PROPOSED MODEL APPLICATION FOR PLANT-SPECIFIC ADOPTION OF

TSTF TRAVELER TSTF-500, REVISION 2,

"DC ELECTRICAL REWRITE – UPDATE TO TSTF-360"

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: [PLANT]
DOCKET NO. 50-[XXX]
LICENSE AMENDMENT REQUEST FOR ADOPTION OF TECHNICAL SPECIFICATIONS TASK FORCE (TSTF) TRAVELER TSTF 500, REVISION 2, "DC ELECTRICAL REWRITE – UPDATE TO TSTF-360"

In accordance with the provisions of Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), [LICENSEE] is submitting a request for an amendment to the technical specifications (TS) for [PLANT].

The proposed amendment would modify TS requirements related to direct current (DC) electrical systems in accordance with TSTF-500, Revision 2, "DC Electrical Rewrite - Update to TSTF-360."

Attachment 1 provides a description and assessment of the proposed changes including the requested confirmation of applicability and plant-specific verifications; technical analyses; regulatory analyses; and environmental considerations. Attachment 2 provides a summary of the required Final Safety Analysis Report (FSAR) descriptions. Attachment 3 provides markup pages of existing TS and TS Bases to show the proposed change in accordance with TSTF-500, Revision 2. Attachment 4 provides revised (clean) TS pages.

[LICENSEE] requests approval of the proposed license amendment by [DATE], with the amendment being implemented [BY DATE OR WITHIN X DAYS].

In accordance with 10 CFR 50.91(a)(1), "Notice for Public Comment," the analysis about the issue of no significant hazards consideration using the standards in 10 CFR 50.92 is being provided to the Commission.

In accordance with 10 CFR 50.91(b)(1), "Notice for Public Comment; State Consultation," a copy of this application and the reasoned analysis about no significant hazards considerations is being provided to the designated [STATE] Official.

I declare [or certify, verify, state] under penalty of perjury that the foregoing is correct and true.

Executed on [date] [Signature]

If you should have any questions about this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Attachments: [As stated or provide list]

Enclosures:

1. Letter(s) from Battery Manufacturer(s) Verifying the Acceptability of Using Float Current Monitoring
2. [Evaluation supporting a CT longer than 72 hours for Specifications [3.8.4, and 3.8.5, Required Action A.3].
3. [Evaluation supporting a CT longer than 2 hours for Specification [3.8.4, Required Action B.1 and C.1].

cc: [NRR Project Manager]
[Regional Office]
[Resident Inspector]
[State Contact]

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ATTACHMENT 1

DESCRIPTION AND ASSESSMENT OF THE PROPOSED CHANGES

1.0 DESCRIPTION

The proposed amendment would revise technical specification (TS) requirements related to direct current (DC) electrical systems in TS limiting condition for operation (LCO) 3.8.[4], ["DC Sources - Operating,"] LCO 3.8.[5], ["DC Sources - Shutdown,"] and LCO 3.8.[6], ["Battery Parameters."] A [new or revised] "Battery Monitoring and Maintenance Program" is being proposed for Section [5.5] ["Administrative Controls - Programs and Manuals."]

This change is consistent with the U.S. Nuclear Regulatory Commission (NRC)-approved Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2. The availability of this TS improvement was announced in the *Federal Register* on [Date] ([ ] FR [ ]).

2.0 ASSESSMENT

2.1 APPLICABILITY OF PUBLISHED SAFETY EVALUATION

[LICENSEE] has reviewed the model safety evaluation (SE) referenced in the *Federal Register* Notice of Availability published on [DATE] ([ ] FR [ ]). The review included the NRC staff's SE, as well as the supporting information provided in TSTF-500, Revision 2. As described herein, [LICENSEE] has concluded that the justifications presented in TSTF-500, Revision 2, and the model SE prepared by the NRC staff are applicable to [PLANT] and justify this amendment for the incorporation of the changes to the [PLANT] TS.

[The [PLANT] TS use different [numbering/titles] than the Standard TS ([NUREG-1430, 1431, 1432, 1433, or 1434]) on which TSTF-500, Revision 2, is based. {NOTE: Specifically, describe differences between the plant-specific TS numbering/titles including Required Actions and Surveillances and the TSTF-500, Revision 2, numbering/titles.} TSTF-500, Revision 2, deletes certain Surveillances and renumbers the subsequent Surveillances. [LICENSEE] has chosen to retain the deleted Surveillance numbers, mark them "Deleted," and to not renumber the subsequent Surveillances. These differences are editorial and do not affect the applicability of TSTF-500, Revision 2, to the [PLANT] TS.]

[The [PLANT] DC system design differs from the design assumed for the standard plant described in the model Safety Evaluation and TSTF-500. [Describe significant differences between the plant-specific DC system design and the reference design described in the STS Bases. For each difference, justify why the published model Safety Evaluation continues to be applicable to the plant-specific design.]

[The [PLANT] Technical Specifications differ from the Standard Technical Specifications which were the basis for TSTF-500. [Describe any non-administrative differences between the changes proposed in the plant-specific amendment and changes proposed in TSTF-500, such as Required Actions or Surveillances that are affected by TSTF-500 that do not exist in the plant-specific TS or features in the plant-specific TS that are affected by the proposed

amendment that do not appear in the TSTF-500. For each difference, justify why the published safety evaluation continues to be applicable to the plant-specific amendment.]

[The [PLANT] TS include a Surveillance Frequency Control Program which allows the licensee to control certain Surveillance Frequencies. Therefore, the Frequency of the affected Surveillances is proposed to be “In accordance with the Surveillance Frequency Control Program.”

2.2 VERIFICATIONS AND REGULATORY COMMITMENTS

As described in Section 4.7.1, “Verifications,” in TSTF-500, [LICENSEE] provides the following verifications.

1. In Enclosure 1, [LICENSEE] provided letter(s) from the manufactures of the batteries used at [PLANT] verifying the acceptability of using float current monitoring instead of specific gravity monitoring as a reliable and accurate indication of the state-of-charge of the battery and that this will hold true over the life of the battery.

2. [LICENSEE] verified that the equipment that will be used to monitor float current under SR 3.8.6.1 will have the necessary accuracy and capability to measure electrical currents in the expected range. Additionally, [LICENSEE] provided verification that the minimum required procedural time to measure battery float current is 30 seconds or as recommended by the float current measurement instrument manufacturer. This minimum float current measurement time is required to provide a more accurate battery float current reading.

3. [LICENSEE] verified that battery room temperature is routinely monitored such that a room temperature excursion could reasonably expect to be detected and corrected prior to the average battery electrolyte temperature dropping below the minimum electrolyte temperature.

4. [In Enclosure 2, [LICENSEE] requests a Completion Time greater than 72 hours for TS 3.8.4, Required Action A.3, and / or TS 3.8.5, Required Action A.3, and has verified the availability of a spare battery charger that is appropriately sized. As stated in a Reviewer's Note in the Bases, a licensee wishing to adopt a longer Completion Time must also demonstrate that the Completion Time is appropriate for the plant in accordance with the guidance in Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," and Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."
   Alternatively, the 7 day Completion Time can be justified by an acceptable alternate method, such as a regulatory commitment that a means to charge the batteries will be available that is capable of being supplied power from a power source that is independent of the offsite power supply.]

5. [In Enclosure 3, [LICENSEE] requests a Completion Time greater than 2 hours for TS 3.8.4, Required Action B.1 or C.1, the licensee must demonstrate that the Completion Time is appropriate for the plant in accordance with the guidance in Regulatory Guide1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," and Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk

Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."

6. The cell resistance limits in existing SR 3.8.4.5 are relocated to the Battery Monitoring and Maintenance Program. [LICENSEE] has provided a brief description of the basis for the cell connection resistance limit based on the vendor specification of inter-cell resistance, voltage drop at the connection, or overall battery resistance.

7. In order to delete SR 3.8.4.7 (now SR 3.8.4.3) Note "once per 60 months" restriction on performing the modified performance discharge test instead of the service test, [LICENSEE] verifies that the modified performance discharge test completely encompasses the load profile of the battery service test and that it adequately confirms the intent of the service test to verify the battery capacity to supply the design basis load profile.

8. The licensee-controlled program, required and described in TS Section 5.5, "Programs and Manuals," and titled the "Battery Monitoring and Maintenance Program." Monitoring of battery parameters (i.e., specific gravity, electrolyte level, cell temperature, float voltage, connection resistance, and physical condition) will be relocated to this program.

As described in Attachment 2, List of Required Final Analysis Report (FSAR) Descriptions, [LICENSEE] commits to verify or to change the Final Safety Analysis Report (FSAR) to include the following as part of the adoption of TSTF-500, Revision 2.

1. How a [5] percent design margin for the batteries corresponds to a [2] amp float current value indicating that the battery is [95] percent charged.

2. How the batteries are sized with correction margins that include temperature and aging and how these margins are maintained.

3. The minimum established design limit for battery terminal float voltage.

4. The minimum established design limit for electrolyte level.

5. The minimum established design limit for electrolyte temperature.

6. How each battery is designed with additional capacity above that required by the design duty cycles to allow for [temperature variations and other factors].

7. Normal DC system operation i.e., powered from the battery chargers with the batteries floating on the system, and with a loss of normal power to the battery charger.

8. [The minimum requirements for the alternate means (i.e., spare battery charger) that is used to obtain an extended battery charger CT.]

2.3 OPTIONAL CHANGES AND VARIATIONS

[LICENSEE is not proposing any variations or deviations from the TS changes described in the TSTF-500, Revision 2, or the applicable parts of the NRC staff's model

safety evaluation dated [DATE].] [LICENSEE is proposing the following variations from the TS changes described in the TSTF-500, Revision 2, or the applicable parts of the NRC staff's model safety evaluation dated [DATE]. These options were recognized as acceptable variations in TSTF-500 and the NRC staff's model safety evaluation.]

[Specification [3.8.4], Required Action A.2, applies to the plant condition "one [or two] battery charger[s] on one train inoperable" and requires restoring the battery terminal voltage to a fully charged state and restoring a qualified battery charger to operable status in a specific time period. Required Action A.2 states that the battery float current must be verified to be ≤ [2] amps once per [12] hours. [LICENSEE] has determined that [PLANT] cannot meet the 12 hour Completion Time (CT) proposed in TSTF-500, Revision 2, due to an inherent battery charging characteristic. {NOTE: Describe the inherent battery charging characteristics that prevents charging within 12 hours.} [LICENSEE] proposes a CT for Required Action A.2 of [X] hours, which is equal to 2 hours plus the time operating experience shows is needed to reach the exponential charging current portion of the battery charge profile following the service test.]

[[LICENSEE] is proposing a CT longer than 72 hours for Specification [3.8.4, Required Action A.3, and 3.8.5, Required Action A.3]. An evaluation is included as Enclosure 2 which supports the longer CT and describes the availability of a spare battery charger and that the battery charger is appropriately sized. [This evaluation is performed in accordance with the guidance provided in Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications," and RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."] [The CT is consistent with the [PLANT'S] Final Safety Analysis Report (FSAR) description of a means to charge the batteries available and that this capability includes power supplied from a source that is independent of the offsite power supply. A description of the power source is also included.]]

[[LICENSEE] is proposing a CT longer than 2 hours for Specification [3.8.4, Required Action B.1 and C.1]. A risk evaluation supporting the longer CT is included as Enclosure 3. This evaluation is in accordance with the guidance provided in Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications," and RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."]

[[LICENSEE] is proposing to adopt Specification [3.8.4], Condition B. Condition B is included because Required Action B.1 (battery inoperable) and Required Action C.1 (DC electrical power subsystem inoperable) should have different CTs.] {NOTE: Describe in detail why there should be different CTs.}

3.0 REGULATORY ANALYSIS

3.1 NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

[LICENSEE] has provided to the Commission, in accordance with the distribution requirements specified in § 50.4, its analysis about the issue of no significant hazards consideration using the standards in § 50.92.

Basis for proposed no significant hazards consideration: As required by 10 CFR 50.91(a), the [LICENSEE] analysis of the issue of no significant hazards consideration is presented below:

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

   Response: No.

   The proposed changes restructure the Technical Specifications (TS) for the direct current (DC) electrical power system and are consistent with TSTF-500, Revision 2. The proposed changes modify TS Actions relating to battery and battery charger inoperability. The DC electrical power system, including associated battery chargers, is not an initiator of any accident sequence analyzed in the Final Safety Analysis Report(FSAR). Rather, the DC electrical power system supports equipment used to mitigate accidents. The proposed changes to restructure TS and change surveillances for batteries and chargers to incorporate the updates included in TSTF-500, Revision 2, will maintain the same level of equipment performance required for mitigating accidents assumed in the FSAR. Operation in accordance with the proposed TS would ensure that the DC electrical power system is capable of performing its specified safety function as described in the FSAR. Therefore, the mitigating functions supported by the DC electrical power system will continue to provide the protection assumed by the analysis. The relocation of preventive maintenance surveillances, and certain operating limits and actions, to a licensee-controlled Battery Monitoring and Maintenance Program will not challenge the ability of the DC electrical power system to perform its design function. Appropriate monitoring and maintenance that are consistent with industry standards, will continue to be performed. In addition, the DC electrical power system is within the scope of 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," which will ensure the control of maintenance activities associated with the DC electrical power system.

   The integrity of fission product barriers, plant configuration, and operating procedures as described in FSAR [insert appropriate chapter/section number] will not be affected by the proposed changes. Therefore, the consequences of previously analyzed accidents will not increase by implementing these changes. Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No

The proposed changes involve restructuring the TS for the DC electrical power system. The DC electrical power system, including associated battery chargers, is not an initiator to any accident sequence analyzed in FSAR [insert appropriate chapter/section number]. Rather, the DC electrical power system supports equipment used to mitigate accidents. The proposed changes to restructure TS and change surveillances for batteries and chargers to incorporate the updates included in TSTF-500, Revision 2, will maintain the same level of equipment performance required for mitigating accidents assumed in FSAR [insert appropriate chapter/section number]. Administrative and mechanical controls are in place to ensure the design and operation of the DC systems continue to meet the plant design basis described in FSAR [insert appropriate chapter/section number]. Therefore, operation of the facility in accordance with this proposed change will not create the possibility of new or different kind of accident from any accident previously evaluated.

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

Response: No.

The margin of safety is established through equipment design, operating parameters, and the setpoints at which automatic actions are initiated. The equipment margins will be maintained in accordance with the plant-specific design bases as a result of the proposed changes. The proposed changes will not adversely affect operation of plant equipment. These changes 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. The changes associated with the [new] battery maintenance and monitoring program will ensure that the station batteries are maintained in a highly reliable manner. The equipment fed by the DC electrical sources will continue to provide adequate power to safety related loads in accordance with analysis assumptions.

TS changes made in accordance with TSTF-500, Revision 2, maintain the same level of equipment performance stated in the FSAR and the current Technical Specifications. Therefore, the proposed changes do not involve a significant reduction of safety.

3.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

A description of the proposed TS change and its relationship to applicable regulatory requirements were published in the *Federal Register* Notice of Availability on [DATE] ([ ] FR [ ]). [LICENSEE] has reviewed the NRC staff's model SE referenced in the Notice of Availability and concluded that the regulatory evaluation section is [not] applicable to [PLANT]. {NOTE: If regulatory evaluation section in model SE is not applicable, discuss/provide applicable regulatory requirements and criteria. Additionally, discuss the effect of any changes on the NRC staff's model SE, including plant-specific information explaining the plant-unique design feature(s) that require such variations or deviations. Plant-specific system names, specification numbering and titles are not considered to be differences with TSTF-500, Revision 2, or the NRC staff's model SE.}

4.0 ENVIRONMENTAL CONSIDERATION

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

5.0 REFERENCES

{NOTE: Provide list of references}

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ATTACHMENT 2

LIST OF REQUIRED FINAL SAFETY ANALYSIS REPORT (FSAR) DESCRIPTIONS

The following table identifies FSAR descriptions required by [LICENSEE] as part of the adoption of TSTF-500, Revision 2. {REVIEWER'S NOTE: These changes will be included with the required implementation date in the Issuance of Amendment letter (typically bullet 3 of the cover letter for the notice of amendment to the facility operating license).}

REQUIRED FSAR DESCRIPTIONS	DUE DATE / EVENT
[LICENSEE] will change or verify that the FSAR describes: 1. How a [5] percent design margin for the batteries corresponds to a [2] amp float current value indicating that the battery is [95] percent charged. 2. How the batteries are sized with correction margins that include temperature and aging and how these margins are maintained. 3. The minimum established design limit for battery terminal float voltage. 4. The minimum established design limit for electrolyte level. 5. The minimum established design limit for electrolyte temperature. 6. How each battery is designed with additional capacity above that required by the design duty cycles to allow for [temperature variations and other factors]. 7. Normal DC system operation (i.e., powered from the battery chargers) with the batteries floating on the system, and a loss of normal power to the battery charger describing how the DC load is automatically powered from the station batteries. 8. [The minimum requirements for the alternate means (i.e., spare battery charger) that is used to obtain an extended battery charger CT.]	Upon implementation of the approved TS amendment

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PROPOSED MODEL SAFETY EVALUATION FOR PLANT-SPECIFIC ADOPTION OF

TSTF TRAVELER TSTF-500, REVISION 2,

"DC ELECTRICAL REWRITE – UPDATE TO TSTF – 360"

1.0 INTRODUCTION

By letter dated [DATE], [LICENSEE] (the licensee) proposed changes to the technical specifications (TS) for [PLANT]. The requested change is the adoption of NRC-approved Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC [direct current] Electrical Rewrite – Update to TSTF – 360." Adoption of TSTF-500, Revision 2, proposes new actions for an inoperable battery charger and alternate battery charger testing criteria for limiting condition for operation (LCO) 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown." TS changes also include the relocation of a number of Surveillance Requirements (SRs) in TS 3.8.4 that perform preventive maintenance on the safety related batteries to a licensee-controlled program. TS LCO 3.8.6, "Battery Parameters," is modified by relocating Table 3.8.6-1, "Battery Cell Parameter Requirements," to a licensee-controlled program, and specific actions with associated Completion Times (CTs) for out-of-limits conditions for battery cell voltage, electrolyte level, and electrolyte temperature are added to TS 3.8.6. In addition, specific SRs are being proposed for verification of these parameters.

[LICENSEE] proposes that the items to be relocated will be contained in [the new] Administrative Controls TS [5.5.17], "Battery Monitoring and Maintenance Program," for the maintenance and monitoring of station batteries.

The proposed adoption of TSTF-500, Revision 2, provides new TS Actions for an inoperable battery charger and alternate battery charger testing criteria. The longer CT for an inoperable battery charger will allow additional time for maintenance and testing.

In addition, a number of SRs are relocated out of TS. Monitoring requirements for battery cell parameters and performance requirements for battery maintenance activities are relocated to a licensee-controlled program. The TS are also revised to include requirements on battery cell parameters as a replacement for requirements on the battery. This focuses TS requirements on the analysis basis safety function of the battery.

The proposed change revises the following:

- Specification 3.8.4, "DC Sources Operating," is revised to add Conditions for inoperable battery chargers and inoperable batteries. Specification 3.8.4 is also revised to relocate Surveillances on battery corrosion, connection resistance, visual inspection, terminal connection, and discharge tests to the [new] TS Administrative Controls Program.

- Specification 3.8.5, "DC Sources - Shutdown," is revised to add Conditions for inoperable battery chargers and inoperable batteries. The list of TS 3.8.4 Surveillances that must be met is also revised to be consistent with the changes to TS 3.8.4.

- LCO 3.8.6, “Battery Cell Parameters,” is renamed “Battery Parameters.”

- Table 3.8.6-1 is deleted and existing Conditions and Surveillances are replaced.

- Maintenance and monitoring of station batteries will be controlled by [a new] Administrative Controls TS [5.5.17], "Battery Monitoring and Maintenance Program.”

2.0 REGULATORY EVALUATION

The following NRC requirements and guidance documents are applicable to the NRC staff’s review of the licensee amendment request:

{REVIEWER’S NOTE: The following paragraphs apply to plants constructed after the promulgation of the GDC..}

The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix A, Criterion 17, “Electric power systems,” states, in part, that:

> An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. … The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure. Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions …. Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.

The regulation at 10 CFR Part 50, Appendix A, GDC 18, Inspection and testing of electric power systems, states, in part, that “[e]lectric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features….”

{REVIEWER’S NOTE: The following paragraph applies to plants constructed before the promulgation of the GDC.}

[For plants constructed before the promulgation of the GDC, the Commission (with all Commissioners agreeing) approved the NRC staff proposal to not apply the GDC to plants with construction permits issued prior to May 21, 1971 (see Staff Requirements Memorandum (SRM), SECY-92-223, issued on September 18, 1992). The Commission also stated that compliance with the intent of the GDC is important.]

The Commission's regulatory requirements related to the content of the TS are contained in 10 CFR 50.36, Technical specifications. The regulation at 10 CFR 50.36 requires applicants for nuclear power plant operating licenses to include TS as part of the license. The regulation requires, in part, that the TS include items in the following categories: (1) Safety limits, limiting safety systems settings, and limiting control settings; (2) Limiting conditions for operation; (3) Surveillance requirements; (4) Design features; and (5) Administrative controls.

- Section 50.36(c)(2)(ii), specifies four criteria to be used in determining whether a TS LCO needs to be established for a particular item. These criteria are summarized as follows:

  (A) Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.

  (B) Criterion 2. A process variable, design feature, or operating restriction that is an initial condition of a design-basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

  (C) Criterion 3. A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

  (D) Criterion 4. A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

- Section 50.36(c)(3), states that "[s]urveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

  Section 50.65(a)(3), Requirements for monitoring the effectiveness of maintenance at nuclear power plants, states in part that:

  Performance and condition monitoring activities and associated goals and preventive maintenance activities shall be evaluated at least every refueling cycle provided the interval between evaluations does not exceed 24 months. … Adjustments shall be made where necessary to ensure that the objective of preventing failures of structures, systems, and components through maintenance is appropriately balanced against the objective of minimizing unavailability of structures, systems, and components due to monitoring or preventive maintenance.

Regulatory Guide (RG) 1.32, Revision 3, "Criteria for Power Systems for Nuclear Power Plants," provides guidance for meeting the intent of GDC 17 and 18 with respect to the design, operation, and testing of safety-related electric power systems of all types of nuclear power plants.

RG 1.75, Revision 3, "Criteria for Independence of Electrical Safety Systems," describes a method acceptable to the NRC staff for complying with the NRC regulations with respect to the physical independence requirements of the circuits and electric equipment that comprise or are associated with safety systems.

RG 1.129, Revision 2, "Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants," provides guidance for meeting the intent of GDC 1, 17, and 18 with respect to the maintenance, testing, and replacement of vented lead-acid storage batteries in nuclear power plants. This RG endorses, in part, the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications."

{REVIEWER'S NOTE: The following two paragraphs apply to plants proposing a Completion Time longer that 72 hours for Specification 3.8.4, Required Action A.3, and Specification 3.8.5, Required Action A.3. or a Completion Time longer than 2 hours for Specification 3.8.4, Required Action B.1 and C.1}

RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," describes a risk-informed approach, acceptable to the NRC, for assessing the nature and impact of proposed licensing-basis changes by considering engineering issues and applying risk insights.

RG 1.177, "An approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," describes an acceptable risk-informed approach specifically for assessing proposed TS changes in allowable outage times. RG 1.174 and 1.177 also provide acceptance guidelines for evaluating the results of such evaluations.

3.0 TECHNICAL EVALUATION

The Standard TS for [pressurized water reactors (NUREGs-1430, 1431, and 1432) use the term "train"][boiling water reactors (NUREGs-1433 and 1434) use the term "division"] when referring to the design of independent and redundant subsystems that make up the DC electrical power system. For the purpose of TSTF-500, Revision 2, the term "subsystem" is used but the discussion is equally applicable to trains or divisions. [LICENSEE] uses the term [train/division] when referring to the independent and redundant subsystems that make up the DC electrical system.

3.1 Design Features of the Class 1E DC Power System

The station Class 1E 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 DC to AC power converters (i.e., inverters)). [[PLANT] is licensed to 10 CFR 50, Appendix A, GDC 17, and 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 at [PLANT] consists of [two] independent and redundant safety related Class 1E DC electrical power subsystems. Each subsystem consists of the

batteries, the battery charger(s) associated with each battery, and all the associated control equipment and interconnecting cabling.

In accordance with [PLANT's] Final Safety Analysis Report (FSAR) Section [8.3.2] and TS Section [3.8.4], during normal operation, the DC load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

Each 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 subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing of dedicated components between redundant Class 1E subsystems, such as batteries, battery chargers, or distribution panels.

Each battery has adequate storage capacity to meet the duty cycles assumptions of the plant FSAR. In accordance with [PLANT's] FSAR Section [8.3.2], each battery is designed with additional capacity above that required by the design duty cycles to allow for temperature variations and other factors.

Each DC electrical power subsystem battery charger has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger also has sufficient excess capacity to restore the battery from the design minimum charge to its fully charged state while supplying normal steady state loads.

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

3.2 Evaluation of Proposed Changes

3.2.1 TS 3.8.4 (DC Sources - Operating) Changes

[LICENSEE] proposes revising the LCO for TS 3.8.4, and to modify and relocate, TS 3.8.4 Conditions, Required Actions, and SRs. Currently, TS 3.8.4 contains a Condition for one DC electrical subsystem inoperable. The proposed change would add two additional Conditions, which are exceptions to the existing Condition.

3.2.1.1 TS 3.8.4 Change (1)

The proposed change would add new Condition A to address the condition in which one or two required battery chargers on one subsystem are inoperable which effectively increases the CT for an inoperable battery charger from the existing 2 hours to [72] hours, provided that battery terminal voltage is restored to greater than or equal to the minimum established float voltage within 2 hours, and battery float current is verified to be less than or equal to [2] amps once per [12] hours.

Evaluation of TS 3.8.4; Change (1)

New Condition A would apply when one [or two] battery charger[s] on one subsystem are inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained). There are three associated Required Actions for new Condition A. The Required Actions provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to operable status in a specific time period. Required Action A.1 requires the battery terminal voltage to be restored to greater than or equal to the minimum established float voltage within 2 hours. Required Action A.2 requires the battery float current to be verified to be ≤ [2] amps once per [12] hours. [[LICENSEE] cannot meet the 12-hour CT due to an inherent battery charging characteristic and proposes an alternate time equal to 2 hours plus the time experienced to accomplish the exponential charging current portion of the battery charge profile following the service discharge test (SR 3.8.4.3). Required Action A.3 requires the battery charger[s] to be restored to operable status within [72] hours].

New Required Action A.1 provides assurance that a battery discharge is terminated by requiring that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. The battery charger, in addition to maintaining the battery operable, provides DC control power to AC circuit breakers and thus supports the recovery of AC power following events such as loss of offsite power or station blackout (SBO). The 2-hour CT provides an allowance for returning an inoperable charger to operable status or for reestablishing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. This provides assurance that the battery will be restored to its fully charged condition from any discharge that might have occurred due to the battery charger being inoperable. At the end of the 2 hours, a terminal voltage of at least the minimum established float voltage provides indication that the battery is on the exponential charging current portion of its recharging cycle.

New Required Action A.2 would require that once per [12] hours, the battery float current be verified to be less than or equal to [2] amps. This would confirm that if the battery has been discharged as the result of an inoperable battery charger, it had been fully recharged. If at the expiration of the [12]-hour period, the battery float current is greater than [2] amps, then the battery is considered inoperable (see Section 3.2.3.1 of this SE for a more detailed discussion on the [2]-amp float current value). This verification provides assurance that the battery has sufficient capacity to perform its safety function.

New Required Action A.3 requires restoring inoperable battery charger to operable status within [72] hours. The presumption that (1) the DC bus remains energized; (2) the battery discharge is terminated based on restoration of the battery terminal voltage (New Required Action A.1); and (3) the battery is fully recharged based upon battery float current (New Required Action A.2), would mean that the licensee has established a basis for extending the restoration time for an inoperable battery charger beyond the existing [2]-hour CT to [72] hours (New Required Action A.3).

[The NRC staff approval of the 72-hour CT for an inoperable battery charger is principally based on the availability of a spare battery charger that is appropriately sized to perform the design function of the battery charger being replaced (i.e., alternate method). Licensees crediting a non-Class 1E battery charger as the spare battery charger must ensure that electrical isolation is maintained in accordance with RG 1.75].

[Licensees proposing to adopt a CT longer than 72 hours and must demonstrate that the CT is appropriate for the plant in accordance with the guidance in RG 1.177 and RG 1.174. Alternatively, a longer CT (i.e., 7 days) has been determined to be an acceptable method because an alternate means to charge the batteries is available and capable of being supplied power from a power source that is independent of the offsite power supply as described in the [PLANT] FSAR.]

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements that when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.1.2 TS 3.8.4; Change (2)

The proposed change would add new Condition B which would apply when one [or two] batteries on one subsystem are inoperable. The Required Action would state that the battery or batteries must be restored to operable status within [2] hours.

Evaluation of TS 3.8.4; Change (2)

[LICENSEE] proposes a longer CT and has provided justification that the longer CT is appropriate for the plant consistent with the guidance in RG 1.177 and RG 1.174. With batteries on one subsystem inoperable, the DC bus is being supplied by an operable battery charger(s). Any event that results in a loss of the AC bus supporting the battery charger(s) will also result in loss of DC power to that subsystem. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output circuit breakers) may rely on battery power. The NRC staff finds that the [2]-hour limit allows sufficient time to effect restoration of an inoperable battery, presuming that the majority of the limiting conditions which lead to battery inoperability (e.g., loss of battery charger, inadequate battery cell voltage) are verified to be met by TSs 3.8.4, 3.8.5, and 3.8.6 and the allowed Required Actions and associated CTs are appropriate.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.1.3 TS 3.8.4; Change (3)

The proposed change would renumber existing Condition A as Condition C and the exception “for reasons other than Condition A [or B]” would be added. Existing Conditions B and C would be renumbered Conditions D and E with no other changes.

Evaluation of TS 3.8.4; Change (3)

The NRC staff reviewed the proposed changes and has determined that the changes are editorial in nature and do not result in a substantive change to requirements, therefore, the changes are acceptable.

3.2.1.4 TS 3.8.4; Change (4)

The proposed change would revise SR 3.8.4.1 from "Verify battery terminal voltage is ≥ [120] V on float charge" to "Verify battery terminal voltage is greater than or equal to the minimum established float voltage." The Frequency of 7 days would remain unchanged. The value for the minimum established float voltage would be removed from the TSs and controlled by [new] TS [5.5.17], "Battery Monitoring and Maintenance Program."

Evaluation of TS 3.8.4; Change (4)

[LICENSEE] proposes to remove specific terminal voltage criteria currently identified in SR 3.8.4.1 from TSs. The purpose of SR 3.8.4.1 is to verify battery terminal voltage while the system is on a float charge to ensure the effectiveness of the battery chargers is not degraded. The battery terminal voltage selected by the battery manufacturer is the minimum voltage which ensures an optimum charging voltage is applied to the battery. The minimum established float voltage will maintain the battery plates in a condition that supports optimizing battery grid life. Maintaining this voltage limit ensures that the battery will be capable of providing its designed safety function. Furthermore, the change to [2.07] V for SR 3.8.6.2 will require battery pilot cells to be selected from those that represent the lowest voltage cells in the battery. This ensures that the other cells will be above the pilot cell voltage and above the TS limit. With all battery cells above [2.07] V, there is adequate assurance that that the terminal voltage is at an acceptable threshold for establishing battery operability.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.1.5 TS 3.8.4; Change (5)

The proposed change relocates the requirements of the following SRs: 3.8.4.2 (visual inspection and connection resistance), 3.8.4.3 (visual inspection for physical damage), 3.8.4.4 (remove visible corrosion and ensure that connections are clean and tight), and 3.8.4.5 (verification of connection resistance) to [new] Battery Monitoring and Maintenance Program.

Evaluation of TS 3.8.4; Change (5)

TSs require testing to be performed in accordance with SR 3.0.1. SR 3.0.1 states, in part,

> Failure to meet a Surveillance, whether such failure is experienced during the performance of the Surveillance or between performance of the Surveillance, shall be failure to meet the LCO.

Resistance verification SRs 3.8.4.2 and 3.8.4.5 represent the minimum acceptable requirements for operability of required equipment. However, visual inspection of the battery terminals for signs of corrosion to ensure that connections are clean and tight are generally considered a routine preventive maintenance activity. Visual inspection of the battery terminals is an important preventive maintenance practice for maintaining a healthy battery (e.g., the early

identification and cleaning of battery terminal corrosion can prevent corrosion from spreading between the post and the connector). However, visual inspection of the battery terminals alone does not provide an indication of a battery's capability to perform its design function. Therefore, the NRC staff finds these activities to be preventive maintenance and that the parameters can be adequately controlled in [new] TS [5.5.17] Battery Monitoring and Maintenance Program.

With regard to the resistance verifications of SR 3.8.4.2 and SR 3.8.4.5, the existing values represent limits at which some action should be taken, not necessarily when the operability of the battery is in question. The plant safety analyses do not assume a specific battery inter-cell connection resistance value, but typically assume that the batteries will supply adequate power. Therefore, the key operability issue is the overall battery connection resistance. Between surveillances, the resistance of each battery inter-cell connection varies independently from all the others. Some of these connection resistance values may be higher or lower than others, and the battery will still be able to perform its function and should not be considered inoperable. Overall connection resistance has a direct impact on operability and is adequately determined by completion of the battery service or modified performance discharge tests. However, licensees must still provide a justification for relocating the cell connection resistance limit [150 μOhm (micro-Ohm)] or for revising the monitoring limit.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.1.6 <u>TS 3.8.4; Change (6)</u>

The proposed changes would renumber SR 3.8.4.6 to SR 3.8.4.2 and modify it to be consistent with SR 3.8.4.1 by replacing the specific voltage limits with "greater than or equal to the minimum established float voltages." The proposed change also adds an alternate criterion to new SR 3.8.4.2.

SR 3.8.4.2 would also be revised to eliminate the renumbered (SR 3.8.6) Note which states: "This Surveillance shall not be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR."

<u>Evaluation of TS 3.8.4; Change (6)</u>

The NRC staff finds that renumbering SR 3.8.4.6 to SR 3.8.4.2 is considered editorial in nature, and therefore, is acceptable.

SR 3.8.4.6 (renumbered as SR 3.8.4.2) specifies battery charger current requirements for each DC source, and its purpose is to verify the design capacity of each battery charger. The proposed change would revise this SR to be consistent with SR 3.8.4.1 by replacing the specific voltage limits with "greater than or equal to the minimum established float voltages." The voltage requirements are based on the battery charger voltage level after a response to a loss of AC power. Battery manufacturers establish this voltage limit to provide the optimum charge on the battery and to maintain the battery plates in a condition that supports maintaining the battery grid life. Maintaining this voltage limit should ensure that the battery will be capable of providing its designed safety function. Furthermore, the change to [2.07] V for SR 3.8.6.2 requires battery pilot cells to be selected to represent the lowest voltage cells in the battery.

This ensures that the other cells are above the pilot cell voltage, which must remain above the TS limit. With all battery cells above [2.07] V, there is adequate assurance that that the terminal voltage is satisfactory.

The licensee also proposed adding an alternative criterion to SR 3.8.4.6 (renumbered as SR 3.8.4.2), which states, "Verify each battery charger can recharge the battery to the fully charged state within [24] 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." This is an alternate method for verifying the design capacity of each battery charger because normal battery loads may not be available following the battery service test and may need to be supplemented with additional loads. The duration of this test may be longer than the charger sizing criteria since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. If each battery charger is capable of recharging its respective battery within [24] hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the design minimum discharge state, the proposed alternate testing criteria would satisfy the purpose of SR 3.8.4.2.

SR 3.8.4.6 (renumbered as SR 3.8.4.2) would also be revised to eliminate a Note. The Note currently states, "This Surveillance shall not be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR." This restriction is eliminated as the alternate method can be performed in MODE 1, 2, or 3 without affecting plant safety.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.1.7 <u>TS 3.8.4; Change (7)</u>

The proposed change would revise the Note in SR 3.8.4.7 to eliminate the "once per 60 months" limitation for satisfying the SR by performing the modified performance discharge test instead of the service discharge test. SR 3.8.4.7 is re-numbered to 3.8.4.3.

<u>Evaluation of TS 3.8.4; Change (7)</u>

The applicant proposed revising the Note to SR 3.8.4.7 (new SR 3.8.4.3) to eliminate the "once per 60 months" limitation for satisfying the SR by performing the modified performance discharge test instead of the service discharge test, effectively allowing the modified performance discharge test to be used instead of the service discharge test at any time. The licensee must renumber SR 3.8.4.7 to SR 3.8.4.3 and confirm that the modified performance discharge test completely encompasses the load profile of the battery service discharge test.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.1.8 <u>TS 3.8.4; Change (8)</u>

The proposed change would relocate SR 3.8.4.8 to SR 3.8.6.6.

Evaluation of TS 3.8.4; Change (8)

The licensee proposed relocating SR 3.8.4.8 to SR 3.8.6.6. The purpose of this SR is to demonstrate the operability of the battery thus, in accordance with SR 3.0.1, this surveillance is relocated to TS 3.8.6, "Battery Parameters." The NRC staff finds that relocating this SR is editorial in nature; consistent with the preferred format and content of TSs; and does not result in a substantive change to TS requirements, and therefore is acceptable.

3.2.2 TS 3.8.5 (DC Sources - Shutdown) Changes

[LICENSEE] proposes revising TS 3.8.5 Conditions, Required Actions, and SRs.

Currently TS 3.8.5 contains a Condition for one or more DC electrical subsystems inoperable. The proposed changes modify the existing Condition and add an additional Condition, which is an exception to the existing Condition. The Required Actions of new Condition B, to declare affected required features inoperable or suspending core alterations and movement of irradiated fuel assemblies in the [secondary] containment, are unchanged.

TS 3.8.5 requires DC electrical power sources to be operable to support specific equipment and capabilities in MODE 5 and 6 and during movement of irradiated fuel assemblies. Depending on the plant design, this may require both DC electrical subsystems to be operable. The new Condition A is bracketed and is included only when the plant-specific implementation of TS 3.8.5 may require both subsystems of the DC electrical power system to be operable. If the plant-specific implementation of LCO 3.8.5 required only one subsystem of the DC electrical power system to be operable, then Condition A would be omitted and Condition B would be renumbered as Condition A.

3.2.2.1 TS 3.8.5; Change (1)

The proposed change would add new Condition A to address the condition in which one or two required battery chargers on one subsystem are inoperable. This change effectively increases the CT for an inoperable battery charger from the 2 hours to [72] hours, provided that battery terminal voltage is restored to greater than or equal to the minimum established float voltage within 2 hours, and battery float current is verified to be is less than or equal to [2] amps once per [12] hours.

Evaluation of TS 3.8.5; Change (1)

This change is identical to the proposed change described in Section 3.2.1.1 of this SE with the exception that this Condition prescribes the limitations during shutdown conditions. The NRC staff's evaluation of this proposed change can be found in Section 3.2.1.1 of this SE.

The NRC staff concludes that the proposed changes meet the 10 CFR 50.36 requirements that when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.2.2 TS 3.8.5; Change (2)

The proposed change would rename the existing Condition A as Condition B and modify new Condition B to state "One or more DC electrical power subsystems inoperable for reasons other than Condition A." An additional condition, joined to Condition B by a logical "OR" statement, states, "Required Actions and associated Completion Time of Condition A not met."

Evaluation of TS 3.8.5; Change (2)

The purpose of this change is to reflect the addition of new Condition A. If two subsystems are required by [LCO 3.8.10], the remaining subsystem with DC power available may be capable of supporting sufficient systems to allow continuation of CORE ALTERATIONS and [recently] irradiated fuel movement. By allowing the option to declare required features inoperable with the associated DC power source(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. The allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of [recently] irradiated fuel assemblies, and operations involving positive reactivity additions) that could result in loss of required shutdown margin (SDM) (MODE 5) or boron concentration (MODE 6). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that what would be required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in reactor coolant system boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive moderator temperature coefficient must also be evaluated to ensure they do not result in a loss of required SDM.

Suspension of these activities must not preclude completion of actions to establish a safe conservative condition. Joining Conditions A and B with a logical "OR" statement, provides assurance that the appropriate actions will be met and minimize probability of the occurrence of postulated events.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.2.3 TS 3.8.5; Change (3)

The proposed change would modify SR 3.8.5.1 to reflect changes previously described in Section 3.2.1 of this safety evaluation report.

Evaluation of TS 3.8.5; Change (3)

The licensee proposed modifying SR 3.8.5.1 to be consistent with the proposed changes to TS 3.8.4. The revised SR 3.8.5.1 would require the licensee to perform all Surveillances required by SR 3.8.4.1 through SR 3.8.4.4. The NRC staff reviewed the proposed changes and has determined that the changes are consistent with the proposed changes to TS 3.8.4 and meet the intent of the SR.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3 TS 3.8.6 (Battery Parameters) Changes

[LICENSEE] proposed replacing battery specific gravity monitoring with float current monitoring for state of charge (OPERABILITY) determination. The applicant also proposed revising the LCO, and modifying and relocating TS 3.8.6 Conditions, Required Actions, and SRs to the [new] TS Battery Monitoring and Maintenance Program.

3.2.3.1 <u>TS 3.8.6; Change (1)</u>

The proposed change would delete the specific gravity limits of existing Table 3.8.6-1 and the associated footnotes.

<u>Evaluation of TS 3.8.6; Change (1)</u>

Currently, battery cell specific gravity verification is required by SRs 3.8.6.1 and 3.8.6.2. [LICENSEE] proposes replacing requirements to determine a battery state of charge by measuring specific gravity with requirements to monitor float current. Float current monitoring is recognized by the industry as being a more direct and expeditious method for determining battery state of charge than specific gravity monitoring. [LICENSEE] provided letter(s) from the manufactures of the batteries used at the [PLANT] verifying the acceptability of using float current monitoring instead of specific gravity monitoring as a reliable and accurate indication of a battery state of charge for the life of the battery. [If the [2]-amp float current value provides an indication that the battery is less than 100 percent charged, [LICENSEE] has changed or verified the description in Section [8.3.2] of the FSAR to maintain a [5%] design margin for the batteries to provide assurance that the battery is fully charged when the [2]-amp float current limit is reached]. For replacement batteries of a different model/size and/or manufacturer, float current limit changes would need to be verified as part of design change documentation package for installing replacement batteries.

[LICENSEE] has verified that the equipment that will be used to monitor float current under [SR 3.8.6.1] will have the necessary accuracy and capability to measure electrical currents in the expected range. See Section 3.2.5 of this SE for more details.

Specific gravity monitoring is appropriate for troubleshooting activities and for periodic trending of the battery's state-of-health and as prescribed by the [new] Battery Monitoring and Maintenance Program specified in TS Administrative Controls Section [5.5]. Therefore, [LICENSEE] will continue taking and trending specific gravity measurements during maintenance and testing activities prior to performing a battery service test, battery performance discharge test, or modified performance discharge test in accordance with the TS Battery Monitoring and Maintenance Program.

The NRC staff finds that the licensee's verifications of the battery manufacturer specifications and the [PLANT] FSAR Section [8.3.2] description to maintain a [5] percent design margin for the batteries corresponds to a [2]-amp float current value which indicates that the battery is [95] percent charged provides adequate assurance that replacing specific gravity

measurements with float current monitoring will not have a significant impact on safety or the ability to accurately determine the operability of the batteries. Based on these requirements, the NRC staff finds that float current monitoring is a suitable replacement for specific gravity monitoring when used to determine a battery's state of charge. The proposed changes will also ensure the battery parameters (maintenance, testing, and monitoring) are appropriately monitored and maintained in accordance with the [new] Battery Monitoring and Maintenance Program specified in TS Administrative Controls Section [5.5].

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3.2 TS 3.8.6; Change (2)

The proposed change would revise the title of TS 3.8.6 from "Battery Cell Parameters" to "Battery Parameters."

Evaluation of TS 3.8.6; Change (2)

The NRC staff reviewed the proposed change and has determined that the change is editorial in nature and does not change any substantive requirement, and therefore, is acceptable.

3.2.3.3 TS 3.8.6; Change (3)

The proposed change would revise TS [3.8.6] LCO to refer to the [[Train A and B][Station Service and DG]] Electrical Power Subsystem Batteries" instead of [[Train A and B][Station Service and DG]] Batteries.

Evaluation of TS 3.8.6; Change (3)

This change adds consistency with the LCO [3.8.4] and LCO [3.8.5] descriptions of the separate and independent electrical power subsystems and uses the term "subsystem," which appears in the Conditions, in the LCO.

The NRC staff reviewed the proposed change and has determined that the change more appropriately reflects the [PLANT] electrical system nomenclature. The NRC staff also finds that the change is editorial in nature; consistent with the preferred format and content of TSs; and does not result in a substantive change to TS requirements, and therefore, is acceptable.

3.2.3.4 TS 3.8.6; Change (4)

The proposed change would delete Table 3.8.6-1, "Battery Cell Parameter Requirements," and revise LCO 3.8.6 to remove the reference to Table 3.8.6-1.

Evaluation of TS 3.8.6; Change (4)

TS Table 3.8.6-1 specifies the battery cell parameter requirements, including electrolyte level, float voltage, and specific gravity. The licensee has proposed deleting TS Table 3.8.6-1 while retaining the table requirements in new SRs and LCOs in TSs.

The licensee proposed relocating the Category A and B values of TS Table 3.8.6-1and the Required Actions associated with restoring inoperable batteries to operable status to the Battery Monitoring and Maintenance Program. The Category A and B values of TS Table 3.8.6-1 represent appropriate monitoring levels and appropriate preventive maintenance levels for long-term battery quality and extended battery life. The NRC staff finds relocating these values to the Battery Monitoring and Maintenance Program acceptable since the licensee provided assurance that these battery parameter values will continue to be controlled at their current level, and that actions to restore deficient values will be implemented in accordance with the licensee's corrective action program. Furthermore, the battery and its preventive maintenance and monitoring program are under the regulatory requirements of 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants." This relocation will continue to assure that the battery is maintained at current levels of performance, and that operators appropriately focus on monitoring the battery parameters for degradation.

The licensee also proposed relocating the Category C specific limiting values of TS Table 3.8.6-1 for the battery electrolyte levels to the Battery Monitoring and Maintenance Program. However, [new] TS 3.8.6, Conditions D and E, will require the electrolyte temperature (pilot cell only) and level (any battery cell) to be greater than or equal to minimum established design limits. The licensee proposed relocating the electrolyte temperature and level criteria (i.e., the minimum established design limits) to the Battery Monitoring and Maintenance Program. Depending on the available excess capacity of the associated battery, the minimum temperature necessary to support operability of the battery can vary. Relocating these values to the Battery Monitoring and Maintenance Program will provide licensees with added flexibility to monitor and control this limit at values directly related to the battery's ability to perform its assumed function. The NRC staff concludes that the Category C specific limiting values for TS Table 3.8.6-1 for the battery electrolyte levels may be relocated the Battery Monitoring and Maintenance Program since the licensee provided assurance that these battery parameter values will continue to be controlled at their current level, and that actions to restore deficient values will be implemented in accordance with the licensee's corrective action program.

See Section 3.2.3.1 of this SE for the NRC staff's evaluation of the licensee's proposal to relocate the specific gravity requirements to TS Section [5.5].

The proposed changes discussed above ensure the battery parameters (maintenance, testing, and monitoring) are appropriately monitored and maintained in accordance with the Battery Monitoring and Maintenance Program. Based on this information, the NRC staff finds that there is assurance that safe plant conditions will continue to be maintained; therefore, the proposed changes are acceptable.

3.2.3.5 TS 3.8.6; Change (5)

The proposed change would add new TS 3.8.6, Condition A to address what was formerly the Category C limit for float voltage in TS Table 3.8.6-1.

Evaluation of TS 3.8.6; Change (5)

The licensee proposed adding new TS 3.8.6 Condition A to address what was formerly the Category C limit for float voltage in TS Table 3.8.6-1. This new Condition would be applicable when one or more batteries on one subsystem are found with one or more battery cells with a float voltage less than [2.07] V. Condition A contains remedial measures (Required Actions) acceptable to the NRC staff for the condition of a degraded battery cell. The Required Actions require the licensee to verify: (a) the battery terminal voltage to be greater than or equal to the minimum established float voltage (SR 3.8.4.1), and (b) each battery's float current is less than or equal to [2] amps (SR 3.8.6.1). The above actions ensure that there is still sufficient capacity for the battery to perform its intended function. Continued operations for up to 24 hours are proposed to allow the restoration of the affected cell(s) voltage to greater than or equal to [2.07] V. Incorporating the minimum established float voltage limit into the plant's FSAR provides reasonable assurance that the value will be appropriately maintained by the licensee to accurately reflect the design of the plant.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3.6 TS 3.8.6; Change (6)

The proposed change would add new TS 3.8.6, Condition B to address battery state of charge.

Evaluation of TS 3.8.6; Change (6)

The licensee proposed adding new TS 3.8.6, Condition B to address battery state of charge. This new Condition would be applicable when one or more batteries on one subsystem are found with a float current greater than [2] amps. A float current of greater than [2] amps provides an indication that a partial discharge has occurred. The Required Action is to verify within 2 hours that the battery terminal voltage is greater than or equal to the minimum established float voltage (SR 3.8.4.1), thus confirming battery charger operability. If the terminal voltage is satisfactory and there are no battery cells with a voltage less than [2.07] V, Required Action B.2 of Condition B ensures that within [12] hours the battery will be restored to its fully-charged condition from any discharge that might have occurred due to a temporary loss of the battery charger. [[LICENSEE] cannot meet the [12]-hour CT due to an inherent battery charging characteristic, and proposes an alternate time equal to 2 hours plus the time experienced to accomplish the exponential charging current portion of the battery charge profile following the service test (SR 3.8.4.3)].

If the terminal voltage is found to be less than the minimum established float voltage, it indicates that the battery charger is either inoperable or is operating in the current limit mode. If the battery charger is operating in the current limit mode for 2 hours, it indicates that the battery has been substantially discharged and likely cannot perform its required design functions. In this case, new Condition F would be entered.

If the float voltage is found to be satisfactory, but there are one or more battery cells with a float voltage less than [2.07] V, the associated "OR" statement in the revised Condition F of TS 3.8.6 would be applicable, and the battery must immediately be declared inoperable. If float voltage is satisfactory and there are no cells less than [2.07] V, and the out-of-limit float current condition is due to one or more battery cells with low voltage, the battery is not substantially discharged and the [12]-hour CT to restore battery float current to within limits is reasonable.

Based on the above, the NRC staff finds that adding new TS 3.8.6 Condition B meets 10 CFR 50.36 requirements that when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.3.7 TS 3.8.6; Change (7)

The proposed change would add new TS 3.8.6, Condition C to address the level of the electrolyte in a cell.

Evaluation of TS 3.8.6; Change (7)

The licensee proposed adding new TS 3.8.6 Condition C to address the electrolyte level in a cell. This new Condition C would be applicable when one or more batteries on one subsystem are found with one or more cells with an electrolyte level less than the minimum established design limits. If the electrolyte level is above the top of the battery plates, but below the minimum limit (i.e., minimum level indication mark on the battery cell jar), the battery should still have sufficient capacity to perform its intended safety function and could be considered operable. With the electrolyte level below the top of the plates, there is a potential for dry-out and plate degradation. New Required Actions C.1 and C.2 (as well as provisions in the [new] Battery Monitoring and Maintenance Program) restore the electrolyte level, ensure that the cause of the loss of the electrolyte level is not due to a leak in the battery cell jar, and equalize and test the battery cells that have been discovered with an electrolyte level below the top of the plates.

Based on the above, the NRC staff finds that adding new TS 3.8.6 Condition C meets 10 CFR 50.36 requirements that when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.3.8 TS 3.8.6; Change (8)

The proposed change would add new TS 3.8.6, Condition D which would apply to a battery found with a pilot cell electrolyte temperature less than the minimum established design limit.

Evaluation of TS 3.8.6; Change (8)

The licensee proposes adding new TS 3.8.6 Condition D which would apply to a battery found with a pilot cell electrolyte temperature less than the minimum established design limit. A low electrolyte temperature limits the current and power available from the battery. This new Condition D would be applicable when one or more batteries on one subsystem have a pilot cell electrolyte temperature less than minimum established design limits.

[LICENSEE] batteries are sized with correction margins to account for factors affecting performance that include temperature and aging and adequate battery design margins. [The [LICENSEE] stated that battery room temperature is periodically monitored by [PLANT] Operations as part of the operator's rounds. The [PLANT] battery rooms are contained in a separate environmentally controlled area outside the engineered safety feature switchgear rooms.] [LICENSEE] has stated that the temperature of the room containing the batteries is monitored at least [INSERT MINIMUM FREQUENCY] during operator tours. [LICENSEE], would implement corrective measures in accordance with plant procedures. Based on these procedures and the fact that batteries have very large thermal inertia, the NRC staff finds that it is highly likely that a room temperature excursion would be corrected by the licensee prior to the battery electrolyte reaching its minimum temperature. Since batteries have very large thermal inertia, it is highly likely that a room temperature excursion would be detected and corrected prior to the battery cells reaching minimum temperature.

Due to the use of [2.07] V as the minimum limit for cell voltage and the use of pilot cell temperature in lieu of average cell temperature, changes are necessary in the method pilot cells are selected. In the past, pilot cells were selected to represent average cells in the battery. The change to [2.07] V now requires pilot cells to be selected to represent the lowest voltage cells in the battery. This ensures that the other cells are above the pilot cell voltage which must remain above the TS limit.

Previously, [LICENSEE] monitored average battery temperature instead of pilot cell temperature. As a result, temperature was not a criterion in selecting a pilot cell. In order to use pilot cell temperature instead of average battery temperature, temperature must be used as a criterion when selecting the pilot cell. This may result in different pilot cells for temperature monitoring and voltage monitoring.

[[LICENSEE] stated that the maximum temperature deviation across the battery does not exceed the IEEE Std. 450-2002 recommended maximum of 5 degrees Fahrenheit (°F), cell temperature, and therefore, the license does not take temperature into account when selecting battery pilot cells.] [[LICENSEE] stated that the maximum battery temperature deviation across the battery exceeds the IEEE Std. 450-2002 recommended maximum of 5 degrees Fahrenheit (°F), cell temperature.] Therefore, the licensee is proposing that they {REVIEWER'S NOTE: select from the following phrases to complete the sentence} [will continue to use average cell temperature and use it in lieu of pilot cell temperature.] [have performed the necessary analysis to demonstrate that sufficient margins exist in sizing to compensate for using the warmest cell as the pilot cell.] [will include using cell temperature as a criterion in selecting the pilot cell or to select a separate pilot cell that reflects the average battery temperature].

Another difference in this approach is rotating pilot cells. [Past practices have been to rotate pilot cells on an annual basis and to not reuse cells that have previously been pilot cells.] The reason for rotation and not reusing cells was to prevent loss of electrolyte by repeated sampling (e.g., specific gravity monitoring). With the transition to float current monitoring, this concern is no longer valid and pilot cells should be selected based on the preceding discussion without regard to whether or not they have been used previously. Pilot cell selection should be evaluated at a minimum of every 92 days, which is consistent with the frequency for taking voltage measurements of each battery connected cell (SR 3.8.6.5), to ensure they continue to meet the selection criteria.

Based on this information, the NRC staff finds that the pilot cell temperature is a sufficiently accurate representation of the temperature of the battery bank because: (1) batteries have very large thermal inertia; (2) the [PLANT] batteries are designed with sufficient margins (i.e., temperature, aging, and design); and (3) the [LICENSEE] monitoring and correction of low battery room temperatures. The proposed 12-hour CT provides adequate time to restore the electrolyte temperature within established limits.

Based on the above, the NRC staff finds that adding new TS 3.8.6 Condition D meets 10 CFR 50.36 requirements that when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.3.9 TS 3.8.6; Change (9)

New TS 3.8.6, Condition E addresses the condition in which two or more redundant subsystem battery parameters are not within established limits.

Evaluation of TS 3.8.6; Change (9)

The licensee proposed adding new TS 3.8.6 Condition E to address the condition where one or more batteries in redundant subsystems with battery parameters not within limits. If this condition exists, there is not sufficient assurance that the batteries will be capable of performing their intended safety function. With redundant batteries involved, loss of function is possible for multiple systems that depend upon the batteries. The licensee proposed that battery parameters for the affected battery in one subsystem be restored to within limits within 2 hours. The NRC staff considers the 2-hour time period to be consistent with similar limiting conditions established by the TSs and reasonable considering the loss of function of components that depend on the batteries while also providing a relatively short duration to resolve the condition.

Based on the above, the NRC staff concludes that adding new TS 3.8.6 Condition D meets 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3.10 TS 3.8.6; Change (10)

The proposed change would modify Condition B by replacing the last two entry Conditions and renaming it Condition F.

Evaluation of TS 3.8.6; Change (10)

Existing Condition B (new Condition F) describes three Conditions of battery inoperability. As part of this proposed change, the applicant proposed replacing the last two entry Conditions. The two new Conditions require entry when one or more batteries with one or more battery cells float voltage of less than [2.07] V (new TS 3.8.6 Condition A) or float current greater than [2] amps (new TS 3.8.6 Condition B).

New Condition F provides a default condition for battery parameters that fall outside the allowance of the Required Actions for Condition A, B, C, D, or E. Under this condition, it is assumed that there is insufficient capacity to supply the maximum expected load requirements. New Condition F also addresses the case where one or more batteries is found with one or

more battery cells having a float voltage less than [2.07] V and a float current greater than [2] amps. Since battery capacity may be insufficient to perform the intended design function, the Required Action is to declare the associated battery Inoperable with an immediate Completion Time.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements that when an LCO is not met, the licensee shall follow any remedial action permitted by the TS until the condition can be met.

3.2.3.11 TS 3.8.6; Change (11)

The proposed changes would delete requirements in SR 3.8.6.1 to verify battery cell parameters meet Table 3.8.6-1 Category A limits; SR 3.8.6.2 to verify battery cell parameters meet Table 3.8.6-1 Category B limits; and SR 3.8.6.3 to verify average electrolyte temperature of representative cells.

Evaluation of TS 3.8.6; Change (11)

The NRC staff finds that the elimination of existing SR 3.8.6.1 and SR 3.8.6.2 is consistent with the elimination of Table 3.8.6.1. As discussed above, the licensee proposed relocating the Category A and B values of TS Table 3.8.6-1 and the Required Actions associated with restoring a battery to operable status to the [new] Battery Monitoring and Maintenance Program. The Category A and B values of TS Table 3.8.6-1 represent appropriate monitoring levels and appropriate preventive maintenance levels for long-term battery quality and extended battery life. The NRC staff finds relocating these values to the Battery Monitoring and Maintenance Program acceptable since the licensee provided assurance that these battery parameter values will continue to be controlled at their current level, and that actions to restore deficient values will be implemented in accordance with the licensee's corrective action program. Furthermore, the battery and its preventive maintenance and monitoring program are under the regulatory requirements of 10 CFR 50.65. This relocation will continue to assure that the battery is maintained at current levels of performance, and that operators appropriately focus on monitoring the battery parameters for degradation.

Existing SR 3.8.6.3 will be replaced with new SR 3.8.6.4 (see Section 3.2.3.15 of this SE for more details).

The proposed changes discussed above ensure the battery parameters (maintenance, testing, and monitoring) are appropriately monitored and maintained in accordance with the Battery Monitoring and Maintenance Program, as specified in TS Section [5.5.17].

Based on this information, the NRC staff finds that there is assurance that plant battery LCOs (10 CFR 50.36(c)(2)) will continue to be maintained; therefore, the proposed changes are acceptable.

3.2.3.12 TS 3.8.6; Change (12)

The proposed change would add new SR 3.8.6.1.

Evaluation of TS 3.8.6; Change (12)

The applicant proposed adding new SR 3.8.6.1, which will require verification that the float current for each battery is less than or equal to [2] amps every 7 days. The purpose of this SR is to determine the state of charge of the battery. Float charge is the condition in which the battery charger is supplying the continuous small amount of current (i.e., less than or equal to [2] amps) required to overcome the internal losses of a battery to maintain the battery in a fully charged state. The float current requirements are based on the float current indicative of a charged battery. As stated above in Section 3.2.3.1 [TS 3.8.6; Change (1)], the use of float current to determine the state of charge of the battery is consistent with the battery manufacturer recommendations.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3.13 TS 3.8.6; Change (13)

The proposed change would add new SR 3.8.6.2.

Evaluation of TS 3.8.6; Change (13)

The licensee proposed adding new SR 3.8.6.2, which will require verification that the float voltage of pilot cells are greater than or equal to [2.07] V every 31 days. This voltage level represents the point where battery operability is in question. The Battery Monitoring and Maintenance Program in new TS Section [5.5.17] includes actions to restore battery cells with float voltage less than [2.13] V and actions to verify that the remaining cells are greater than or equal to [2.07] V when a cell or cells have been found to be less than [2.13] V.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3.14 TS 3.8.6; Change (14)

The proposed change would add new SR 3.8.6.3, which will require verification that the connected cell electrolyte level of each battery is greater than or equal to the minimum established design limits every 31 days..

Evaluation of TS 3.8.6; Change (14)

The licensee proposed adding SR 3.8.6.3. Operation of the batteries at electrolyte levels greater than the minimum established design limit ensures that the battery plates do not suffer physical damage and continue to maintain adequate electron transfer capability.

The licensee also proposed relocating the specific limiting values for the battery electrolyte level to the Battery Monitoring and Maintenance Program. SR 3.8.6.3 would require the electrolyte level to be greater than or equal to the “minimum established design limits.” Relocation to the licensee controlled Battery Monitoring and Maintenance Program will allow

flexibility to monitor and control this limit at values directly related to the battery ability to perform its required safety function. Incorporating the minimum established design level limit into the plant's FSAR provides reasonable assurance that the value will be appropriately maintained by the licensee to accurately reflect the design of the plant.

Based on the above, the NRC staff concludes that the proposed change adequately ensures that the necessary quality of systems and components is maintained, and that the LCOs will be met.

3.2.3.15 TS 3.8.6; Change (15)

The proposed change would add new SR 3.8.6.4, which will require verification that the temperature of each battery pilot cell is greater than or equal to the minimum established design limits every 31 days.

Evaluation of TS 3.8.6; Change (15)

The licensee proposed adding SR 3.8.6.4. This SR would replace existing SR 3.8.6.3, which required verifying the average (versus pilot cell) electrolyte temperature every 92 days. Batteries have very large thermal inertia; the batteries are designed with margins to account for factors affecting performance (i.e., temperature, aging); and there is monitoring to maintain optimum battery room temperatures. As a result, the pilot cell temperature is an accurate representation of the temperature of the battery bank and is adequate to ensure that the minimum electrolyte temperature is maintained. The surveillance frequency is consistent with the recommendations provided in IEEE Std. 450-2002.

The licensee also proposed relocating the specific limiting values for the battery electrolyte temperature to the Battery Monitoring and Maintenance Program. SR 3.8.6.4 would require the electrolyte temperature to be greater than or equal to the "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. Relocation to the Battery Monitoring and Maintenance Program will allow flexibility to monitor and control this limit at values directly related to the battery ability to perform its intended function. Incorporating the minimum established design temperature limit into the plant's FSAR provides reasonable assurance that the value will be appropriately maintained by the licensee to accurately reflect the design of the plant.

Based on the above, the NRC staff finds that the pilot cell temperature is an accurate representation of the temperature of the battery bank. The NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.3.16 TS 3.8.6; Change (16)

The proposed change would add new SR 3.8.6.5, which will require verification that the float voltage of all connected cells are greater than or equal to [2.07] V every 92 days.

Evaluation of TS 3.8.6; Change (16)

The licensee proposed adding new SR 3.8.6.5. This voltage level represents the point at which battery operability cannot be assured. 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, which corresponds to [130.5] V at the battery terminals, or [2.25] V per cell. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than [2.07] V per cell, are addressed in the Battery Monitoring and Maintenance Program. Furthermore, the Battery Monitoring and Maintenance Program includes actions to restore battery cells with float voltage less than [2.13] V and actions to verify that the remaining cells are greater than or equal to [2.07] V when a cell or cells have been found to be less than [2.13] V. The [2.07] V individual cell limit reflects the Operability limit for the batteries. With all battery cells above [2.07] V, there is adequate assurance that that the terminal voltage is at an acceptable threshold for establishing battery operability.

Based on the above, the NRC staff concludes that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.2.4 TS [5.5], Battery Monitoring and Maintenance Program

The proposed change would add a [new] Battery Monitoring and Maintenance Program to TS Section [5.5].

Evaluation of TS [5.5] Change

[LICENSEE] proposes the [new] administrative program titled “Battery Monitoring and Maintenance Program” to Administrative TS Section [5.5], to read as follows:

> Battery Monitoring and Maintenance Program
>
> This program provides controls for battery restoration and maintenance. The program shall be in accordance with the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std) 450-2002, “IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications,” as endorsed by Regulatory Guide 1.129, Revision 2 (RG), with RG exceptions and program provisions as identified below:
>
> a. The program allows the following RG 1.129, Revision 2 exceptions:
>
> 1. Battery temperature correction may be performed before or after conducting discharge tests.
>
> 2. RG 1.129, Regulatory Position 1, Subsection 2, “References,” is not applicable to this program.
>
> 3. In lieu of RG 1.129, Regulatory Position 2, Subsection 5.2, “Inspections,” the following shall be used: “Where reference is

made to the pilot cell, pilot cell selection shall be based on the lowest voltage cell in the battery."

4. In RG 1.129, Regulatory Position 3, Subsection 5.4.1, "State of Charge Indicator," the following statements in Paragraph (d) may be omitted: "When it has been recorded that the charging current has stabilized at the charging voltage for three consecutive hourly measurements, the battery is near full charge. These measurements shall be made after the initially high charging current decreases sharply and the battery voltage rises to approach the charger output voltage."

5. In lieu of RG 1.129, Regulatory Position 7, Subsection 7.6, "Restoration," the following may be used: "Following the test, record the float voltage of each cell of the string."

b. The program shall include the following provisions:

1. Actions to restore battery cells with float voltage < [2.13] V;

2. Actions to determine whether the float voltage of the remaining battery cells is ≥ [2.13] V when the float voltage of a battery cell has been found to be < [2.13] V;

3. Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates;

4. Limits on average electrolyte temperature, battery connection resistance, and battery terminal voltage; and

5. A requirement to obtain specific gravity readings of all cells at each discharge test, consistent with manufacturer recommendations.

[LICENSEE] states that monitoring of the current battery parameters (i.e., specific gravity, electrolyte level, cell temperature, float voltage, connection resistance, and physical condition) will be relocated to this program. The TS Battery Maintenance and Monitoring Program will ensure that the above battery parameters will be maintained and that actions will be implemented should the battery parameter(s) not be met.

The TS [5.5] Battery Monitoring and Maintenance Program provides assurance that the battery parameters will be monitored and controlled in accordance with the program, and that actions to restore deficient parameters will be implemented in accordance with the licensee's corrective action program. Furthermore, the battery and its preventive maintenance and monitoring program continue to be subject to the regulatory requirements of 10 CFR 50.65.

The NRC staff finds that this change provides assurance that the battery is maintained at required levels of performance, battery parameters are monitored, and that the limiting conditions for operation will continue to be met. Based on the above the NRC staff concludes

that the proposed changes meet 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the limiting conditions for operation will be met.

3.3 Summary and Conclusions

Based on the above evaluation, the NRC staff finds the proposed changes to the [PLANT] TS provide assurance of the continued availability of the required DC power to shut down the reactor and to maintain the reactor in a safe condition after an anticipated operational occurrence or a postulated design-basis accident. The NRC staff also concludes that the proposed TS changes are in accordance with 10 CFR 50.36, 50.63, and 50.65, and meet the intent of GDCs 17 and 18. Therefore, the NRC staff finds the proposed changes acceptable.

4.0 CONCLUSIONS

{REVIEWER'S NOTE: Provide conclusion.}

5.0 STATE CONSULTATION

{REVIEWER'S NOTE: Provide state consultation paragraph.}

6.0 ENVIRONMENTAL CONSIDERATION

{REVIEWER'S NOTE: Provide environmental consideration.}

7.0 REFERENCES

1. TSTF–500, Revision 2, “Rewrite DC Electrical Systems – Update TSTF 360, Rev. 1,” September 22, 2009 (ADAMS Accession No. ML092670242).

2. RG 1.32, Revision 3, “Criteria for Power Systems for Nuclear Power Plants,” (ADAMS Accession No. ML040680488).

3. RG 1.75, Revision 3, “Criteria for Independence of Electrical Safety Systems,” (ADAMS Accession No. ML043630448).

4. RG 1.129, Revision 2, “Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants,” (ADAMS Accession No. ML063490110).

5. RG 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis,” NRC, August 1998 (ADAMS Accession No. ML003740133).

6. RG 1.177, “An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications,” August 1998 (ADAMS Accession No. ML003740176).