surveillance requirements in 4.8.2.3 are conservative.

  Float current monitoring will be used in place of specific gravity monitoring for tests performed weekly and quarterly. The battery manufacturer concurs with the use of float current monitoring for the purpose of determining the state-of-charge of the STP station batteries. The accuracy and capability of the float current monitoring equipment will provide adequate assurance that the deletion of the requirement for specific gravity measurements will not have a significant impact on safety or the ability to accurately determine the operability of the station batteries. The 5% design margin reserved by STP ensures that the 2-amp limit is conservative for the life of the battery.

Operability of the DC electrical power subsystems in accordance with the proposed technical specifications is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant.

The proposed changes will not alter the manner in which equipment operation is initiated, nor will the functional demands on credited equipment be changed. No alteration in the operating procedures is proposed, and no change is being made to procedures relied upon in response to an off-normal event. No new failure modes are being introduced, and the proposed change does not alter assumptions made in the safety analyses.

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

- **The proposed change does not involve a significant reduction in the margin of safety.**

  The proposed change will not adversely affect operation of plant equipment and will not result in a change to the setpoints at which protective actions are initiated. Sufficient DC capacity to support operation of mitigation equipment is ensured, even with restoration time extended to seven days. The provisions of the Battery Monitoring and Maintenance Program will ensure that the station batteries are maintained in a highly reliable manner. Changes in and additions to surveillance requirements in 4.8.2.3 are conservative.

  Relocation of preventive maintenance surveillances and certain operating limits and actions to a "Battery Monitoring and Maintenance Program" will not challenge the ability of the subject subsystem to perform its design function. Maintenance and monitoring currently required will continue to be performed.

  Float current monitoring will be used in place of specific gravity monitoring for tests performed weekly and quarterly. The battery manufacturer concurs with the use of float current monitoring for the purpose of determining the state-of-charge of the STP station batteries. The accuracy and capability of the float current monitoring equipment will provide adequate assurance that the deletion of the requirement for specific gravity measurements will not have a significant impact on safety or the ability to accurately determine the operability of the station batteries. The 5% design margin reserved by STP ensures that the 2-amp limit is conservative for the life of the battery.

  The equipment fed by the DC electrical system will continue to provide adequate power to safety-related loads in accordance with analysis assumptions.

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

Based on the evaluation provided above, the South Texas Project concludes that the proposed change does not involve a significant hazards consideration and will not have a significant effect on safe operation of the plant. Therefore, there is reasonable assurance that operation of the South Texas Project in accordance with the proposed revision to the Technical Specifications will not endanger the public health and safety.

5.2 APPLICABLE REGULATORY REQUIREMENTS

- 10CFR50, Appendix A, General Design Criterion (GDC) 17, "Electric Power Systems"

- NRC Regulatory Guide 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," March 10, 1971
- NRC Regulatory Guide 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants," Revision 2, February 1977
- IEEE 308-1971, "Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations," dated August 1972
- IEEE 450, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications

5.3 ANALYSIS

The design of the South Texas Project Class 1E 125-vdc electrical power systems is in accordance with the requirements of GDC 17, NRC Regulatory Guide 1.6, and IEEE-308. Redundant power supplies and equipment satisfy GDC 17 for a single failure.

The overall system design, including functional requirements, redundancy, capacity, and availability is in conformance with IEEE-308 criteria for Class 1E systems with the exception of intervals for battery performance discharge tests, which are in accordance with IEEE 450. The battery charger supply capacity is in accordance with Regulatory Guide 1.32.

Periodic inspection and testing of the DC systems are performed to monitor the condition of the equipment to ensure reliable operation. Visual inspections, liquid level, specific gravity, and cell voltage checks, and performance discharge tests are performed at regular intervals on each battery. Maintenance and testing procedures and criteria for replacement are in accordance with IEEE 450. Visual checks and performance tests are also scheduled for the battery chargers.

The proposed changes to the DC electrical power system specifications are consistent with the applicable regulatory requirements. Full charger operability based on the margin afforded in the design capacity of the battery charger continues to be required. Verification that the batteries are maintained within the established limitations ensures that the batteries have sufficient capacity to perform the required duty cycle.

Based upon the considerations discussed above:

- There is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner;
- Such activities will be conducted in compliance with the Commission's regulations; and
- 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

10 CFR 51.22(b) specifies the criteria for categorical exclusion from the requirements for a specific environmental assessment per 10 CFR 51.21. The South Texas Project has evaluated the proposed amendment and determined that:

- The proposed amendment does not involve a significant hazards consideration.

As demonstrated in the No Significant Hazards Consideration Determination, the requested license amendment does not involve any significant hazards consideration.

- There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

  The proposed amendment involves no change to the facility and does not involve any change in the manner of operation of any plant systems involving the generation, collection or processing of radioactive materials or other types of effluents. Therefore, no increase in the amounts of effluents or new types of effluents would be created.

- There is no significant increase in individual or cumulative occupational radiation exposure.

  The requested license amendment involves no change to the facility and will not increase the radiation dose resulting from the operation of any plant system. Furthermore, implementation of this proposed change will not involve work activities that could contribute to occupational radiation exposure. Therefore, there will be no increase in individual or cumulative occupational radiation exposure associated with this proposed change.

Accordingly, the proposed amendment meets the eligibility criteria 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 is required to be prepared in connection with these proposed changes.

This amendment request meets the criteria specified in 10 CFR 51.22(c)(9). The specific criteria contained in this section are discussed below.

7.0 IMPLEMENTATION

The South Texas Project requests NRC review and approval of the proposed changes by June 30, 2007. Implementation of the proposed Technical Specifications will require procedure changes and rescheduling of the surveillances. The South Texas Project requests 120 days following approval by the NRC to allow for implementation of procedure revisions.

ATTACHMENT 3

PROPOSED TECHNICAL SPECIFICATION CHANGES

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

ELECTRICAL POWER SYSTEMS

3/4.8.2 DC SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 As a minimum, the following DC electrical sources shall be OPERABLE:

a. Channel I 125-volt Battery Bank E1A11 (Unit 1), E2A11 (Unit 2) and one of its two associated chargers,

b. Channel II 125-volt Battery Bank E1D11 (Unit 1), E2D11 (Unit 2) and one of its two associated full capacity chargers,

c. Channel III 125-volt Battery Bank E1B11 (Unit 1), E2B11 (Unit 2) and one of its two associated full capacity chargers, and

d. Channel IV 125-volt Battery Bank E1C11 (Unit 1), E2C11 (Unit 2) and one of its two associated chargers.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With one of the required battery banks inoperable, restore the inoperable battery bank to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With no battery chargers for a channel OPERABLE, ~~restore at least one battery charger to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.~~

1. Restore battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours, AND

2. Verify float current for the affected battery does not exceed 2 amps once per 12 hours, AND

3. Restore one battery charger to OPERABLE status within 7 days.

If the battery terminal voltage cannot be restored in the allowed time, float current is excessive, or a battery charger is not restored to operability in the time allowed, the affected reactor unit is to be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one of the required channels inoperable for reasons other than (a) or (b) above, restore the channel to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

~~SURVEILLANCE REQUIREMENTS~~

4.8.2.1 Each 125-volt battery bank and charger shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that:

~~1) The parameters in Table 4.8-2 meet the Category A limits, and~~

~~2)~~ The total battery terminal voltage is greater than or equal to ~~129 volts on float charge~~ the minimum established float voltage.

b. Not used. ~~At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 135 volts, by verifying that:~~

~~1) The parameters in Table 4.8-2 meet the Category B limits,~~

~~2) There is no visible corrosion at either cell-to-cell or terminal connections, or the connection resistance of these items is less than or equal to 150 X 10^{-6} ohm, and~~

~~3) The average electrolyte temperature of six connected cells is above 65° F.~~

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

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

~~2) The cell-to-cell and terminal connections are clean, tight, and coated with anticorrosion material,~~

~~3) The resistance of each cell-to-cell and terminal connection is less than or equal to 150 x 10^{-6} ohm, and~~

~~4)~~ 1) The battery charger ~~will~~ can supply at least 300 amperes at greater than or equal to the minimum established float voltage ~~125 volts~~ for at least 8 hours.

OR

2) Each battery charger can recharge the battery to the fully charged state within 12 hours while supplying the largest combined demands of the various continuous steady-state loads following a battery discharge to the bounding design-basis event discharge state.

d. Not used. ~~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 ESF loads for the design duty cycle when the battery is subjected to a battery service test;~~

e. Not used. ~~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. Once per 60-month interval this performance discharge test may be performed in lieu of the battery service test required by Specification 4.8.2.1d.; and~~

f. Not used. ~~At least once per 18 months, during shutdown, by giving performance discharge tests of battery capacity to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.~~

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TABLE 4.8-2

BATTERY SURVEILLANCE REQUIREMENTS

	CATEGORY A(1)	CATEGORY B(2)	
PARAMETER	LIMITS FOR EACH DESIGNATED PILOT CELL	LIMITS FOR EACH CONNECTED CELL	ALLOWABLE(3) VALUE FOR EACH CONNECTED CELL
Electrolyte Level	>Minimum level indication mark, and <1/4" above maximum level indication mark	>Minimum level indication mark, and <1.4" above maximum level indication mark	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 volts	≥ 2.13 volts (6)	> 2.07 volts
Specific Gravity (4)	≥ 1.200 (5)	≥ 1.195	Not more than 0.020 below the average of all connected cells
		Average of all connected cells ≥ 1.205	Average of all connected cells ≥ 1.195(5))

TABLE NOTATIONS

(1) For any Category A parameter(s) outside the limit(s) shown, the battery may be considered OPERABLE provided that within 24 hours all Category B measurements are taken and found to be within their allowable values, and provided all Category A and B parameter(s) are restored to within limits within the next 6 days.

(2) For any Category B parameters outside the limit(s) shown, the battery may be considered OPERABLE provided that the Category B parameter(s) are within their allowable values and provided that Category B parameters(s) are restored to within limits within 7 days.

(3) Any Category B parameter not within its allowable value indicates an inoperable battery.

(4) Corrected for electrolyte temperature and level.

(5) Or battery charging current is less than 2 amps when on charge.

(6) Corrected for average electrolyte temperature.

ELECTRICAL POWER SYSTEMS

DC SOURCES

SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.2 DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.3.2, "Onsite Power Distribution – Shutdown."

APPLICABILITY: MODES 5 and 6

ACTION: [Editorial (format) change]

a. With one or more required DC electrical power subsystems inoperable:

1. Immediately declare affected required feature(s) inoperable OR

2. Immediately:

- Initiate action to suspend operation with a potential for draining the reactor vessel, AND
- Suspend all operations involving CORE ALTERATIONS, operations involving positive reactivity additions that could result in loss of required SHUTDOWN MARGIN or required boron concentration, or movement of irradiated fuel, AND
- Initiate corrective action to restore the required DC electrical power subsystems to OPERABLE status as soon as possible.

b. With no battery chargers for a required channel OPERABLE:

1. Restore battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours, AND

2. Verify float current for the affected battery does not exceed 2 amps once per 12 hours, AND

3. Restore one battery charger to OPERABLE status within 7 days.

If the battery terminal voltage cannot be restored within the allowed time, float current is excessive, or a battery charger is not restored to operability in the time allowed:

- Initiate action to suspend operation with a potential for draining the reactor vessel, AND

LIMITING CONDITION FOR OPERATION (Continued)

- Suspend all operations involving CORE ALTERATIONS, operations involving positive reactivity additions that could result in loss of required SHUTDOWN MARGIN or required boron concentration, or movement of irradiated fuel, AND

- Initiate corrective action to restore the required DC electrical power subsystems to OPERABLE status as soon as possible.

SURVEILLANCE REQUIREMENTS

~~4.8.2.2 The required DC sources shall be demonstrated OPERABLE in accordance with Specification 4.8.2.1.~~

4.8.2.2 Each 125-volt battery bank shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that the total battery terminal voltage is greater than or equal to the minimum established float voltage.

b. At least once per 18 months by verifying that the battery charger can supply at least 300 amperes at greater than or equal to the minimum established float voltage for at least 8 hours.

OR

Verify each battery charger can recharge the battery to the fully charged state within 12 hours while supplying the largest combined demands of the various continuous steady-state loads following a battery discharge to the bounding design-basis event discharge state.

c. NOTE: 1. The modified performance discharge test in SR 4.8.2.3.f may be performed in lieu of Surveillance Requirement 4.8.2.2.c.

2. This surveillance shall only be performed during shutdown. Credit may be taken for unplanned events that satisfy this surveillance requirement.

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

ELECTRICAL POWER SYSTEMS

BATTERY PARAMETERS

LIMITING CONDITION FOR OPERATION

3.8.2.3 Parameters for the Class 1E batteries shall be within the specified limits.

APPLICABILITY: When associated DC electrical power subsystems are required to be OPERABLE.

ACTION:

a. If a battery has one or more cells with float voltage <2.07 V:

1. Perform surveillance requirement 4.8.2.1.a within 2 hours, AND

2. Perform surveillance requirement 4.8.2.3.a within 2 hours, AND

3. Restore float voltage of the affected cell(s) to ≥2.07 volts within 24 hours.

If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

b. If a battery has float current >2 amps:

1. Perform surveillance requirement 4.8.2.1.a within 2 hours, AND

2. Restore battery float current to ≤2 amps within 12 hours.

If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

c. If a battery has one or more cells with electrolyte level less than minimum established design limits:

1. Restore electrolyte level in the affected cell(s) to above the top of the plates within 8 hours if electrolyte level is below the top of the plates, AND

2. Verify there is no evidence of electrolyte leakage within 12 hours if electrolyte level is below the top of the plates, AND

3. Restore electrolyte level in the affected cell(s) to greater than or equal to minimum established design limits within 31 days.

If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

d. If a battery has a pilot cell electrolyte temperature less than the minimum established design limits, restore battery pilot cell electrolyte temperature to greater than or equal to minimum established design limits within 12 hours.

If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

e. If battery parameters are not within limits for 2 or more batteries, restore battery parameters to within design limits within 2 hours with no more than one battery outside design limits if a longer time for completion is applicable.

If the required action and associated completion of the above conditions are not met, declare the associated batter(ies) INOPERABLE immediately.

LIMITING CONDITION FOR OPERATION (Continued)

If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

f. If a battery has one or more battery cells with float voltage < 2.07 volts and float current > 2 amps, declare the associated battery INOPERABLE immediately.

SURVEILLANCE REQUIREMENTS

4.8.2.3. Each 125-volt battery bank and charger shall be demonstrated operable:

a. [NOTE: Performance of this surveillance is not required when battery terminal voltage is less than the minimum established float voltage of surveillance requirement 4.8.2.1.a.]

At least once per 7 days, verify the float current for each battery is ≤ 2 amps.

b. At least once per 31 days, verify each battery pilot cell voltage is ≥ 2.07 V on float charge.

c. At least once per 92 days, verify each battery connected cell voltage is ≥2.07V on float charge.

d. At least once per 31 days, verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.

e. At least once per 31 days, verify each battery pilot cell temperature is greater than or equal to minimum established design limits.

f. [NOTE: Battery capacity is to be verified during shutdown.]

1) At least once per 12 months by giving modified performance discharge tests of battery capacity to any battery that shows degradation or reaches 85% of the service life expected for the application with capacity less than 100% of the manufacturer's rating. Degradation is indicated when battery capacity drops more than 10% from its capacity on the previous performance/modified performance discharge test, or is below 90% of the manufacturer's rating; AND

2) At least once per 24 months by giving modified performance discharge tests of battery capacity to any battery reaching 85% of the service life with capacity greater than or equal to 100% of the manufacturer's rating; AND

3) At least once per 60 months by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a modified performance discharge test.

6.8.3.o (continued)

3. If crack indications are found in any SG tube, then the next inspection for each SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever is less). If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary-to-secondary leakage.

p. Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, which includes the following:

1) Actions to restore battery cells discovered with float voltage < 2.13 V;

2) Actions to equalize and test battery cells found with electrolyte level below the top of the plates;

3) Actions to verify that the remaining cells are > 2.07 V when a cell or cells are found to be < 2.13 V; AND

4) Actions to ensure that the specific gravity readings are taken prior to each discharge test.

ATTACHMENT 4

REVISED TECHNICAL SPECIFICATION PAGES

INDEX

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

ELECTRICAL POWER SYSTEMS

3/4.8.2 DC SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 As a minimum, the following DC electrical sources shall be OPERABLE:

a. Channel I 125-volt Battery Bank E1A11 (Unit 1), E2A11 (Unit 2) and one of its two associated chargers,

b. Channel II 125-volt Battery Bank E1D11 (Unit 1), E2D11 (Unit 2) and one of its two associated full capacity chargers,

c. Channel III 125-volt Battery Bank E1B11 (Unit 1), E2B11 (Unit 2) and one of its two associated full capacity chargers, and

d. Channel IV 125-volt Battery Bank E1C11 (Unit 1), E2C11 (Unit 2) and one of its two associated chargers.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With one of the required battery banks inoperable, restore the inoperable battery bank to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With no battery chargers for a channel OPERABLE,

1. Restore battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours, AND

2. Verify float current for the affected battery does not exceed 2 amps once per 12 hours, AND

3. Restore one battery charger to OPERABLE status within 7 days.

If the battery terminal voltage cannot be restored in the allowed time, float current is excessive, or a battery charger is not restored to operability in the time allowed, the affected reactor unit is to be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one of the required channels inoperable for reasons other than (a) or (b) above, restore the channel to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.1 Each 125-volt battery bank and charger shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that:

The total battery terminal voltage is greater than or equal to the minimum established float voltage.

b. Not used.

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

1) The battery charger can supply at least 300 amperes at greater than or equal to the minimum established float voltage for at least 8 hours.

OR

2) Each battery charger can recharge the battery to the fully charged state within 12 hours while supplying the largest combined demands of the various continuous steady-state loads following a battery discharge to the bounding design-basis event discharge state.

d. Not used.

e. Not used.

f. Not used.

THIS PAGE NOT USED

ELECTRICAL POWER SYSTEMS

DC SOURCES

SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.2 DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.3.2, "Onsite Power Distribution – Shutdown."

APPLICABILITY: MODES 5 and 6

ACTION:

a. With one or more required DC electrical power subsystems inoperable:

1. Immediately declare affected required feature(s) inoperable OR

2. Immediately:

- Initiate action to suspend operation with a potential for draining the reactor vessel, AND

- Suspend all operations involving CORE ALTERATIONS, operations involving positive reactivity additions that could result in loss of required SHUTDOWN MARGIN or required boron concentration, or movement of irradiated fuel, AND

- Initiate corrective action to restore the required DC electrical power subsystems to OPERABLE status as soon as possible.

b. With no battery chargers for a required channel OPERABLE:

1. Restore battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours, AND

2. Verify float current for the affected battery does not exceed 2 amps once per 12 hours, AND

3. Restore one battery charger to OPERABLE status within 7 days.

If the battery terminal voltage cannot be restored within the allowed time, float current is excessive, or a battery charger is not restored to operability in the time allowed:

- Initiate action to suspend operation with a potential for draining the reactor vessel, AND

LIMITING CONDITION FOR OPERATION (Continued)

- Suspend all operations involving CORE ALTERATIONS, operations involving positive reactivity additions that could result in loss of required SHUTDOWN MARGIN or required boron concentration, or movement of irradiated fuel, AND

- Initiate corrective action to restore the required DC electrical power subsystems to OPERABLE status as soon as possible.

SURVEILLANCE REQUIREMENTS

4.8.2.2 Each 125-volt battery bank shall be demonstrated OPERABLE:

a. At least once per 7 days by verifying that the total battery terminal voltage is greater than or equal to the minimum established float voltage.

b. At least once per 18 months by verifying that the battery charger can supply at least 300 amperes at greater than or equal to the minimum established float voltage for at least 8 hours.

OR

Verify each battery charger can recharge the battery to the fully charged state within 12 hours while supplying the largest combined demands of the various continuous steady-state loads following a battery discharge to the bounding design-basis event discharge state.

c. NOTE: 1. The modified performance discharge test in SR 4.8.2.3.f may be performed in lieu of Surveillance Requirement 4.8.2.2.c.

2. This surveillance shall only be performed during shutdown. Credit may be taken for unplanned events that satisfy this surveillance requirement.

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

ELECTRICAL POWER SYSTEMS

BATTERY PARAMETERS

LIMITING CONDITION FOR OPERATION

3.8.2.3 Parameters for the Class 1E batteries shall be within the specified limits.

APPLICABILITY: When associated DC electrical power subsystems are required to be OPERABLE.

ACTION:

a. If a battery has one or more cells with float voltage <2.07 V:

   1. Perform surveillance requirement 4.8.2.1.a within 2 hours, AND
   2. Perform surveillance requirement 4.8.2.3.a within 2 hours, AND
   3. Restore float voltage of the affected cell(s) to ≥2.07 volts within 24 hours.

   If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

b. If a battery has float current >2 amps:

   1. Perform surveillance requirement 4.8.2.1.a within 2 hours, AND
   2. Restore battery float current to ≤2 amps within 12 hours.

   If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

c. If a battery has one or more cells with electrolyte level less than minimum established design limits:

   1. Restore electrolyte level in the affected cell(s) to above the top of the plates within 8 hours if electrolyte level is below the top of the plates, AND
   2. Verify there is no evidence of electrolyte leakage within 12 hours if electrolyte level is below the top of the plates, AND
   3. Restore electrolyte level in the affected cell(s) to greater than or equal to minimum established design limits within 31 days.

   If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

d. If a battery has a pilot cell electrolyte temperature less than minimum established design limits, restore battery pilot cell electrolyte temperature to greater than or equal to minimum established design limits within 12 hours.

   If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

e. If battery parameters are not within limits for 2 or more batteries, restore battery parameters to within design limits within 2 hours with no more than one battery outside design limits if a longer time for completion is applicable.

   If the required action and associated completion of the above conditions are not met, declare the associated batter(ies) INOPERABLE immediately.

LIMITING CONDITION FOR OPERATION (Continued)

If the required action and associated completion of the above conditions are not met, declare the associated battery INOPERABLE immediately.

f. If a battery has one or more battery cells with float voltage < 2.07 volts and float current > 2 amps, declare the associated battery INOPERABLE immediately.

SURVEILLANCE REQUIREMENTS

4.8.2.3. Each 125-volt battery bank and charger shall be demonstrated operable:

a. [NOTE: Performance of this surveillance is not required when battery terminal voltage is less than the minimum established float voltage of surveillance requirement 4.8.2.1.a.]

At least once per 7 days, verify the float current for each battery is ≤ 2 amps.

b. At least once per 31 days, verify each battery pilot cell voltage is ≥ 2.07 V on float charge.

c. At least once per 92 days, verify each battery connected cell voltage is ≥2.07V on float charge.

d. At least once per 31 days, verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.

e. At least once per 31 days, verify each battery pilot cell temperature is greater than or equal minimum established design limits.

f. [NOTE: Battery capacity is to be verified during shutdown.]

1) At least once per 12 months by giving modified performance discharge tests of battery capacity to any battery that shows degradation or reaches 85% of the service life expected for the application with capacity less than 100% of the manufacturer's rating. Degradation is indicated when battery capacity drops more than 10% from its capacity on the previous performance/modified performance discharge test, or is below 90% of the manufacturer's rating; AND

2) At least once per 24 months by giving modified performance discharge tests of battery capacity to any battery reaching 85% of the service life with capacity greater than or equal to 100% of the manufacturer's rating; AND

3) At least once per 60 months by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a modified performance discharge test.

6.8.3.o (continued)

3. If crack indications are found in any SG tube, then the next inspection for each SG for the degradation mechanism that caused the crack indication shall not exceed 24 effective full power months or one refueling outage (whichever is less). If definitive information, such as from examination of a pulled tube, diagnostic non-destructive testing, or engineering evaluation indicates that a crack-like indication is not associated with a crack(s), then the indication need not be treated as a crack.

e. Provisions for monitoring operational primary-to-secondary leakage.

p. Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, which includes the following:

1) Actions to restore battery cells discovered with float voltage < 2.13 V;

2) Actions to equalize and test battery cells found with electrolyte level below the top of the plates;

3) Actions to verify that the remaining cells are > 2.07 V when a cell or cells are found to be < 2.13 V; AND

4) Actions to ensure that specific gravity readings are taken prior to each discharge test.

ATTACHMENT 5

SUPPORTING TECHNICAL SPECIFICATION BASES CHANGES

c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

In general, when the unit is shutdown, the Technical Specification requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

During MODES 1, 2, 3, and 4, various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are generally planned and administratively controlled. Relaxation from MODES 1, 2, 3, and 4 LCO requirements is acceptable during shutdown modes based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODE 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability to support systems necessary to avoid immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite diesel generator (DG) power.

3/4.8.2 DC SOURCES

BACKGROUND

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety-related equipment and preferred AC vital bus power (via inverters). As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The DC electrical power system conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The 125 VDC electrical power system consists of four independent and redundant safety-related Class 1E DC electrical power subsystems Trains A, B, C, and D. Each subsystem consists of one 125 VDC battery, the associated battery chargers, and the associated control equipment and interconnecting cabling.

There are two 100% capacity battery chargers per battery. One charger is kept in operation and the other is a backup. If the backup battery charger is applied, the requirements of independence and redundancy between subsystems are maintained.

During normal operation, the 125 VDC load is powered from the battery charger with the battery floating on the system. Following loss of normal power to the battery charger, the DC load is automatically powered from the station battery.

The Train A, B, C, and D electrical power subsystems provide the control power for the associated Class 1E AC power load group, 4.16 kV switchgear, and 480 V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses. The DC power distribution system is described in more detail in the Bases for LCO 3.8.3.1, "Onsite Power Distribution - Operating," and LCO 3.8.3.2, " Onsite Power Distribution - Shutdown."

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 121.8 V for a 59-cell battery (i.e., cell voltage of 2.065 volts per cell). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with its open circuit voltage $\geq$ 2.065 volts per cell, the battery cell will maintain its capacity for 30 days without further charging. The minimum float voltage required by the battery manufacturer is 2.17 volts per cell, which corresponds to 128 V for 59 cells at the battery terminals. Optimal long-term performance, however, is obtained by maintaining the float voltage between 2.17 and 2.25 volts per cell. This provides adequate over-potential which limits the formation of lead sulfate and self-discharge. The nominal float voltage of 2.23 volts per cell corresponds to a total float voltage output of 131.5 V for a 59-cell battery as discussed in UFSAR Chapter 8 (Ref. 4).

Each 125 VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystems to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class IE subsystems, such as batteries, battery chargers, or distribution panels.

DC SOURCES (continued)

Each battery has adequate storage capacity to meet the assumed duty cycle for the bounding design basis event. Additional margin is available to support the ability of the battery to carry the DC loads continuously for approximately 4 hours as discussed in UFSAR Chapter 8 (Ref. 4) for station blackout. The batteries are designed with a 5% margin.

The batteries for Trains A, B, C, and D DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. The minimum design voltage limit is approximately 105 V.

Each Train A, B, C, and D DC electrical power subsystem battery charger has sufficient 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 also has sufficient capacity to restore the battery from the design minimum charge to its fully charged state within 12 hours while supplying normal steady-state loads discussed in UFSAR Chapter 8 (Ref. 4).

This charging capacity exceeds the minimum requirements for the charger to support the required DC loads in analyzed accidents and supports minimizing the operational limitations imposed on battery testing and associated recharging.

The battery charger is normally in the float-charge mode. Float charge is the condition in which the charger supplies the connected loads and the battery cells receive adequate current to maintain the battery in a fully charged condition. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Lead-calcium batteries have recharge efficiencies of greater than 95%, so after at least 105% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery.

Industry test data also show that when charging at equalized voltage, and the charging current reduces to approximately 13% of the charger current limit setting (42.9 amps), 95% of the original battery capacity has been restored. With the designed margins in battery sizing and the excess capacity available above the maximum assumed load, battery OPERABILITY (including post-maintenance return-to-service) is assured at charging currents well above 10 amps.

DC SOURCES (continued)

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in UFSAR Chapter 6 (Ref. 5), and in UFSAR Chapter 15 (Ref. 6), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation.

OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one train of DC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC power or all onsite AC power; and

b. A worst case single failure.

The DC sources satisfy Criterion 3 of 10CFR50.36(c)(2)(ii).

3/4.8.2.1 DC SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

Each DC electrical power subsystem is required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Each DC electrical power subsystem consists of one battery, two battery chargers, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus within the train. Loss of the DC electrical power subsystem of any train does not prevent the minimum safety function from being performed (Ref. 4).

An OPERABLE DC electrical power subsystem requires the battery and one associated charger to be operating and connected to the associated DC bus.

APPLICABILITY

The DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated DBA.

The DC electrical power requirements for MODES 5 and 6 are addressed in the BASES for LCO 3.8.2.2, "DC Sources—Shutdown."

DC SOURCES (Continued)

ACTIONS

a. This action represents one Train with its associated battery inoperable. With the battery inoperable, the OPERABLE battery charger supplies the DC bus. Any event that results in loss of the AC bus supporting the battery charger will also result in loss of DC to that Train. Therefore, it is imperative that the operator focus attention on stabilizing the unit, thereby minimizing the potential for complete loss of DC power to the affected Train.

The 2-hour limit allows sufficient time to effect restoration of an inoperable battery while minimizing the risk of a loss of AC power to the associated battery charger as a result of imposing a required unit shutdown. During this time, assumption of additional single failures is not required.

b. This action represents one Train with both battery chargers inoperable (e.g., the voltage limit of SR 4.8.2.1.a. is not maintained).

Action b.1 requires that the terminal voltage of the affected batteries be restored to greater than or equal to the minimum established float voltage within 2 hours. The 2-hour limit provides for returning the required charger(s) to OPERABLE status or providing an alternate means of restoring the associated battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the terminal voltage of the affected batteries to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the affected battery will be restored to its fully charged condition from any discharge that might have occurred due to the charger inoperability.

A spare non-Class 1E battery charger may be provided in the future to serve as an alternate means of restoring the associated battery terminal voltage if the affected batteries have less than the minimum established float voltage and they are to be considered operable after two hours. The spare non-Class 1E battery charger will be diesel-backed.

If established battery terminal float voltage cannot be restored to greater than or equal to the minimum established float voltage within 2 hours, and the charger is not operating in the current limiting mode, a faulty charger is indicated. A faulty charger that is not capable of maintaining established battery terminal float voltage does not provide assurance that it can revert to and operate properly in the current limit mode that is necessary during the recovery period following a battery discharge event for which the DC system is designed.

Required Action 3.8.2.1.b.2 allows 12 hours to establish that the battery capacity remains (or is restored) sufficient to perform its required safety function (duty cycle) and further requires that this determination be periodically re-verified. This provides assurance that in the event of a DBA during the 7 days allowed by Required Action 3.8.2.1.b.3 to restore a battery charger to OPERABLE status, the battery will be available to perform its assumed function. If at the expiration of the initial 12-hour period the battery capacity can not be determined to be sufficient to perform the design duty cycle, the battery must be declared inoperable and Action 3.8.2.1.a entered. A test (e.g., battery service test) to confirm the battery capacity is not required. The intent of this Required Action is to evaluate the capacity based on available

DC SOURCES (continued)

operational data. The ability of the battery to satisfy this Required Action can be evaluated by indirect means, such as observation of the charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery. Consideration of excess capacity determined by previous testing may also be utilized in this evaluation.

The charger operating in the current limit mode after 2 hours is an indication that the battery is partially discharged and its capacity margins have been reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of load on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is insufficient assurance that it can be recharged within 12 hours.

During the 12-hour Completion Time of Required Action 3.8.2.1.b.2, provided the battery is otherwise not known to be inoperable (including charging currents not in excess of 10 amps), the battery may be considered OPERABLE unless otherwise indicated. This is an acceptable presumption based on the limited discharge of the battery (< 2 hours), the expectation that at least some recharge is occurring (Required Action b.1 assures no further discharging is occurring), and that confirmation will be available within 12 hours of discovery of the inoperable battery charger.

Without adequate assurance that the battery can be recharged within 12 hours, the affected battery must also be declared inoperable and Action 3.8.2.1.a initiated. This is consistent with the battery parameter requirements and actions of LCO 3.8.2.3.

Required Action 3.8.2.1.b.3 limits the restoration time for the inoperable required battery charger to 7 days. This action is applicable if battery terminal voltage is restored to meet or exceed the minimum established float voltage by using an alternative method. The 7-day completion time reflects a reasonable time to effect restoration of the qualified battery charger to operable status.

c. This condition represents a train with a loss of ability to respond to an event, and a loss of ability to remain energized during normal operation. An example would be failure of a battery breaker. The operator must minimize the potential for complete loss of DC power to the affected train. The 2-hour limit is consistent with the allowed time for an inoperable DC distribution system train.

If one of the required DC electrical power subsystems is inoperable, the other DC electrical power subsystems have the capability to support a safe shutdown and to mitigate an accident condition. However, continued power operation should not exceed 2 hours. The 2-hour completion time is based on Regulatory Guide 1.93 and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem. If the DC electrical power subsystem is not restored to OPERABLE status, the time allowed is sufficient to prepare to effect an orderly and safe unit shutdown.

DC SOURCES (continued)

SURVEILLANCE REQUIREMENTS

SR 4.8.2.1.a

Verification of battery terminal voltage while on float charge helps to ensure the effectiveness of the battery chargers supporting the ability of the batteries to perform their intended function. Float charge is the condition in which the charger supplies the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state, while supplying the continuous steady-state loads of the associated DC subsystem. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum voltage on float charge established by the battery manufacturer (2.17 volts per cell or 128 V at the battery terminals for a 59-cell battery). This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The 7-day cycle is conservative with respect to manufacturer recommendations and IEEE-450 (Ref. 8).

SR 4.8.2.1.b

Not used.

SR 4.8.2.1.c

This charging capacity exceeds the minimum requirements for the charger to support the required DC loads in analyzed accidents. The excess capability supports minimizing the operational limitations imposed on battery testing and associated recharging.

This SR provides two options. One option requires that each battery charger be capable of supplying 300 amps at 128 volts (the minimum established float voltage) for 8 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of AC power. The time allowed is sufficient for the charger temperature to stabilize and be maintained for at least 2 hours.

The second option requires that each battery charger be capable of recharging the battery within 12 hours following a service test coincident with supplying the largest combined demands of the various continuous steady-state loads (regardless of the status of the plant during which these demands occur). This load level may not normally be available following the battery service test and will need to be supplemented with additional loads. The duration of this test may be longer than the charger sizing criterion since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is less than or equal to 2 amps.

The surveillance frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 18-month intervals. In addition, this frequency is intended to be consistent with expected fuel cycle lengths.

DC SOURCES (continued)

3/4.8.2.2 DC SOURCES – SHUTDOWN

LIMITING CONDITION FOR OPERATION

One DC electrical power subsystem consisting of one battery, at least one charger, and the corresponding control equipment and interconnecting cabling within the train are required to be OPERABLE to support one train of the distribution systems required to be OPERABLE by LCO 3.8.3.2, "Distribution Systems-Shutdown." This ensures availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown.

APPLICABILITY

The DC electrical power sources required as OPERABLE in MODES 5 and 6 provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Required features needed to mitigate a fuel-handling accident are available;

c. Required features needed to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability are available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

ACTIONS

By allowing the option to declare required features inoperable with the associated DC power source inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. Allowance is made for sufficiently conservative actions. The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required shutdown margin is maintained.

Suspension of these activities does not preclude completion of actions to establish a safe, conservative condition. The actions minimize the probability of occurrence of postulated events.

Use of "immediately" for Completion Time is consistent with the required times for actions requiring prompt attention.

DC SOURCES (continued)

SURVEILLANCE REQUIREMENT

SR 4.8.2.2.a

Verification of battery terminal voltage while on float charge helps to ensure the effectiveness of the battery chargers supporting the ability of the batteries to perform their intended function. Float charge is the condition in which the charger supplies the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state, while supplying the continuous steady-state loads of the associated DC subsystem. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum voltage established by the battery manufacturer (2.17 volts per cell or 128 V at the battery terminals for a 59-cell battery). This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The 7-day cycle is conservative with respect to manufacturer recommendations and IEEE-450 (Ref. 8).

SR 4.8.2.2.b

This charging capacity exceeds the minimum requirements for the charger to support the required DC loads in analyzed accidents. The excess capability supports minimizing the operational limitations imposed on battery testing and associated recharging.

This SR provides two options. One option requires that each battery charger be capable of supplying 300 amps at 125 volts for 8 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of AC power. The time allowed is sufficient for the charger temperature to stabilize and be maintained for at least 2 hours.

The second option requires that each battery charger be capable of recharging the battery within 12 hours following a service test coincident with supplying the largest combined demands of the various continuous steady-state loads (regardless of the status of the plant during which these demands occur). This load level may not normally be available following the battery service test and will need to be supplemented with additional loads. The duration of this test may be longer than the charger sizing criterion since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is less than or equal to 2 amps.

The surveillance frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 18-month intervals. In addition, this frequency is intended to be consistent with expected fuel cycle lengths.

SR 4.8.2.2.c

This SR allows a modified performance discharge test to be used in lieu of a battery service test. Either the battery service test or the modified performance discharge test may be used to

DC SOURCES (continued)

satisfy SR 4.8.2.2.c. However, only the modified performance discharge test may be used to satisfy the requirements of SR 4.8.2.3.f.

3/4.8.2.3 BATTERY PARAMETERS

LIMITING CONDITION FOR OPERATION

In order to ensure the ability of the batteries to perform their intended function, the batteries are normally maintained in a fully charged state and the environment in which the batteries are located is maintained within the parameters used to determine battery sizing and operation. Verifying average electrolyte temperature, total battery terminal voltage on float charge, connection resistance values, and the performance of battery service and discharge tests ensures the effectiveness of the charging system and the ability to handle high discharge rates, and compares the battery capacity with the rated capacity.

Battery 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. Battery parameter limits are conservatively established, allowing continued electrical system function even with limits not met.

Additional preventive maintenance, testing, and monitoring performed in accordance with the Battery Monitoring and Maintenance Program is conducted without direct impact on the requirements of this Specification. Failure to meet any Battery Monitoring and Maintenance Program requirement is evaluated against the Technical Specification limits, OPERABILITY determinations, and Maintenance Rule Program, but does not necessarily result in failure to meet this LCO.

APPLICABILITY

The battery parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery parameter limits are only required when the DC power source is required to be OPERABLE. Refer to the Applicability discussion in Bases for LCO 3.8.2.1 and LCO 3.8.2.2.

ACTIONS

a. With float voltage in one or more cells in one or more batteries < 2.07 V, the battery cell is degraded. Within 2 hours, verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage SR 4.8.2.1.a. and of the overall battery state of charge by monitoring the battery float charge current SR 4.8.2.3.a. This assures that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one or more batteries < 2.07 V, and continued operation is permitted for a limited period up to 24 hours.

DC SOURCES (continued)

Since the LCO Actions only specify "perform," failure to satisfy SR 4.8.2.1.a or SR 4.8.2.3.a acceptance criteria does not result in this Required Action not being met. However, if one of the SRs is not met, the applicable Action in the associated specification is entered.

b. Float current greater than 2 amps in one or more batteries indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possible due to one or more battery cells in a low voltage condition reflecting some loss of capacity. However, although float current may be greater than 2 amps, the battery capacity remains sufficient to perform its intended safety function during the time allowed.

Taking into consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery parameters to normal limits, this time is acceptable for operation prior to declaring the DC batteries inoperable.

If the affected battery float current is less than or equal to 2 amps, and the battery has been discharged as the result of the inoperable battery charger, this indicates that the battery is fully recharged. If, at the expiration of the initial 12-hour period, the battery float current is NOT less than or equal to 2 amps, unit shutdown is initiated. There may be additional battery problems, as well.

c. With one or more batteries with electrolyte level in one or more cells below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Even in the event level drops slightly below the top of the plates, the plates are porous and acid will wick from the immersed plate. Therefore, not meeting the specified electrolyte level does not by itself require the affected battery to be considered inoperable. Level is required to be restored to above the top of plates within 8 hours, and within 31 days the minimum established design limits for electrolyte level must be re-established.

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The frequency is consistent with IEEE-450 (Ref. 8).

d. This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit of 65°F. Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is consistent with IEEE-450 (Ref. 8).

With one or more batteries with pilot cell temperature less than the minimum established design limits, 12 hours is allowed to restore the temperature to within limits. A low electrolyte temperature limits the current and power available. Because the battery is sized with margin, degraded battery capacity leaves sufficient capacity to perform the intended function and the affected battery is not required to be considered inoperable solely as a result of not meeting the required pilot cell temperature.

DC SOURCES (continued)

e. Where batteries in redundant trains are found with batteries not within design limits, and one of the two associated chargers in each affected train is not operable, there is insufficient assurance that battery capacity remains sufficient to the extent that the batteries can still perform their required function. The longer completion times associated with some parameters are therefore not appropriate, and the batteries' conditions must be restored to within limits within 2 hours. No more than one battery may be exempted from the two-hour restriction if a longer completion time would otherwise apply.

f. If a battery is found with one or more battery cell float voltage less than 2.07 V, and float current is greater than 2 amps, the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared INOPERABLE immediately.

SURVEILLANCE REQUIREMENTS

The surveillance requirements are based on:

- NRC-approved Technical Specification Task Force (TSTF) Standard Technical Specification Change Traveler TSTF-360, Revision 1, "DC Electrical Rewrite," as incorporated in NUREG-1431, Revision 2, "Standard Technical Specifications, Westinghouse Plants" (June 2001), and

- IEEE 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Generating Stations and Substations."

The voltage requirements are based on the nominal design voltage of the battery and are consistent with the initial voltages assumed in the battery sizing calculations. The seven-day cycle is conservative with respect to manufacturer recommendations and IEEE-450 (Ref. 8).

SR 4.8.2.3.a

Verification of battery float current while on float charge is used to determine the state of charge on the battery. Float charge is the condition in which the charger is supplying continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. Float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref. 8).

This surveillance requirement is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 4.8.2.1.a. When this float voltage is not maintained, LCO Action 3.8.2.2.a is applicable, and provides the necessary and appropriate verification of the battery condition. The float current limit of 2 amps is based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 4.8.2.3.b and SR 4.8.2.3.c

These SRs require verification that the cell voltages are equal to or greater than the short-term absolute minimum of 2.07 V.

DC SOURCES (continued)

Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer. This provides adequate over-potential, which limits formation of lead sulfate. Monitoring individual cell long-term performance is accomplished by the Battery Monitoring and Maintenance Program, which implements a program for monitoring various battery parameters based on the recommendations of IEEE 450-2002 (Ref.8). Individual cell voltages < 2.13 V will result in increased monitoring and appropriate corrective action(s) in accordance with this program.

The minimum float voltage required by the battery manufacturer is 2.17 volts per cell, which corresponds to 128 V for 59 cells at the battery terminals. Individual cell float voltages less than 2.13 volts per cell, but greater than 2.07 volts per cell, are addressed in Technical Specification Administrative Control subsection 6.8.3.p. The Frequency for cell voltage verification, every 31 days for each pilot cell and 92 days for each connected cell, is consistent with IEEE-450 (Ref. 8). The primary change to incorporate this method is that the pilot cells are no longer average cells. Pilot cells are now the cells with the lowest individual cell voltages.

SR 4.8.2.3.d

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The Frequency is consistent with IEEE-450 (Ref. 8).

SR 4.8.2.3.e

This surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit of 65°F. Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity.

The Frequency is consistent with IEEE-450 (Ref. 8).

SR 4.8.2.3.f

If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the surveillance cycle is reduced to 12 months. Degradation is indicated, according to IEEE-450 (Ref. 8), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is $\geq$ 10% below the manufacturer's rating. These frequencies are consistent with the recommendations in IEEE-450 (Ref. 8).

A modified performance discharge test of battery capacity is given to any battery reaching 85% of the service life with capacity at least equal to the manufacturer's rating. The interval between tests is to be no longer than 24 months.

A modified performance discharge test is performed at 60-month intervals. The acceptance criteria for this surveillance are consistent with IEEE-450 (Ref. 8) and IEEE-485 (Ref. 9). These references

DC SOURCES (continued)

recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

A battery performance discharge test is a test of constant current capacity of a battery to detect any change in the capacity determined by the acceptance test. This test is intended to determine overall battery degradation due to age and usage.

A modified performance discharge test is a test of the battery capacity and its ability to provide the highest rate of the duty cycle. This confirms the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for the service test.

The modified performance test consists of just two rates, the one-minute rate for the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a one-minute discharge represent a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

Either the battery performance discharge test or the modified battery performance discharge test is acceptable for satisfying SR 4.8.2.2.c; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 4.8.2.3.f.3.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE-308
4. UFSAR, Chapter 8
5. UFSAR, Chapter 6
6. UFSAR, Chapter 15
7. Regulatory Guide 1.93, December 1974
8. IEEE 450-2002
9. IEEE 485-1983
10. Regulatory Guide 1.32, February 1997

ATTACHMENT 6

INPUT FOR TECHNICAL REQUIREMENTS MANUAL

6.14 BATTERY MONITORING AND MAINTENANCE PROGRAM

1. The BATTERY MONITORING AND MAINTENANCE PROGRAM provides for battery restoration and maintenance which requires the following actions:
   a. Restore battery cells discovered with float voltage <2.13 V
   b. Equalize and test battery cells discovered with electrolyte level below top of the plates.
   c. Verify that the remaining cells are ≥2.07 V when a cell or cells are found to be <2.13 V.
   d. Take specific gravity readings prior to each discharge test.
2. Each 125-volt battery bank and charger shall be demonstrated operable as follows:
   a. At least once per 92 days, verify that:
      - There is no visible corrosion at either cell-to-cell or terminal connections, or the connection resistance of these items is less than or equal to 40x10-6 ohm; and
      - The average electrolyte temperature of six connected cells is above 65°F.
   b. Within 7 days after a severe battery discharge with battery terminal voltage below 1.6 volts per cell, or severe battery overcharge with battery voltage above 2.5 volts per cell, verify that:
      - There is no visible corrosion at either cell-to-cell or terminal connections, or the connection resistance of these items is less than or equal to 40x10-6 ohm;
      - The average electrolyte temperature of six connected cells is above 65°F;
      - Each battery connected cell voltage is ≥ 2.07 V on float charge;
      - Each battery connected cell electrolyte level is greater than or equal to the minimum established design limits; and
      - Battery pilot cell temperature is greater than or equal to 65°F.
   c. At least once per 18 months, verify that:
      - The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration;
      - The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material;
      - The resistance of each cell-to-cell and terminal connection resistance less than or equal to 40x10-6 ohm or less than 90x10-6 ohm provided the average connection resistance is less than 40x10-6 ohm; and
      - Specific gravity is within operational limits.

ATTACHMENT 7
BATTERY VENDOR CORRESPONDENCE

INDUSTRIAL POWER
A Division of EXIDE Technologies

GNB Industrial Power
3950 Sussex Avenue
Aurora, IL 60504-7932
USA

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800.872.0471 toll free
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www.gnb.com

21 March 2007

Float Current Monitoring

From: Robert J. Schmitt
Staff Engineer
GNB Network Power

To: Mr. Steve Clark
Systems Engineering
South Texas Project NOC

cc: Mr. A. Bell - NLI
Mr. M. Berger - GNB

GNB's position on the use of float current measurements by South Texas Project to determine the state of charge of flooded stationary lead-calcium batteries is as follows:

- The concept of utilizing float current levels of a flooded, stationary string battery to determine a state of charge throughout the life of the battery is reasonable. It is the responsibility of the licensee to establish the value of float current at which the battery is capable of performing its design function and is operable.

- There is a relationship between percentage of ampere-hours returned following a successful discharge capacity test and battery state of charge.

- Proper follow-up and verification of satisfactory float charge voltage, current and specific gravities is necessary to determine whether the battery is operating properly per GNB's Installation and Operating Manual, section 93.10.

- The charge current of each battery and can be affected by impurity levels, age, operating environment and maintenance history.

I hope this addresses your concerns on this matter and that you will contact me with any further questions.

Best regards,

RjS

ATTACHMENT 8

LIST OF COMMITMENTS

LIST OF COMMITMENTS

The following table identifies the actions in this document to which the STP Nuclear Operating Company has committed. Statements in this submittal with the exception of those in the table below are provided for information purposes and are not considered commitments. Please direct questions regarding these commitments to Philip Walker at (361) 972-8392.

Commitment	Expected Completion Date	CR Action
STPNOC will continue to use specific gravity monitoring to measure electrolyte strength in addition to float current monitoring. STPNOC will relocate the current battery parameter for specific gravity from the Technical Specifications to the Battery Monitoring and Maintenance Program.	06/30/2007*	04-12263-27
Maintain a 5% design margin allowing use of 2 amps as the float current limit. This margin will be included in the Technical Specification Bases and in the battery sizing calculation.	06/30/2007*	04-12263-28
STPNOC commits to incorporate the Battery Monitoring and Maintenance Program into the STP Technical Requirements Manual.	06/30/2007*	04-12263-29
The BATTERY MONITORING AND MAINTENANCE PROGRAM provides for battery restoration and maintenance which requires the following actions: – Restore battery cells discovered with float voltage <2.13 V – Equalize and test battery cells discovered with electrolyte level below top of the plates. – Verify that the remaining cells are ≥2.07 V when a cell or cells are found to be <2.13 V. Take specific gravity readings prior to each discharge test.	06/30/2007*	04-12263-25
Relocate to the Battery Monitoring and Maintenance Program (from 4.8.2.1.b): At least once per 92 days, verify: – There is no visible corrosion at either cell-to-cell or terminal connections, or the connection resistance is no greater than 150x10-6 ohm; and – The average cell electrolyte temperature at six connected cells is above 65°F.	06/30/2007*	04-12263-23
Relocate to the Battery Monitoring and Maintenance Program (from 4.8.2.1.b): Within 7 days after a severe battery discharge with battery terminal voltage below 1.6 volts per cell, or severe battery overcharge with battery voltage above 2.5 volts per cell, verify that:: – There is no visible corrosion at either cell-to-cell or terminal connections, or the connection resistance of these items is less than or equal to 40x10-6 ohm; and – The average electrolyte temperature of six connected cells is above 65°F.	06/30/2007*	04-12263-26
Relocate to the Battery Monitoring and Maintenance Program (from 4.8.2.1.c): At least once per 18 months, verify that: • The cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration; • Cell-to-cell and terminal connections are clean, tight, and coated with anticorrosion material; and • The resistance of each cell-to-cell and terminal connection is less than or equal to 150x10-6 ohm.	06/30/2007*	04-12263-24

* Arbitrary date. Issuance is to occur within 120 days following NRC approval.