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

April 27, 2021

Mr. Frank R. Payne
Site Vice President
Energy Harbor Nuclear Corp.
Perry Nuclear Power Plant
P.O. Box 97, SB306
Perry, OH 44081-0097

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – ISSUANCE OF AMENDMENT NO. 193 REGARDING THE ADOPTION OF TSTF 500, "DC ELECTRICAL REWRITE – UPDATE TO TSTF 360" (EPID L-2020-LLA-0089)

Dear Mr. Payne:

The U.S Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 193 to Renewed Facility Operating License No. NPF-58 for Perry Nuclear Power Plant, Unit No. 1. The amendment consists of changes to the technical specifications (TS) in response to your application dated April 24, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20115E517), as supplemented by letters dated September 29, 2020 and November 19, 2020 (ADAMS Accession Nos. ML20274A055 and ML20324A125, respectfully).

The amendments revise the requirements related to direct current (DC) electrical systems based on the NRC approved Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update to TSTF-360."

A copy of the related Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's monthly *Federal Register* notice.

Sincerely,

/RA/

Scott P. Wall, Senior Project Manager
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosures:
1. Amendment No. 193 to NPF-58
2. Safety Evaluation

cc: Listserv

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

ENERGY HARBOR NUCLEAR CORP.

ENERGY HARBOR NUCLEAR GENERATION, LLC

DOCKET NO. 50-440

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 193
License No. NPF-58

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment filed by Energy Harbor Nuclear Corp., et al.,[1] dated April 24, 2020, as supplemented by letters dated September 29, 2020 and November 19, 2020, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations as set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

[1] Energy Harbor Nuclear Corp. is authorized to act as agent for Energy Harbor Nuclear Generation, LLC and has exclusive responsibility and control over the physical construction, operation, and maintenance of the facility.

2. Accordingly, the license is amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-58 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 193, are hereby incorporated into the license. Energy Harbor Nuclear Corp. shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of its issuance and shall be implemented within 75 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert F. Kuntz

Digitally signed by Robert F. Kuntz
Date: 2021.04.27 08:11:20 -04'00'

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Facility Operating License No. NPF-58 and Technical Specifications

Date of Issuance: April 27, 2021

ATTACHMENT TO LICENSE AMENDMENT NO. 193

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

FACILITY OPERATING LICENSE NO. NPF-58

DOCKET NO. 50-440

Facility Operating License No. NPF-58

Replace the following page of Facility Operating License No. NPF-58 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change

REMOVE	INSERT
-4-	-4-

Technical Specifications

Replace the following pages of the Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE	INSERT
iii	iii
3.8-24	3.8-24
3.8-25	3.8-25
3.8-26	3.8-26
3.8-27	3.8-27
3.8-29	3.8-29
3.8-30	3.8-30
3.8-32	3.8-32
3.8-33	3.8-33
---	3.8-33a
3.8-34	3.8-34
3.8-35	3.8-35
3.8-36	---
5.0-15d	5.0-15d
5.0-15e	5.0-15e

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Energy Harbor Nuclear Corp. is authorized to operate the facility at reactor core power levels not in excess of 3758 megawatts thermal (100% power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 193, are hereby incorporated into the license. Energy Harbor Nuclear Corp. shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Antitrust Conditions

a. Energy Harbor Nuclear Generation LLC shall comply with the antitrust conditions delineated in Appendix C to this license; Appendix C is hereby incorporated into this license.

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(continued)

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources - Operating

LCO 3.8.4 The Division 1, Division 2, and Division 3 DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required battery charger on one subsystem inoperable.	A.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND		
	A.2	Verify battery float current ≤ 2 amps.	Once per 12 hours
	AND		
	A.3	Restore battery charger to OPERABLE status.	72 hours
B. Division 1 or 2 DC electrical power subsystem inoperable for reasons other than Condition A.	B.1	Restore Division 1 and 2 DC electrical power subsystems to OPERABLE status.	2 hours
C. Division 3 DC electrical power subsystem inoperable.	C.1	Declare High Pressure Core Spray System inoperable.	Immediately
D. Required Action and associated Completion Time not met.	D.1	Be in MODE 3.	12 hours
	AND		
	D.2	Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.2	Verify each required Division 1 and 2 battery charger supplies ≥ 400 amps at ≥ 125 V for ≥ 8 hours; and each required Division 3 battery charger supplies ≥ 50 amps at ≥ 125 V for ≥ 8 hours. OR Verify each battery charger can recharge the battery to the fully charged state within 12 hours for Division 1 and 2 and 8 hours for Division 3 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.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	----------NOTE---------- SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3. ---------- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	In accordance with the Surveillance Frequency Control Program

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ACTIONS

----------NOTE----------
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required battery charger on one subsystem inoperable. AND The redundant subsystem battery and charger OPERABLE.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND A.2 Verify battery float current ≤ 2 amps. AND A.3 Restore battery charger to OPERABLE status.	2 hours Once per 12 hours 72 hours
B. One or more required DC electrical power subsystems inoperable.	B.1 Declare affected required feature(s) inoperable. OR B.2.1 Suspend CORE ALTERATIONS. AND B.2.2 Suspend movement of recently irradiated fuel assemblies in the primary containment and fuel handling building. AND B.2.3 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately Immediately Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	----------NOTE---------- The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3. ---------- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.4.1 SR 3.8.4.2 SR 3.8.4.3	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery Parameters

LCO 3.8.6 Battery parameters for the Division 1, 2, and 3 electrical power subsystem batteries shall be within limits.

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

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each battery.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two batteries on one subsystem with one or more battery cell float voltage ≤ 2.07 V.	A.1 Perform SR 3.8.4.1. AND A.2 Perform SR 3.8.6.1. AND A.3 Restore affected cell voltage > 2.07 V.	2 hours 2 hours 24 hours
B. One or two batteries on one subsystem with float current > 2 amps.	B.1 Perform SR 3.8.4.1. AND B.2 Restore battery float current to ≤ 2 amps.	2 hours 12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
----------NOTE---------- Required Action C.2 shall be completed if electrolyte level was below the top of plates. ----------	----------NOTE---------- Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of plates. ----------	
C. One or two batteries on one subsystem with one or more cells electrolyte level less than minimum established design limits.	C.1 Restore electrolyte level to above top of plates. AND C.2 Verify no evidence of leakage. AND C.3 Restore electrolyte level to greater than or equal to minimum established design limits.	8 hours 12 hours 31 days
D. One or two batteries on one subsystem with pilot cell electrolyte temperature less than minimum established design limits.	D.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits.	12 hours
E. One or more batteries in redundant subsystems with battery parameters not within limits.	E.1 Restore battery parameters for batteries in one subsystem to within limits.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR One or two batteries on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 2 amps.	F.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	----------NOTE---------- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. ---------- Verify each battery float current is ≤ 2 amps.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.6.2	Verify each battery pilot cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.3	Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.4	Verify each battery pilot cell temperature is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.5	Verify each battery connected cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.6.6	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.	In accordance with the Surveillance Frequency Control Program AND 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of the manufacturer's rating AND 24 months when the battery has reached 85% of the expected life with capacity ≥ 100% of the manufacturer's rating

5.5 Programs and Manuals (continued)

5.5.15 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies." Revision 1

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

5.5.16 Battery Monitoring and Maintenance Program

This Program provides controls for battery restoration and maintenance. The program shall be in accordance with 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 for 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."

(continued)

5.5 Programs and Manuals

5.5.16 Battery Monitoring and Maintenance Program (continued)

4. In Regulatory Guide 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 < 2.13V;

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.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 193 TO

FACILITY OPERATING LICENSE NO. NPF-58

ENERGY HARBOR NUCLEAR CORP.

ENERGY HARBOR NUCLEAR GENERATION LLC

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated April 24, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20115E517), as supplemented by letters dated September 29, 2020, and November 19, 2020 (ADAMS Accession Nos. ML20274A055 and ML20324A125, respectfully), Energy Harbor Nuclear Corp. (EHNC or the licensee) proposed changes to the technical specifications (TS) for Perry Nuclear Power Plant, Unit No. 1 (PNPP) to adopt NRC-approved Technical Specifications Task Force (TSTF) Standard Technical Specifications (STS) Change 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.

The licensee proposes that the items to be relocated will be contained in the new Administrative Controls TS 5.5.16, "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 TSs. 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 change to TS 3.8.4.

- LCO 3.8.6, “Battery Cell Parameters,” is renamed “Battery Parameters.” An associated change is proposed for the TS Table of Contents. Table 3.8.6-1 is deleted and existing Conditions and Surveillances are replaced

- Maintenance and monitoring of station batteries will be controlled by the new Administrative Controls TS 5.5.16, “Battery Monitoring and Maintenance Program.”

The Notice of Availability (NOA) for TSTF-500, Revision 2, was published in the *Federal Register* on September 1, 2011 (76 FR 54510), to announce the availability of the model application and model safety evaluation (SE) (ADAMS Accession No. ML111751792) for plant specific adoption of TSTF-500, Revision 2, as part of the consolidated line item improvement process (CLIIP). This NOA was later corrected to clarify that TSTF-500 was available for plant-specific adoption, but not under the CLIIP. The clarifying NOA was published in the Federal Register on November 8, 2011 (76 FR 69296).

TSTF-500, Revision 2, Attachment B, “Revisions to Revision 1 of the ISTS [Improved Standard Technical Specifications] NUREGs,” provides the changes to Revision 1 of the ISTS NUREGs to incorporate TSTF-500. TSTF-500, Revision 2, stated that the changes in Attachment B should be used for plants that have not adopted TSTF-360. Since PNPP is a boiling-water reactor (BWR) plant that has not adopted TSTF-360, the U.S. Nuclear Regulatory Commission (NRC or Commission) staff used the changes to NUREG-1434, “Standard Technical Specifications – General Electric Plants (BWR/6),” Revision 1 in Attachment B of TSTF-500, Revision 2, as the model for evaluating the proposed PNPP TS changes.

The supplemental letters dated September 29, 2020, and November 19, 2020, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on June 2, 2020 (85 FR 33752).

Attachment 4 to the April 24, 2020, application, provided revised TS Bases pages to be implemented with the associated TS changes. These pages were provided for information only and will be revised by the licensee in accordance with the TS Bases Control Program discussed in TS 5.5.11, "Technical Specifications (TS) Bases Control Program."

2.0 REGULATORY EVALUATION

The following NRC requirements and guidance documents are applicable to the NRC staff's review:

- The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 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…."

- The regulation at 10 CFR Part 50, Appendix A, GDC 1, "Quality standards and records," requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

- The regulations at 10 CFR 50.36 "Technical specifications," establish the requirements related to the content of the TS. Pursuant to 10 CFR 50.36, TS are required to include items in the following five categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) LCOs; (3) SRs; (4) design features; and (5) administrative controls.

- The regulation at 10 CFR 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 (1-4) are summarized as follows:

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.

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.

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.

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

- The regulation at 10 CFR 50.36(c)(3), states that "[SRs] 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 [LCOs] will be met."

- The regulation at 10 CFR 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 1.129, Revision 2, "Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants," dated February 2007 (ADAMS Accession No. ML063490110), provides guidance 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."

- RG 1.75, Revision 0, "Physical Independence of Electric Systems," dated February 1974, provides guidance with respect to the physical independence

- requirements of the circuits and electric equipment that comprise or are associated with safety systems.

- TSTF 500, Revision 2, “DC Electrical Rewrite – Update to TSTF 360.”

- The model application and SE for plant-specific adoption of TSTF 500, Revision 2 (ADAMS Accession No. ML111751792), as published for availability in the *Federal Register* on September 1, 2011 (76 FR 54510).

3.0 TECHNICAL EVALUATION

The licensee uses the term 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 alternating current (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 (direct current) to AC power converters (i.e., inverters)). PNPP is licensed to 10 CFR Part 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.

On August 12, 1994, the request for an extension of the Construction Permit for Perry Nuclear Power Plant, Unit No. 2 was withdrawn (ADAMS Accession No. ML20072C971). A Site Stabilization Plan was subsequently transmitted on December 29, 1994 (ADAMS Accession No. ML20079B216). This plan provided the activities needed to redress portions of the Perry site affected by the Unit 2 construction activities. Systems and equipment that were originally to be shared by both units or intended for Unit 2 but are now used to support Unit 1 operations, continued under the full control of the Unit 1 programs.

3.1.1 Class 1E, Division 1 and 2 Direct Current Systems

Each unit has two Class 1E systems, Division 1 and Division 2, and they are independent and redundant. Division 1 includes a 125-volt (V) DC system with a 61-cell battery and Division 2 includes a 125 V DC system with a 60-cell battery. Each system includes a 1260-ampere -hour (AH) battery and a 400-ampere (A) battery charger. In addition, a 400 A reserve battery charger is provided for each division and can be connected to the appropriate division of either the Unit 1 or Unit 2, Class 1E, 125 V DC systems by means of the maintenance tie buses. No interdivisional ties are provided between the divisions associated with Unit 1 or Unit 2 during normal operating conditions. Maintenance tie buses only connect the same divisions of the two units (Unit 1, Division 1 to Unit 2, Division 1 and Unit 1, Division 2 to Unit 2, Division 2). The maintenance tie bus circuit breakers are normally open and are manually operated under administrative control. The maintenance tie bus circuit breakers permit isolation of the battery and normal battery charger associated with either Unit 1 or Unit 2 for purposes of maintenance, testing, or equalizing the battery. If the DC batteries are the only available power source, the maintenance tie circuit breakers may be closed to allow the Unit 1 and Unit 2 batteries to be paralleled.

3.1.2 Class 1E, Division 3 Direct Current System

Each unit has a Class 1E, Division 3, 125-V DC, system which is capable of feeding the high-pressure core spray system logic, the Division 3 diesel generator control system, and other Division 3 DC controls. Division 3 includes a 60-cell battery and a 250 AH battery charger. In addition, a 50 A reserve battery charger is provided. The reserve battery charger is located with the equipment associated with Unit 1 but can be connected to the Unit 2, Class 1E, 125-V DC system by means of a maintenance tie bus. No interdivisional ties are provided between the divisions associated with Unit 1 or Unit 2. The maintenance tie bus only connects Unit 1, Division 3 to Unit 2, Division 3. The maintenance tie bus circuit breaker is normally open and is manually operated under administrative control. This breaker permits isolation of the battery and normal battery charger associated with either Unit 1 or Unit 2 for purposes of maintenance, testing or equalizing the battery. If the DC batteries are the only available power sources, the Unit 1 and Unit 2 batteries may be paralleled by closing the maintenance tie circuit breaker.

3.2 Evaluation of Proposed changes

3.2.1 TS 3.8.4, "DC Sources – Operating," Changes

The licensee proposes revising the LCO for TS 3.8.4, and to modify and relocate, TS 3.8.4 Conditions, Required Actions, and SRs. TS 3.8.4 LCO requires Divisions 1, 2, and 3, DC electrical power subsystems to be operable. Currently, TS 3.8.4 contains two Conditions A and B for one DC electrical subsystem inoperable. The proposed changes would modify and renumber current Conditions A and B as new Conditions B and C respectively, and add a new Condition A.

3.2.1.1 TS 3.8.4; New Condition A (Added); Change (1)

The proposed change would add new Condition A as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required battery charger on one subsystem inoperable	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage	2 hours
	AND	
	A.2 Verify battery float current ≤ 2 amps	Once per 12 hours
	AND	
	A.3 Restore battery charger to OPERABLE status	72 hours

Evaluation of TS 3.8.4 New Condition A, Change (1)

According to the PNPP TS Bases 3.8.4, each DC electrical power subsystem consists of either the Unit 1 or Unit 2 battery, either the normal or reserve battery charger, and the corresponding control equipment and interconnecting cabling supplying power to the

associated bus within the divisions. In the April 24, 2020, submittal in Section 2.1, the licensee states, in part:

> The PNPP was designed with qualified Unit 1 and Unit 2 class 1E, safety related batteries, and has the ability to tie in the Unit 2 batteries to their respective Unit 1 buses. Based on the operational flexibility of having both Unit 1 and Unit 2 batteries, loss of one of two batteries and/or chargers on one subsystem does not require declaring a division inoperable, and therefore TS 3.8.4, "DC Sources - Operating," specifically Condition A was revised to state "Required" *battery charger on one subsystem inoperable*.
>
> […]
>
> Because this change does not alter the intended application of the LCO and its related Actions, the change is considered a minor variation from TSTF-500.

The NRC staff finds that the addition of the term "Required" to the statement of the proposed TS 3.8.4 new Condition A is acceptable because the condition satisfies the requirements of LCO 3.8.4.

New Required Action A.1 provides assurance that the battery terminal voltage will 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 the control power for safety-related DC equipment and supports safe shutdown and isolation of the reactor for a Station Blackout (SBO) event. The 2-hour CT provides an allowance for returning an inoperable charger to operable status or for reestablishing an alternate means (e.g., spare battery charger) of restoring battery terminal voltage to greater than or equal to the minimum established float voltage.

According to Section 8.3, "Onsite Power Systems," of the PNPP Updated Safety Analysis Report (USAR), Division 1 and Division 2 each include a reserve charger in both Unit 1 and Unit 2. Division 3 includes one reserve charger connected to a manually operated maintenance tie bus between Unit 1 and Unit 2 Division 3 DC systems. Each charger is provided for the purpose of maintenance or equalizing the battery. Thus, the reserve battery charger(s) will be able to restore the affected required battery(ies) terminal voltage(s) to greater than or equal to the minimum established float voltage within the 2-hour CT. At the end of the 2-hour CT, 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. This provides assurance that the battery can be restored to its fully charged condition from any discharge that occurs due to the charger inoperability. The proposed new Required Action A.1 will allow the DC bus to remain energized and the battery discharge to be terminated and is, therefore, acceptable.

New Required Action A.2 would require that the battery float current be verified as less than or equal to 2 amps once per 12 hours. This would indicate that if the battery had been discharged as the result of the inoperable battery charger, it had been recharged and fully capable of supplying the maximum expected load requirement. PNPP USAR Section 8.3.2.1.2.2, "Capacity," states that the Division 1 and 2 batteries: (1) are sized to supply the required DC loads for a minimum of 2 hours and (2) their battery chargers are sized to supply the continuous load of both units while simultaneously recharging the

batteries to a fully charged condition from the design minimum charge within 12 hours. The USAR Section 8.3.2.1.3.5, "Battery Capacity," states that the "Division 3 battery charger can recharge the Division 3 battery from a fully discharged condition in 8 hours while also supplying the steady-state dc bus loads." Table 8.3-7, "Load Requirements, 125 Volts DC Class 1E Batteries," shows that the Division 3 batteries are required to supply the design basis loads for 2 hours. Thus, the Divisions 1, 2, and, 3 batteries would be fully recharged within 12 hours to less than or equal to 2 amps (see Section 3.2.3.3 of this SE for the NRC staff's evaluation of the 2-amp float current) by the reserve chargers (which have the same capacities as the normal chargers) after being discharged for the 2-hour allowed time to place a reserve battery charger on the battery. If at the expiration of the 12-hour period the battery float current is greater than 2 amps, then the battery is considered inoperable. The verification of float current provides assurance that the battery has sufficient capacity to perform its safety function; therefore, the NRC staff finds the proposed new Required Action A.2 and its associated CT acceptable.

New Required Action A.3 would limit the restoration time for the inoperable battery charger to 72 hours. An alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage (e.g., spare battery charger) will be in use during this time. 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. Both Division 1 and Division 2 in each unit include a reserve battery charger, and Division 3 includes a reserve charger shared between both units.

Based on the above, the NRC staff concludes that the proposed TS 3.8.4 new Condition A, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 to ensure that the required DC electrical power subsystems are capable of performing their safety functions, and is, therefore, acceptable.

3.2.1.2 TS 3.8.4, Current Condition A (Revised and renumbered as Condition B), Change (2)

The proposed change would revise current Condition A and renumber it as Condition B.

Current Condition A with associated Required Action and CT state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Division 1 or 2 DC electrical power subsystem inoperable	A.1 Restore Division 1 and 2 DC electrical power subsystems to OPERABLE status	2 hours

Revised and renumbered Condition B with associated Required Action and CT would state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Division 1 or 2 DC electrical power subsystem inoperable for reasons other than Condition A	B.1 Restore Division 1 and 2 DC electrical power subsystems to OPERABLE status	2 hours

Evaluation of Current Condition A (Revised and Renumbered as Condition B); Change (2)

The renumbered Condition B would apply when one DC electrical power subsystem is inoperable for reasons other than the new Condition A. Because the new Condition A (from Section 3.2.1.1 of this SE) will address the restoration of inoperable required battery charger within a 72-hour CT, the new Condition A must be excluded from the revised and renumbered Condition B, which would have a different CT. The NRC staff finds the proposed revised and renumbered Condition B acceptable because it reflects the addition of the new Condition A to TS 3.8.4.

Current Required Action A.1 would be renumbered as Required Action B.1, and there are no other changes. The NRC staff finds that renumbering Required Action A.1 as B.1 is editorial in nature and is, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed TS 3.8.4 revised and renumbered Condition B, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 to ensure that the required DC electrical power subsystems are capable of performing their safety functions and is, therefore, acceptable.

3.2.1.3 TS 3.8.4, Current Conditions B and C (Renumbered as Conditions C and D), Change (3)

The proposed change would renumber current Conditions B and C as Conditions C and D.

Evaluation of Current Conditions B and C (Renumbered as Conditions C and D), Change (3)

The NRC staff reviewed the proposed change and has determined that the change is editorial in nature and is therefore acceptable.

3.2.1.5 TS 3.8.4; SR 3.8.4.1 (Revised); Change (4)

Current SR 3.8.4.1 states:

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is $\geq$ 129 V on float charge.	In accordance with the Surveillance Frequency Control Program

Revised SR 3.8.4.1 would state:

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage	In accordance with the Surveillance Frequency Control Program

Evaluation of Current SR 3.8.4.1 (Revised), Change (4)

The purpose of SR 3.8.4.1 is to verify the battery terminal voltage while the battery is on a float charge to ensure that the effectiveness of the associated battery charger is not degraded. The battery terminal voltage selected by the battery manufacturer is the minimum float voltage that ensures an optimum charging voltage is applied to the battery.

This minimum established float voltage will maintain the battery plates in a condition that supports optimizing the battery grid life and will ensure that the battery will be capable of providing its designed safety function. In addition, in Enclosure A of its April 24, 2020, letter, the licensee stated that the PNPP USAR will be revised to include the minimum established design limit for the battery terminal float voltage. Because future changes to the design limit would be subject to the requirements of 10 CFR 50.59, the NRC staff finds that there is reasonable assurance that the numerical value for the minimum established battery float voltage will be appropriately maintained by the licensee to accurately reflect the design of the PNPP battery system.

In Enclosure A of its April 24, 2020, letter, the licensee stated that the monitoring of battery float voltage will be relocated to the proposed new Battery Monitoring and Maintenance Program in TS 5.5.16. The new program would include a provision with the limits on the battery terminal voltage. This will allow the flexibility to monitor and control the minimum established float voltage limit at values directly related to the battery's ability to perform its required safety function. The NRC staff finds the revised SR 3.8.4.1 acceptable since relocating the TS limiting value of the battery's terminal float voltage to a licensee-controlled program will allow adequate monitoring of the battery's ability to perform its safety functions.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.4.1 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met, and is, therefore, acceptable.

3.2.1.5 TS 3.8.4, Current SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5 (Relocated) Change (5)

Current SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5 state:

SURVEILLANCE		FREQUENCY
SR 3.8.4.2	Verify no visible corrosion at terminals and connectors for the vital batteries. OR Verify battery connection resistance is ≤ 5.0 E-5 ohm for inter-cell connections. ≤ 5.0 E-5 ohm for inter-rack connections. ≤ 5.0 E-5 ohm for inter-tier connections. ≤ 5.0 E-5 ohm for terminal connections: for Div 1 and Div 2 and ≤ 1.0 E-4 ohm for inter-cell connections. ≤ 1.0 E-4 ohm for inter-rack connections. ≤ 1.0 E-4 ohm for inter-tier connections. ≤ 1.0 E-4 ohm for terminal connections. for Div 3.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.4	Remove visible corrosion and verify battery cell to cell and terminal connections are coated with anticorrosion material	In accordance with the Surveillance Frequency Control Program

SURVEILLANCE		FREQUENCY
SR 3.8.4.5	Verify battery connection resistance is ≤ 5.0 E-5 ohm for inter-cell connections. ≤ 5.0 E-5 ohm for inter-rack connections. ≤ 5.0 E-5 ohm for inter-tier connections. ≤ 5.0 E-5 ohm for terminal connections: for Div 1 and Div 2 and ≤ 1.0 E-4 ohm for inter-cell connections. ≤ 1.0 E-4 ohm for inter-rack connections. ≤ 1.0 E-4 ohm for inter-tier connections. ≤ 1.0 E-4 ohm for terminal connections for Div 3	In accordance with the Surveillance Frequency Control Program

Evaluation of Units 1 and 2, TS 3.8.4, Current SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5, (Relocated), Change (5)

In Section 1.0, “Description,” of the April 24, 2020, letter, the licensee stated that a number of SRs in TS 3.8.4 will be relocated to a licensee-controlled program. Specifically, the requirements of SR 3.8.4.2 (visual inspection for corrosion or verification of connection resistances), SR 3.8.4.3 (visual inspection for physical damage or abnormal deterioration), SR 3.8.4.4 (removal of visible corrosion and ensuring battery connections are coated with anti-corrosion material), and SR 3.8.4.5 (verification of connection resistances) will be relocated to a licensee-controlled program.

Visual inspection of the battery terminals (SRs 3.8.4.2, 3.8.4.3, and 3.8.4.4) 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. Furthermore, the preventive maintenance for the batteries and related components are subject to the regulatory requirements of 10 CFR 50.65. Therefore, the NRC staff finds that the preventive maintenance currently contained in SRs 3.8.4.2, 3.8.4.3, and 3.8.4.4 will be adequately controlled in a licensee-controlled program.

Regarding the battery cell connection resistance verification of SRs 3.8.4.2 and 3.8.4.5, the resistance values represent limits at which some actions should be taken, not necessarily when the operability of the battery is in question. 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. As stated in Section 2.2 of the April 20, 2020, letter, the cell resistance limits in existing SR 3.8.4.5 will be relocated to the “Battery Monitoring and Maintenance Program,” and the connection resistance limit is 50 micro-ohms for Divisions 1 and 2, and 100 micro-ohms for Division 3. The resistance limits apply to the overall connection resistance and allows for normal degradation while maintaining battery operability. 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. The overall

connection resistance has a direct impact on operability and is adequately determined by completion of the battery service or performance discharge tests. Therefore, the NRC staff finds that the verification of the batteries' connections resistance limits in the current SRs 3.8.4.2 and 3.8.4.5 will be more appropriately controlled in a licensee-controlled program.

Based on the above, the NRC staff finds that the proposed relocation of SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5, from TS 3.8.4 into a licensee-controlled program will ensure that the visual inspection and verification of connection resistances for the batteries are appropriately monitored and maintained in accordance with the program. The NRC staff finds that there is reasonable assurance that safe plant conditions will continue to be maintained, and as such, the proposed change is acceptable.

3.2.1.6 TS 3.8.4, Current SRs 3.8.4.6 (Revised and Renumbered as SR 3.8.4.2), Change (6)

Current SR 3.8.4.6 states:

SURVEILLANCE		FREQUENCY
SR 3.8.4.6	Verify each required Division 1 and 2 battery charger supplies ≥ 400 amps at ≥ 125 V for ≥ 8 hours: and each required Division 3 battery charger supplies ≥ 50 amps at ≥ 125 V for ≥ 8 hours	In accordance with the Surveillance Frequency Control Program

Revised and renumbered SR 3.8.4.2 would state:

SURVEILLANCE		FREQUENCY
SR 3.8.4.2	Verify each required Division 1 and 2 battery charger supplies ≥ 400 amps at ≥ 125 V for ≥ 8 hours: and each required Division 3 battery charger supplies ≥ 50 amps at ≥ 125 V for ≥ 8 hours OR Verify each battery charger can recharge the battery to the fully charged state within 12 hours for Division 1 and 2 and 8 hours for Division 3 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.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.4, Current SR 3.8.4.6 (Revised and Renumbered as SR 3.8.4.2), Change (6)

The current SR 3.8.4.6 verifies the design capacity of each battery charger based on the criteria for the battery charger’s current limit amperes or capability requirements.

The current SR 3.8.4.6 would be renumbered as SR 3.8.4.2. As discussed in Section 3.2.1.5 of this SE, the current SRs 3.8.4.2 through 3.8.4.5 will be relocated from TS 3.8.4 to a licensee-controlled program. The NRC staff finds that the renumbering of SR 3.8.4.6 as SR 3.8.4.2 is consistent with the preceding changes to TS 3.8.4, is editorial in nature and is, therefore, acceptable.

The revised and renumbered SR 3.8.4.2 would provide two options. The first option requires that each required Division 1 and Division 2 battery charger supplies greater than or equal to 400 amps at greater than or equal to 125 V for greater than or equal to 8 hours; and each required Division 3 battery charger supplies greater than or equal to 50 amps at greater than or equal to 125 V for greater than or equal to 8 hours. The first option remains consistent with the current SR 3.8.4.6, and will continue to verify the design capacity of the battery charger.

The second option of the renumbered SR 3.8.4.2 would require that each battery charger be capable of recharging the battery to the fully charged state within 12 hours for Division 1 and Division 2 and 8 hours for Division 3, 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 option will provide an alternate method for verifying the design capacity of the vital battery chargers. This test would be performed following a battery service test or capacity discharge test. The level of loading required for this test may not be available following the battery service test and will need to be supplemented with additional loads. In PNPP UFSAR Section 8.3.2, the licensee stated that each Division 1 and Division 2 battery charger can recharge the battery to a fully charged condition from the design minimum charge for each Division 1 or 2 within 12 hours while supplying the continuous loads of both units. In addition, the licensee stated that the Division 3 battery charger can recharge the Division 3 battery from a fully discharged condition in 8 hours while also supplying the steady-state dc bus loads. The NRC staff finds that the second option for the revised and renumbered SR 3.8.4.2 will confirm the battery charger design capacity, and is, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed revised and renumbered SR 3.8.4.2 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met, and is, therefore, acceptable.

3.2.1.7 TS 3.8.4 Current SR 3.8.4.7 (Revised and Renumbered as SR 3.8.4.3), Change (7)

Current SR 3.8.4.7 states:

SURVEILLANCE		FREQUENCY
SR 3.8.4.7	----------NOTE---------- SR 3.8.4.8 may be performed in lieu of SR 3.8.4.7 ---------- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	In accordance with the Surveillance Frequency Control Program

Revised and renumbered SR 3.8.4.3 would state:

SURVEILLANCE		FREQUENCY
SR 3.8.4.3	----------NOTE---------- SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3 ---------- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.4, Current SR 3.8.4.7 (Revised and Renumbered as SR 3.8.4.3), Change (7)

The current SR 3.8.4.7 is modified by a Note that allows the battery performance discharge test in SR 3.8.4.8 to be performed instead of the service test in SR 3.8.4.7. The current SR 3.8.4.7 would be revised by renumbering it as SR 3.8.4.3 and by modifying the current Note. As discussed in the above Section 3.2.1.6 of this SE, the preceding SR 3.8.4.6 will be renumbered as SR 3.8.4.2. Therefore, the NRC staff finds that the renumbering of SR 3.8.4.7 as SR 3.8.4.3 is consistent with the preceding changes to TS 3.8.4, is editorial in nature and is, therefore, acceptable.

The current Note would be further revised by renumbering SR 3.8.4.8 as SR 3.8.6.6. The SR 3.8.4.8 would be relocated and renumbered as SR 3.8.6.6 (see Section 3.2.3.18 of this SE for a detailed discussion regarding the renumbered SR 3.8.6.6). The NRC staff finds that the renumbering of the SRs in Note is consistent with the proposed changes to TS 3.8.4 and, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed renumbered SR 3.8.4.3 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met and is, therefore, acceptable.

3.2.1.8 TS 3.8.4, Current SR 3.8.4.8 (Relocated to New SR 3.8.6.6), Change (8)

Current SR 3.8.4.8 states:

SURVEILLANCE		FREQUENCY
SR 3.8.4.8	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.	In accordance with the Surveillance Frequency Control Program <u>AND</u> 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating <u>AND</u> 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

<u>Evaluation of TS 3.8.4, Current SR 3.8.4.8 (Relocated to New SR 3.8.6.6), Change (8)</u>

The licensee proposed to relocate current SR 3.8.4.8 from TS 3.8.4 to TS 3.8.6 and renumber it as SR 3.8.6.6. The purpose of SR 3.8.4.8 is to demonstrate the operability of the battery; thus, this surveillance is relocated to TS 3.8.6. This change is discussed further in Section 3.2.3.18 of this SE.

3.2.2 TS 3.8.5, “DC Sources – Shutdown,” Changes

The licensee proposes revising the LCO for TS 3.8.5, and to modify TS 3.8.5 Conditions, Required Actions, and SRs. 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. Currently, TS 3.8.5 contains Condition A one DC electrical subsystem inoperable. The proposed changes would renumber current Condition A as new Condition B, and add a new Condition A.

3.2.2.1 TS 3.8.5; New Condition A (Added); Change (1)

The proposed change would add new Condition A as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required battery charger on one subsystem inoperable <u>AND</u> The redundant subsystem battery and charger OPERABLE.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage <u>AND</u> A.2 Verify battery float current ≤ 2 amps <u>AND</u> A.3 Restore battery charger to OPERABLE status	2 hours Once per 12 hours 72 hours

<u>Evaluation of TS 3.8.5 New Condition A, Change (1)</u>

New Condition A would be applicable when one required battery charger on one subsystem is inoperable and the redundant subsystem battery and charger are operable.

In the April 24, 2020, submittal, in Section 2.1, the licensee states, in part:

> The PNPP was designed with qualified Unit 1 and Unit 2 class 1E, safety related batteries, and has the ability to tie in the Unit 2 batteries to their respective Unit 1 buses. Based on the operational flexibility of having both Unit 1 and Unit 2 batteries, loss of one of two batteries and/or chargers on one subsystem does not require declaring a division inoperable…
>
> […]
>
> In addition, TS 3.8.5, “DC Sources - Shutdown,” Condition A was also revised to state the “Required” battery charger on one subsystem inoperable. Because this change does not alter the intended application of the LCO and its related Actions, the change is considered a minor variation from TSTF-500.

The NRC staff finds that the addition of the term “Required” to the statement of the proposed TS 3.8.5 new Condition A is acceptable because the condition satisfies the requirements of LCO 3.8.5

PNPP TS 3.8.5 LCO requires, in part, the operability of (1) one Class 1E battery and one Class 1E battery charger associated with the Division 1 or Division 2 Class 1E DC power distribution subsystem(s) required by LCO 3.8.8 in LCO 3.8.5.a and (2) another Class 1E battery or battery charger capable of supplying power to the remaining Division 1 or Division 2 Class 1E DC power distribution subsystem required by LCO 3.8.8 in LCO 3.8.5.b. The NRC staff notes that the proposed new Condition A will be entered in the event that the required battery charger in LCO 3.8.5.b becomes inoperable while the battery and battery charger in LCO 3.8.5.a are operable. For this reason, the NRC staff finds the proposed new Condition A is acceptable.

New Required Action A.1 would require the affected battery terminal voltage to 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, supports the recovery of AC power following events such as loss of offsite power or SBO. The 2-hour CT provides an allowance for returning an inoperable charger to operable status or for reestablishing an alternate means (e.g., spare battery charger) of restoring battery terminal voltage to greater than or equal to the minimum established float voltage.

According to Section 8.3 of the PNPP USAR, Division 1 or Division 2 includes a spare charger in both Unit 1 and Unit 2. Division 3 includes one reserve charger connected to a manually operated maintenance tie bus between Unit 1 and Unit 2. Thus, the reserve battery charger(s) will be able to restore the affected required battery(ies) terminal voltage(s) to greater than or equal to the minimum established float voltage within the 2-hour CT. At the end of the 2-hour CT, 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. This provides assurance that the battery can be restored to its fully charged condition from any discharge that occurs due to charger inoperability. The proposed new Required Action A.1 will allow the DC bus to remain energized and the battery discharge to be terminated and is, therefore, acceptable.

New Required Action A.2 would require that the battery float current be verified less than or equal to 2 amps once per 12 hours. This would indicate that if the battery had been discharged as the result of the inoperable battery charger, it had been recharged and fully capable of supplying the maximum expected load requirement. As discussed in Section 3.2.1 of this SE, the Division 1, 2, and 3 batteries would be fully recharged within 12 hours to less than or equal to 2 amps (see Section 3.2.3.3 of this SE for the NRC staff’s evaluation of the 2-amp float current) by the reserve chargers (which have the same capacities as the normal chargers) after being discharged for the 2-hour allowed time to place a reserve battery charger on the battery. If at the expiration of the 12-hour period the battery float current is greater than 2 amps, then the battery is considered inoperable. The verification of float current provides assurance that the battery has sufficient capacity to perform its safety function; therefore, the NRC staff finds the proposed new Required Action A.2 and its associated CT acceptable.

New Required Action A.3 would limit the restoration time for the inoperable battery charger to 72 hours. An alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage (e.g., spare battery charger) will be in use

during this time. 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. Division 1 or Division 2 in each unit includes a reserve battery charger, and Division 3 includes a reserve charger shared between both units.

Based on the above, the NRC staff concludes that the proposed TS 3.8.5 new Condition A, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 to ensure that the required DC electrical power subsystems are capable of performing their safety functions, and is, therefore, acceptable.

3.2.2.2 TS 3.8.5, Current Condition A (Renumbered as Condition B), Change (2)

The proposed change would renumber current Condition A as Condition B.

Current Condition A with associated Required Action and CT states:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required DC electrical power subsystems inoperable.	A.1 Declare affected required feature(s) inoperable	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS	Immediately
	AND	
	A.2.2 Suspend movement of recently irradiated fuel assemblies in the primary containment and fuel handling building.	Immediately
	AND	
	A.2.3 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

Renumbered TS 3.8.5, Condition B with associated Required Actions and CTs remain unchanged from the corresponding what is shown above. Only the alpha character designator is changed to Condition B with Required Actions B.1, B.2.1, B.2.2, and B.2.3.

Evaluation of TS 3.8.5, Current Condition A (Renumbered as Condition B), Change (2)

The NRC staff reviewed the proposed change and has determined that the change is editorial in nature and is therefore acceptable.

3.2.2.3 TS 3.8.5, Current SR 3.8.5.1 (Revised), Change (3)

Current SR 3.8.5.1 states:

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	----------NOTE---------- The following SRs are not required to be performed: SR 3.8.4.4, SR 3.8.4.6, SR 3.8.4.7, and SR 3.8.4.8. ---------- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.4.1 SR 3.8.4.4 SR 3.8.4.7 SR 3.8.4.2 SR 3.8.4.5 SR 3.8.4.8 SR 3.8.4.3 SR 3.8.4.6	In accordance with applicable SRs

Revised SR 3.8.5.1 would state:

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	----------NOTE---------- The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3. ---------- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.4.1 SR 3.8.4.2 SR 3.8.4.3	In accordance with applicable SRs

Evaluation of TS 3.8.5, Current SR 3.8.5.1 (Revised), Change (3)

The current SR 3.8.5.1 would be revised by modifying the applicable SRs from SR 3.8.4.1 through SR 3.8.4.8 to SR 3.8.4.1 through SR 3.8.4.3.

As discussed in Sections 3.2.1.5 through 3.2.1.8 of this SE, (1) SRs 3.8.4.2, 3.8.4.3, 3.8.4.4, and 3.8.4.5 will be relocated from TS 3.8.4 to a licensee-controlled program; (2) SRs 3.8.4.6 and 3.8.4.7 will be revised and renumbered as SRs 3.8.4.2 and 3.8.4.3, respectively; and (3) SR 3.8.4.8 will be relocated to TS 3.8.6 and renumbered as SR 3.8.6.6. The NRC staff finds that the proposed list of applicable SRs 3.8.4.1 through 3.8.4.3 referenced in the revised SR 3.8.5.1 is consistent with the proposed changes to TS 3.8.4, and is, therefore, acceptable.

The current note in the current SR 3.8.5.1 allows the current SR 3.8.4.4, SR 3.8.4.6, SR 3.8.4.7, and SR 3.8.4.8 not to be performed. According to TS Bases for SR 3.8.5.1, the intent of the current note is to preclude requiring the operable DC sources (battery and

battery chargers) from being discharged below their capability to provide the required power supply or from being rendered inoperable during the performance of SRs for the battery charger capacity tests and the battery service test. Nevertheless, these SRs must still be capable of being met.

The current note would be revised by replacing SR 3.8.4.4, SR 3.8.4.6, SR 3.8.4.7, and SR 3.8.4.8 with SR 3.8.4.2 and SR 3.8.4.3. As discussed above, (1) SR 3.8.4.4 will be relocated from TS 3.8.4; (2) SRs 3.8.4.6 and 3.8.4.7 will be renumbered as SRs 3.8.4.2 and 3.8.4.3, respectively; and SR 3.8.4.8 will be relocated to TS 3.8.6 consistent with the proposed changes to TS 3.8.4.

The revised note in the revised SR 3.8.5.1 would not require the performance of the renumbered SR 3.8.4.2 (battery charger capacity test) and SR 3.8.4.3 (battery service test) in TS 3.8.5 (shutdown conditions). The renumbered SRs 3.8.4.2 and 3.8.4.3 may be performed during normal operation in TS 3.8.4 without affecting plant safety. Since the renumbered SRs 3.8.4.2 and 3.8.4.3 can be performed during operating conditions, the revised note will prevent requiring the operable DC sources from being discharged below their capability to provide the required power supply or from being rendered inoperable during the performance of these SRs at shutdown (TS 3.8.5). The NRC staff finds that the revised note for the revised SR 3.8.5.1 satisfies the intent of the current note and is acceptable.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.5.1 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met and is, therefore, acceptable.

3.2.3 TS 3.8.6, “Battery Parameters,” Changes

The licensee proposed replacing the battery specific gravity monitoring with the float current monitoring for determining the state of charge (OPERABILITY). The licensee also proposed revising the LCO, and existing TS 3.8.6 Conditions, Required Actions, SRs, deleting Table 3.8.6-1, and relocating some of the surveillances to the new TS 5.5.16, “Battery Monitoring and Maintenance Program.”

3.2.3.1 TS 3.8.6; Title (Revised); Change (1)

The proposed change would revise the title of TS 3.8.6 from “Battery Cell Parameters” to “Battery Parameters.” The TS Table of Contents page that includes TS 3.8.6 would be changed to align with the new title.

Evaluation of TS 3.8.6; Title (Revised); Change (1)

The NRC staff concludes that the proposed change is editorial in nature and is, therefore, acceptable.

3.2.3.2 TS 3.8.6, Table 3.8.6-1, "Battery Cell Parameter Requirements" (Deleted), Change (2)

The current TS Table 3.8.6-1, “Battery Cell Parameters Requirements,” specifies the requirements (Categories A, B, and C limits) for the battery cell parameters (electrolyte

level, float voltage, and specific gravity). The proposed change would delete TS Table 3.8.6-1 and relocate the table requirements to proposed new SRs in TS 3.8.6 and the new Battery Monitoring and Maintenance Program in TS 5.5.16.

Evaluation of Table 3.8.6-1 (deleted), Change (2)

The TS Table 3.8.6-1, Category A, defines the normal limits for each designated pilot cell; Category B defines the normal limits for each connected cell; and Category C defines the allowable limits for each connected cell.

The Categories A and B limits for battery electrolyte level, float voltage, and specific gravity represent appropriate monitoring levels and appropriate preventive maintenance levels for long-term battery quality and extended battery life. The Category C limits for battery float voltage and electrolyte level will be addressed in the proposed TS 3.8.6, new Conditions A (battery float voltage), and C (electrolyte level) (see Sections 3.2.3.6 and 3.2.3.8 of this SE for the NRC staff's evaluation of the proposed new TS 3.8.6 Conditions A and C, respectively). The Category C limits for specific gravity used for verifying battery state of charge will be replaced with float current monitoring in the proposed new SR 3.8.6.1 (battery float current) (see Section 3.2.3.13 of this SE for the NRC staff's evaluation of the proposed new SRs 3.8.6.1). In addition, the proposed new SRs 3.8.6.2, 3.8.6.3, and 3.8.6.5 will require monitoring of battery pilot cell float voltage, connected cell electrolyte level, and connected cell float voltage, respectively (see Sections 3.2.3.14, 3.2.3.15, and 3.2.3.17 of this SE for the NRC staff's evaluation of the proposed new SRs 3.8.6.2, 3.8.6.3, and 3.8.6.5, respectively).

The NRC staff finds the relocation of the Categories A, B, and C, limits to the Battery Monitoring and Maintenance Program acceptable because: (1) Categories A and B limits are maintenance levels, (2) Category C limits will be addressed in proposed new SRs and conditions and specific gravity measurement criteria are being replaced with float current monitoring, and (3) the licensee provided assurance that these battery parameter values will continue to be controlled in accordance with the program and actions to restore deficient values of any of the parameters will be implemented in accordance with the licensee's corrective action program.

Based on the above, the NRC staff concludes that the proposed elimination of TS Table 3.8.6-1 ensures the battery parameters (maintenance, testing, and monitoring) will be appropriately monitored and maintained in accordance with the new Battery Monitoring and Maintenance Program in TS 5.5.16 and the new requirements in TS 3.8.6. Therefore, the NRC staff finds that there is assurance that safe plant conditions will continue to be maintained, and as such, the proposed deletion of TS Table 3.8.6-1 is acceptable.

3.2.3.3 TS 3.8.6 Float Current Monitoring (Added to Replace Specific Gravity Measurement), Change (3)

The proposed change would replace requirements to measure specific gravity to determine the battery state of charge with requirements to monitor battery float current and would relocate requirements to obtain specific gravity readings to the proposed new Battery Monitoring and Maintenance Program specified in TS 5.5.16.

Evaluation of TS 3.8.6 Float Current Monitoring (Added to Replace Specific Gravity Measurement), Change (3)

Currently, battery cell-specific gravity verification is required by existing SRs 3.8.6.1 and 3.8.6.2 and TS 3.8.6 Condition A based on the Categories A, B, and C, values of current TS Table 3.8.6-1. The Category C specific gravity values are the allowable values for each battery connected cell.

The licensee proposed replacing the requirement for monitoring the specific gravity to determine the battery state of charge with the requirement for monitoring the battery's float current. Float current monitoring is recognized by the industry as being a more direct method for determining battery state of charge than specific gravity monitoring. In Enclosure B of its April 24, 2020, letter, the licensee provided letters from the battery manufacturers dated October 6, 2017, from C&D Technologies, Inc, and October 20, 2017, from the EnerSys, verifying the acceptability of using float current measurement as a reliable indication of the PNPP Class 1E batteries' state of charge for the life of the batteries.

The licensee proposed a float current of 2 amps for the batteries. In Section 2.2, “Verifications and Required Updated Safety Analysis Report Changes,” of the April 24, 2020, submittal, the licensee stated that the PNPP USAR will be revised to include, “How a 15 percent design margin for the batteries corresponds to a 2-amp float current value indicating that the battery is 92 percent charged for Division 1, 96 percent charged for Division 2, and 95 percent charged for Division 3."

The NRC staff requested the licensee to explain how maintaining the 15 percent design margin for the batteries will ensure that the batteries are fully charged (i.e., capable of performing their design functions). In its letter dated November 19, 2020, in response to the staff request RAI-EEOB-01, the licensee stated that the Divisions 1, 2, and 3 batteries are sized with 15 percent design margin. The licensee provided a revised letter from the C&D battery manufacturer dated October 30, 2020, that indicated 95 percent charge is returned to the KCR-7 battery (Division 3 battery) once the charge current reaches 2 amps and the battery cells are within 2.20 and 2.25 volts per cell (Vpc). The C&D letter also stated that if the licensee had at least 5 percent margin to meet your duty cycle, then 2 amps could be used as criteria for returning the KCR-7 battery to service.

Furthermore, the EnerSys battery manufacturer letter dated October 20, 2017, also indicated that when the charging float current is less than or equal to 2 amps, 96 percent capacity is returned to the 60-cell battery (Division 2 battery) at 2.25 Vpc and 92 percent capacity is returned to the 61-cell battery (Division 1 battery) at 2.21 Vpc. The licensee further stated that the Divisions 1, 2, and 3, batteries at the above-mentioned percent capacities will still have the ability to supply all required design basis loads for the 2-hour event. The NRC staff noted that the above-mentioned percent capacities returned to the Divisions 1, 2, and 3 batteries at 2-amp float current provided by the battery manufacturers were obtained without the PNPP 15 percent battery design margins. Thus, maintaining the 15 percent design margin in the PNPP battery sizing calculation will ensure that 100 percent battery capacity is available once the charging current is 2 amps or less for these batteries and as such, the batteries can perform their safety-related functions during a design-basis event.

The NRC staff finds that: (1) the licensee's verification of the battery manufacturer specifications regarding the use of the float current measurement to determine the batteries' state of charge, and (2) the addition of 15 percent design margin to the batteries' sizing to

ensure that the batteries can perform their safety functions (as will be described in the PNPP USAR) provide adequate assurance that replacing the specific gravity measurements with the float current monitoring will not impact the ability to accurately determine the operability of the batteries. The NRC staff concludes that the proposed float current monitoring is a suitable replacement for the specific gravity monitoring when used to determine the state of charge of the batteries.

The requirements for monitoring the float current are provided in the proposed new SR 3.8.6.1 (see Section 3.2.3.13 of this SE for the NRC staff's evaluation of the proposed new SR 3.8.6.1). In Enclosure A of the April 24, 2020, submittal, the licensee stated that the measuring equipment that will be used to monitor float current under the proposed new SR 3.8.6.1 will have the necessary accuracy and capability to measure electrical currents in the expected range.

Specific gravity monitoring is appropriate for troubleshooting activities and for periodic trending of the battery's state of health. The licensee will continue taking and trending specific gravity measurements during maintenance and testing activities prior to performing a battery service test or battery performance discharge test in accordance with the new proposed Battery Monitoring and Maintenance Program in TS 5.5.16.

Based on the above, the NRC staff concludes that the proposed float current monitoring meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components are maintained and that the LCOs will be met, and is, therefore, acceptable.

3.2.3.4 TS 3.8.6, Current LCO 3.8.6 (Revised), Change (4)

Current LCO 3.8.6, states:

> LCO 3.8.6 Battery cell parameters for the Division 1, 2 and 3 batteries shall be within limits.

Revised LCO 3.8.6, would state:

> LCO 3.8.6 Battery parameters for the Division 1, 2 and 3 electrical power subsystem batteries shall be within limits.

Evaluation of TS 3.8.6, Current LCO 3.8.6 (Revised), Change (4)

Current LCO 3.8.6 requires that the battery cell parameters for Division 1, 2, and 3, batteries be within limits. The LCO 3.8.6 would be revised by adding the term "electrical power subsystem" and by deleting the term "cell". The NRC staff finds that adding the term "electrical power subsystem" to the LCO 3.8.6 statement does not change the current requirements of LCO 3.8.6, is editorial in nature, and is, therefore, acceptable. In addition, since the term "cell" will be deleted from TS 3.8.6, the NRC staff finds that deleting the term "cell" from LCO 3.8.6 is consistent with the proposed changes to TS 3.8.6 and is, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed revised LCOs 3.8.6 is acceptable and will continue to meet the requirements of 10 CFR 50.36(c)(2) since the

proposed changes are editorial in nature and do not change the current requirements of the LCO 3.8.6.

3.2.3.5 TS 3.8.6, Current Condition A (Deleted), Change (5)

The proposed change would delete current Condition A.

Current Condition A with associated Required Action and CT states:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more batteries with one or more battery cell parameters not within Table 3.8.6-1 Category A or B limits.	A.1 Verify pilot cell's electrolyte level and float voltage meet Table 3.8.6-1 Category C limits.	1 hours
	AND	
	A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits	24 hours AND Once per 7 days thereafter
	AND	
	A.3 Restore battery cell parameters to Table 3.8.6-1 Category A and B limits.	31 days

Evaluation of TS 3.8.6, Current Condition A (deleted), Change (5)

The proposed change would delete current Condition A with its associated required actions and CTs. The current Condition A references the battery parameter limits in the Table 3.8.6-1. As discussed in Section 3.2.3.2 of this SE, Table 3.8.6-1 will be deleted from TS 3.8.6. The NRC staff finds that the removal of the current Condition A with its associated required actions and CTs from TS 3.8.6 is consistent with the elimination of TS Table 3.8.6 and is, therefore, acceptable.

3.2.3.6 TS 3.8.6, New Condition A (Added), Change (6)

The proposed change would add new Condition A as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two batteries on one subsystem with one or more battery cell float voltage ≤ 2.07 V.	A.1 Perform SR 3.8.4.1. AND A.2 Perform SR 3.8.6.1. AND A.3 Restore affected cell voltage > 2.07 V.	2 hours 2 hours 24 hours

Evaluation of TS 3.8.6 New Condition A (added), Change (6)

The proposed new TS 3.8.6 Condition A would address the required vital battery(ies) in one subsystem with cell(s) float voltage less than or equal to 2.07 V. In its November 19, 2020, letter, the licensee stated in response to the NRC staff request for additional information (RAI)-EEOB-04 that the current Table 8.3.6-1 Category 'C' limit for float voltage is greater than 2.07 V per individual cell, which would equate to an open circuit voltage of 126.27 VDC for Division 1 batteries and 124.2 VDC for Division 2 and 3 batteries. Thus, the NRC staff finds that the use of the greater than 2.07 V limit as part of TSTF-500 is consistent with the existing PNPP TS open circuit cell voltage.

The proposed new Required Actions A.1 and A.2 would require the licensee to verify that, within 2 hours, (a) the battery terminal voltage is greater than or equal to the minimum established float voltage (revised SR 3.8.4.1), and (b) each battery's float current is less than or equal to 2 amps (new SR 3.8.6.1), respectively (see Sections 3.2.1.4 and 3.2.3.13 of this SE for the NRC staff's evaluation of the proposed revised SR 3.8.4.1 and new SR 3.8.6.1, respectively). These actions will ensure that there is still enough battery capacity to perform the intended function so that the affected battery will not be required to be considered inoperable solely because of one or more cells float voltage less than or equal to 2.07 V. Therefore, new Required Action A.3 would allow continued operation for a limited period up to 24 hours for restoring the affected cell(s) voltage to greater than 2.07 V.

Because these actions will ensure that there is still enough battery capacity to perform the intended function, the NRC staff finds that the proposed Required Actions A.1, A.2, and A.3 with the associated CTs are reasonable and are acceptable.

Based on the above, the NRC staff concludes that the proposed TS 3.8.6 new Condition A, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 and is acceptable.

3.2.3.7 TS 3.8.6, New Condition B (Added), Change (7)

The proposed change would add new Condition B as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or two batteries on one subsystem with float current > 2 amps	B.1 Perform SR 3.8.4.1. AND B.2 Restore battery float current to ≤ 2 Amps	2 hours 12 hours

Evaluation of TS 3.8.6 New Condition B (added), Change (7)

The proposed new Condition B would address the required battery(ies) in one subsystem having float current greater than 2 amps. A battery float current greater than 2 amps indicates that a partial discharge of the battery has occurred. The discharge in the battery may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition, reflecting some loss of capacity.

The proposed new Required Action B.1 would verify within 2 hours that the required battery terminal voltage is greater than or equal to the minimum established float voltage (revised SR 3.8.4.1), thus confirming battery charger operability. If the terminal voltage is satisfactory, the proposed new Required Action B.2 would ensure that the affected battery float current is restored to less than 2 amps within 12 hours. This would confirm that the affected battery had been fully recharged from any discharge that might have occurred. As discussed in Section 3.2.1.1 of this SE, the Division 1, 2, and 3, batteries would be fully recharged within 12 hours to less than or equal to 2 amps (see Section 3.2.3.3 of this SE for the NRC staff's evaluation of the 2-amp float current) by the reserve chargers (which have the same capacities as the normal chargers) after being discharged for the 2-hour allowed time to place a reserve battery charger on the battery. Restoring the affected required vital battery to its fully charged state provides the assurance that the battery has enough capacity to perform its safety function.

If the battery's terminal voltage is found to be less than the minimum established float voltage, it indicates that the vital battery charger is either inoperable or is operating in the current limit mode. If the vital battery charger is operating in the current limit mode for 2 hours, it indicates that the vital battery has been substantially discharged and likely cannot perform its required design functions. In this case, the proposed new TS 3.8.6, Condition F, would be entered.

Based on the above, the NRC staff concludes that the proposed TS 3.8.6 new Condition B, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 and is acceptable.

3.2.3.8 TS 3.8.6, New Condition C (Added), Change (8)

The proposed change would add new Condition C as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
----------NOTE---------- Required Action C.2 shall be completed if electrolyte level was below the top of the plates. ----------	----------NOTE---------- Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of the plates. ----------	
C. One or two batteries on one subsystem with one or more cells electrolyte levels less than minimum established design limits.	C.1 Restore electrolyte level to above top of plate. AND C.2 Verify no evidence of leakage. AND C.3 Restore electrolyte level to greater than or equal to minimum established design limits	8 hours 12 hours 31 days

Evaluation of TS 3.8.6 New Condition C (added), Change (8)

The new Condition C would address the required battery(ies) on one subsystem having cell(s) with an electrolyte level less than the minimum established design limits.

If the electrolyte level is above the top of the plates but below the minimum limit (i.e., minimum level indication mark on the battery cell jar), the battery should still have enough capacity to perform its intended safety function and is not considered inoperable. The new Required Action C.3 would restore the affected battery electrolyte level to greater than or equal to the minimum established design limits within 31 days.

If the electrolyte level is below the top of the plates there is potential for plate degradation. The proposed new Required Action C.1 would ensure that the cell electrolyte level is restored to above the top of the plates (current Table 3.8.6-1 Category C limit for electrolyte level) within 8 hours, and the proposed new Required Action C.2 would ensure that the cause of the loss of electrolyte level is not due to a leak in the battery cell jar within 12 hours. These actions would be modified by a note to indicate that they would be applicable only if the electrolyte level is below the top of the plates. Additionally, provisions in the proposed new Battery Monitoring and Maintenance Program specified in TS 5.5.16 would provide actions to equalize and test the battery cells that have been discovered with an electrolyte level below the top of the plates. With one or more batteries in one subsystem with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains enough capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. The new Required Action C.3 would restore the affected battery electrolyte level to greater than or equal

to the minimum established design limits within 31 days. For these reasons, the NRC staff finds that the proposed new Required Actions C.1, C.2, and C.3 with associated CTs will ensure that the batteries will be restored to an operable condition in a timely manner and are, therefore, acceptable.

In Enclosure A of the April 24, 2020, submittal, the licensee stated the PNPP USAR will be revised to include the minimum established design limit for battery cells electrolyte level. Because future changes to this value would be subject to the requirements of 10 CFR 50.59, the NRC staff finds that there is reasonable assurance that the value of the limit will be appropriately maintained by the licensee to accurately reflect the design of the batteries.

Based on the above discussion, the NRC staff concludes that the proposed TS 3.8.6 new Condition C with its associated required action and CT provides acceptable remedial actions that provide reasonable assurance of public health and safety.

Based on the above, the NRC staff concludes that the proposed TS 3.8.6 new Condition C, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 and is acceptable.

3.2.3.9 TS 3.8.6, New Condition D (added) Change (9)

The proposed change would add new Condition D as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One or two batteries on one subsystem with pilot cell electrolyte temperature less than minimum established decision limits	D.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits	12 hours

Evaluation of TS 3.8.6, New Condition D (Added), Change (9)

The proposed new Condition D would apply to one or two battery(ies) on one subsystem having a pilot cell electrolyte temperature less than the minimum established design limits.

Batteries are designed with margins to account for factors that affect battery performance. As described in Section 8.3 of the PNPP USAR, the battery capacity design requirements consider the effects of aging. In Enclosure A of the April 24, 2020, submittal, the licensee stated the PNPP USAR will be revised to include (1) how the batteries are sized with correction margins that include temperature and aging and (2) how a 15 percent design margin for the batteries corresponds to a 2 amp float current value indicating that the battery is 92 percent charged for Division 1, 96 percent charged for Division 2, and 95 percent charged for Division 3. Because future changes to these values would be subject to the requirements of 10 CFR 50.59, the NRC staff finds that there is reasonable assurance that the values of the margins will be appropriately maintained by the licensee to accurately reflect the design of the batteries.

Furthermore, in its letter dated September 29, 2020, the licensee discussed the monitoring of the battery room temperatures and actions to maintain and restore battery room temperatures within design limits. The licensee stated, “At PNPP, battery room temperatures are monitored and recorded every 12 hours by the control room operator during equipment rounds. At 74 (Fahrenheit (°F), which is 2 °F above the minimum, action is initiated. Restoration of temperature would include actions such as adjusting thermostats, verifying proper ventilation operation, and energizing duct heaters where installed.”

Based on these above considerations (i.e., battery temperature margins and room temperature monitoring) and the fact that batteries have very large thermal inertia, the NRC staff finds that a battery room temperature excursion will likely be corrected by the licensee prior to the battery electrolyte reaching its maximum or minimum design temperature. Thus, the NRC staff concludes that the pilot cell temperature is an accurate representation of the temperature of the batteries because: (1) batteries have very large thermal inertia; (2) batteries are designed with margins (i.e., temperature, aging, and design); and (3) the licensee monitors and corrects low battery room temperatures.

If pilot cell electrolyte temperature for battery(ies) on one DC subsystem falls below the minimum established design temperature, the proposed new Required Action D.1 would restore the battery pilot cell temperature to greater than or equal to the minimum established design limits within 12 hours. Since the temperature of the entire battery is represented by the pilot cell temperature, the 12-hour CT provides adequate time to restore the battery electrolyte temperature within established limits. Therefore, the NRC staff finds that the Required Action D.1 and associated 12-hour CT are acceptable.

In Enclosure A of the April 24, 2020, submittal, the licensee stated the PNPP USAR will be revised to include the minimum established design limit for battery electrolyte temperature. Because future changes to these values would be subject to the requirements of 10 CFR 50.59, the NRC staff finds that there is reasonable assurance that the numerical value will be appropriately maintained by the licensee to accurately reflect the design of the battery subsystems.

Based on the above, the NRC staff concludes that the proposed TS 3.8.6 new Condition D with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 and is acceptable.

3.2.3.10 TS 3.8.6, New Condition E (added) Change (10)

The proposed change would add new Condition E as follows:

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One or more batteries in redundant subsystems with battery parameters not within limits	D.1 Restore battery parameters for batteries to one subsystem to within limits	2 hours

Evaluation of TS 3.8.6, New Condition E (Added), Change (10)

The proposed new Condition E would address the condition where one or more batteries in redundant subsystems are found with battery parameters not within limits. If this condition exists, there is not sufficient assurance that the batteries can perform their intended safety functions. With redundant batteries involved, loss of safety function is possible for multiple systems that depend upon the batteries.

The proposed new Required Action E.1 would restore the parameters for the affected battery in one subsystem within limits within 2 hours. Considering the potential for loss of function of components (i.e., engineered safety features, inverter(s)) that depend on the redundant batteries, the NRC staff finds the relatively short duration of 2 hours to resolve the condition reasonable and, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed TS 3.8.6 new Condition E, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 and is acceptable.

3.2.3.11 TS 3.8.6, Current Condition B (revised and renumbered as Condition F), Change (11)

Current Condition B with associated Required Action and CT state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met. OR One or more batteries with average electrolyte temperature of the representative cells < 72 °F. OR One or more batteries with one or more battery cell parameters not within Table 3.8.6-1 Category C limits.	B.1 Declare associated battery inoperable.	Immediately

Revised and renumbered Condition F with associated Required Action and CT would state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. OR One or two batteries on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 2 amps.	F.1 Declare associated battery inoperable.	Immediately

Evaluation of TS 3.8.6 Current Condition B (Revised and renumbered as Condition F), Change (11)

Current Condition B describes conditions of battery inoperability. The second entry condition (i.e., one or more batteries with average electrolyte temperature of the representative cells< 72 °F) would be deleted. The licensee proposed to monitor pilot cell electrolyte temperature (proposed new SR 3.8.6.4) instead of the average electrolyte temperature of representative cells (current SR 3.8.6.3). The out-of-limit condition for pilot cell electrolyte temperature will be covered in the proposed new TS 3.8.6, Condition D. The third entry condition (i.e., one or more batteries with one or more battery cell parameters not within Table 3.8.6-1 Category C limits) would also be deleted. Deleting the third entry condition is consistent with the elimination of TS Table 3.8.6-1 from TS 3.8.6 as discussed in Section 3.2.3.2 of this SE. The NRC staff finds that the deletion of the second entry and third entry conditions of current Condition B is consistent with the proposed changes to the TS and, therefore, acceptable.

The revised Condition B would be renumbered as Condition F. Current Required Action B.1 would be renumbered as Required Action F.1 with the same CT. The NRC staff finds that the renumbering of Condition B and Required Action B.1 as Condition F and Required Action F.1, respectively, is editorial in nature, and is, therefore, acceptable.

The revised and renumbered Condition F would apply when battery parameters fall outside the allowance of the required actions for Conditions A, B, C, D, or E. Under this condition, it is assumed that there is insufficient capacity to supply the maximum expected load requirements. The revised and renumbered Condition F would also address one new alternate condition for one or two battery(ies) on one subsystem found with one or more battery cells having a float voltage less than or equal to 2.07 V and a float current greater than 2 amps. In these cases, the affected required battery(ies) may not have sufficient capacity to perform their intended design functions.

The renumbered Required Action F.1 for either of the above entry conditions would declare the associated battery inoperable with a CT of “immediately.” Since the battery capacity may be insufficient to supply the required loads in the above conditions specified for the revised and renumbered Condition F, the NRC staff finds that the Required Action F.1 and

associated CT for the revised and renumbered Condition F are reasonable and consistent with TSTF-500, Revision 2, and are, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed TS 3.8.6 revised and renumbered Condition F, with its associated required actions and CTs, provides acceptable remedial actions as allowed by 10 CFR 50.36 and is acceptable.

3.2.3.12 TS 3.8.6 Current SRs 3.8.6.1, 3.8.6.2 and 3.8.6.3 (Deleted) Change (12)

Current SRs 3.8.6.1, 3.8.6.2 and 3.8.6.3 state:

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	Verify battery cell parameters meet Table 3.8.6-1 Category A limits	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.2	Verify battery cell parameters meet Table 3.8.6-1 Category B limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.3	Verify average electrolyte temperature of representative cells is > 72°F.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.6 Current SRs 3.8.6.1, 3.8.6.2 and 3.8.6.3 (Deleted), Change (12)

The TS Table 3.8.6-1 Categories A and B limits, as referenced in current SRs 3.8.6.1 and 3.8.6.2, no longer represent conditions in which the batteries cannot perform their safety functions. As discussed in Section 3.2.3.2 of this SE, the Table 3.8.6-1 Categories A and B limits will be relocated to the Battery Monitoring and Maintenance Program in TS 5.5.16 Since the Table 3.8.6-1 Categories A and B limits referenced in the current SRs 3.8.6.1 and 3.8.6.2 will be eliminated from TS 3.8.6, the NRC staff finds that the elimination of current SRs 3.8.6.1 and 3.8.6.2 is acceptable.

The current SR 3.8.6.3 requires the monitoring of the battery's average cell electrolyte temperature. The licensee proposed to replace the monitoring of the battery average cells electrolyte temperature with the monitoring of the pilot cell electrolyte temperature in the proposed new SR 3.8.6.4. Because the battery cell temperature will be monitored in the proposed new SR 3.8.6.4, the NRC staff finds the elimination of the current SR 3.8.6.3 is acceptable.

Based on the above, the NRC staff concludes that the proposed deletion of SRs 3.8.6.1, 3.8.6.2, and 3.8.6.3 is acceptable because the change is consistent with the proposed

changes to TS 3.8.6.

3.2.3.13 TS 3.8.6, New SR 3.8.6.1, (Added), Change (13)

The proposed change would add TS 3.8.6, SR 3.8.6.1 as follows:

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	----------NOTE---------- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. ---------- Verify each battery float current is ≤ 2 amps.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.6, New SR 3.8.6.1 (Added), Change (13)

In accordance with Surveillance Frequency Control Program (SFCP), the proposed new SR 3.8.6.1 would require verification that the float current for each battery is less than or equal to 2 amps.

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 discussed in Section 3.2.3.3 of this SE, the use of float current to determine the state of charge of the battery is consistent with the recommendations of the battery manufacturer.

The proposed new SR 3.8.6.1 would be modified by a note that would allow SR 3.8.6.1 not to be met when the battery terminal voltage is less than the minimum established float voltage of the revised SR 3.8.4.1. When this minimum established float voltage is not maintained at the vital battery's terminals, it likely indicates issues with the vital battery and/or the associated battery charger. In this case, the required actions for the new TS 3.8.4 Conditions A and/or the revised TS 3.8.4 Condition B will provide the necessary and appropriate verifications of the vital battery condition. Furthermore, the float current limit is established based on the nominal float voltage value and is not directly applicable when this minimum established float voltage is not maintained.

The licensee proposed to specify the surveillance frequency for new SR 3.8.6.1 in the SFCP required by TS 5.5.15, for consistency with the PNPP adoption of TSTF-425, Revision 3, “Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b” (ADAMS Accession No. ML090850642). On February 23, 2016, the NRC issued Amendment No. 171 for PNPP adoption of TSTF-425, Revision 3 (ADAMS Accession No. ML15307A349). Thus, the current PNPP TS have incorporated TSTF-425, which

allows the licensee to relocate most periodic frequencies of TS surveillances and their bases to the SFCP required by TS 5.5.15. According to TSTF-425, all frequencies can be relocated to the SFCP with some exceptions and the TS Bases of the affected surveillances are to be revised to state that the frequency is set in accordance with the SFCP. The surveillance frequency for new SR 3.8.6.1 is for verification of float current. This frequency does not reference other approved programs, is not event-driven, and is not related to a specific condition of the battery. The TS Bases for the new SR 3.8.6.1 are revised to state that the surveillance frequency is controlled under the SFCP. Furthermore, as stated in TS 5.5.15, changes to the frequencies listed in the SFCP shall be made in accordance with Nuclear Energy Institute (NEI) 04-10, Revision 1, "Risk-Informed Technical Specifications Initiative 5b, Risk-Informed Method for Control of Surveillance Frequencies," April 2007. Based on the above information, the NRC staff finds that controlling the new SR 3.8.6.1 frequency under the SFCP is consistent with TSTF-425, and the SFCP provides assurance that the frequency will effectively be changed in accordance with NEI 04-10.

Based on the above, the NRC staff concludes that the proposed new SR 3.8.6.1 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met, and is, therefore, acceptable.

3.2.3.14 TS 3.8.6, New SR 3.8.6.2, (Added), Change (14)

The proposed change would add TS 3.8.6, SR 3.8.6.2 as follows:

SURVEILLANCE		FREQUENCY
SR 3.8.6.2	Verify each battery Pilot cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.6, New SR 3.8.6.2 (Added), Change (14)

The proposed new SR 3.8.6.2 would require verifying each battery pilot cell float voltage is greater than 2.07 V in accordance with the SFCP.

The NRC staff requested the licensee to discuss the basis for the PNPP battery cell float voltage limit of "greater than 2.07 Volt" compared to the TSTF-500 TS 3.8.6 battery cell float voltage limit, which is "greater than or equal to 2.07 Volt." In its September 29, 2020, response letter to RAI-EEOB-06, the licensee stated that the cell float voltage of "greater than 2.07 V" is consistent with the current TS Table 3.8.6-1 Category C limit for connected cells float voltage. The licensee further clarified that the PNPP batteries are designed and sized to support all design basis loads and duty cycle whenever battery Category C limits (including cell float voltage greater than 2.07 V) are as defined in the current TS Table 3.8.6-1. Thus, the cell voltage value of 2.07 V represents the point at which battery operability cannot be assured. The pilot cell float voltage limit must be greater than 2.07 V to reflect the operability limit for the batteries. The licensee proposed to select the battery pilot cell based on the lowest voltage cell in the battery in accordance with the proposed new Battery Monitoring and Maintenance Program in TS 5.5.16 (see Section 3.2.4.1 of this SE for the NRC staff's evaluation of the

proposed new program). This ensures that the voltages of the other cells in the batteries are above the pilot cell voltage.

Furthermore, 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 132 V at the battery terminals, or 2.20 Vpc for the diesel generator and station service 60-cell batteries. This provides adequate over-potential, which limits the formation of lead sulfate and self-discharge, which could eventually render the battery inoperable. In Attachment 4 of the April 24, 2020, submittal, the licensee stated that optimal long-term battery performance is obtained by maintaining a battery float voltage between 2.20 to 2.25 Vpc. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in the proposed new Battery Monitoring and Maintenance Program in TS 5.5.16. The program includes actions to: (1) restore battery cells with float voltage less than 2.13 V, and (2) verify that the remaining cells are greater than or equal to 2.13 V when a cell or cells have been found to be less than 2.13 V. The program would also require the selection of a battery pilot cell based on the lowest voltage cell in the battery. This will ensure that when the pilot cell float voltage is greater than 2.07 V, all battery cells will be above 2.07 V. With all battery cell float voltages above 2.07 V, there is adequate assurance that the battery terminal voltage is at an acceptable threshold for establishing battery operability. Based on the above information, the NRC staff finds that when all battery cells are above 2.07 V, there is adequate assurance that that the battery's terminal voltage is at an acceptable threshold for establishing battery operability.

The licensee proposed to specify the surveillance frequency for new SR 3.8.6.2 in the SFCP required by TS 5.5.15 for consistency with the PNPP adoption of TSTF-425, Revision 3. The surveillance frequency for new SR 3.8.6.2 applies to the verification of pilot cell float voltage. In accordance with TSTF-425, the frequency for new SR 3.8.6.2 does not reference other approved programs, is not event-driven, and is not related to a specific condition of the battery. Also, the TS Bases for new SR 3.8.6.2 will state that the surveillance frequency is controlled under the SFCP. The NRC staff finds that controlling the new SR 3.8.6.2 frequency under the SFCP is acceptable since this change is consistent with TSTF-425, Revision 3.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.6.2 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met, and is, therefore, acceptable.

3.2.3.15 TS 3.8.6, New SR 3.8.6.3, (Added), Change (15)

The proposed change would add TS 3.8.6, SR 3.8.6.3 as follows:

SURVEILLANCE		FREQUENCY
SR 3.8.6.3	Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.6, New SR 3.8.6.3 (Added), Change (15)

The proposed new SR 3.8.6.3 would require verifying each required battery and each battery connected cell electrolyte level in accordance with the Surveillance Frequency Control Program.

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. In Enclosure A, Section 2.2 of the April 24, 2020, submittal, the licensee stated that the monitoring of the battery electrolyte level will be relocated to the Battery Monitoring and Maintenance Program in TS 5.5.16. This relocation will allow flexibility to monitor and control this limit at values directly related to the battery ability to perform its required safety function. The licensee also stated that the PNPP USAR will be updated to include the minimum established design limit for battery electrolyte level. This provides reasonable assurance that the numerical value will be appropriately maintained by the licensee to accurately reflect the design of the batteries.

The licensee proposed to specify the surveillance frequency for new SR 3.8.6.3 in the SFCP required by TS 5.5.15 for consistency with the PNPP adoption of TSTF-425, Revision 3. The surveillance frequency for new SR 3.8.6.3 applies to the verification of connected cell electrolyte level. In accordance with TSTF-425, the frequency for new SR 3.8.6.3 does not reference other approved programs, is not event-driven, and is not related to a specific condition of the battery. Also, the TS Bases for new SR 3.8.6.3 will state that the surveillance frequency is controlled under the SFCP. The NRC staff finds that controlling the new SR 3.8.6.3 frequency under the SFCP is acceptable since this change is consistent with TSTF-425, Revision 3.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.6.3 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met and is, therefore, acceptable.

3.2.3.16 TS 3.8.6, New SR 3.8.6.4, (Added), Change (16)

The proposed change would add TS 3.8.6, SR 3.8.6.4 as follows:

SURVEILLANCE		FREQUENCY
SR 3.8.6.4	Verify each required battery and each battery pilot cell temperature is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.6, New SR 3.8.6.4 (Added), Change (16)

Currently, the licensee monitors battery average cell electrolyte temperature (current SR 3.8.6.3) instead of battery pilot cell temperature (proposed new SR 3.8.6.4). In order to use the battery pilot cell temperature instead of the battery average cell temperature, temperature must be used as a criterion when selecting a pilot cell. However, if it can be

shown that the maximum temperature deviation across the battery does not exceed the maximum of 5 °F (as recommended by IEEE Std. 450-2002), then temperature is not a critical parameter and does not have to be considered when selecting pilot cells. The NRC staff requested the licensee to discuss the selection of the battery pilot cell based on temperature.

In its September 29, 2020, response letter, the licensee stated that historical data dating back to 2013 was reviewed for all PNPP divisional Class 1E batteries at PNPP and no battery cell temperature was found to deviate more than 5 °F. The licensee further stated that the selection of the pilot cell is on a rotating basis at PNPP and not based on individual cell temperature. The NRC staff finds that since the maximum temperature variations across the batteries do not exceed 5°F, temperature is not a critical parameter and does not have to be considered when selecting battery pilot cells.

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 and is adequate to ensure that the minimum electrolyte temperature is maintained. In addition, depending on the available excess capacity of the associated battery, the minimum temperature necessary to support operability of the battery can vary. In Enclosure A, Section 2.2, of the April 24, 2020, submittal, the licensee stated that the monitoring of the battery cell temperature will be relocated to the proposed new Battery Monitoring and Maintenance Program in TS 5.5.16. This relocation will allow flexibility to monitor and control this limit at values directly related to the battery ability to perform its intended function.

The licensee proposed to specify the surveillance frequency for new SR 3.8.6.4 in the SFCP required by TS 5.5.15 for consistency with the PNPP adoption of TSTF-425, Revision 3. The surveillance frequency for new SR 3.8.6.4 applies to the verification of pilot cell temperature. In accordance with TSTF-425, the frequency for new SR 3.8.6.4 does not reference other approved programs, is not event-driven, and is not related to a specific condition of the battery. Also, the TS Bases for new SR 3.8.6.4 will state that the surveillance frequency is controlled under the SFCP. The NRC staff finds that controlling the new SR 3.8.6.4 frequency under the SFCP is acceptable since this change is consistent with TSTF-425, Revision 3.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.6.4 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met and is, therefore, acceptable.

3.2.3.17 TS 3.8.6, New SR 3.8.6.5, (Added), Change (17)

The proposed change would add TS 3.8.6, SR 3.8.6.5 as follows:

SURVEILLANCE		FREQUENCY
SR 3.8.6.5	Verify each battery connected cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program

Evaluation of TS 3.8.6, New SR 3.8.6.5 (Added), Change (17)

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 135 V at the battery terminals or 2.25 Vpc for a 60-cell battery and 2.21 Vpc for a 61-cell battery. This provides adequate over-potential, which limits the formation of lead sulfate and self-discharge, which could eventually render the battery inoperable. In Attachment 4 of the April 24, 2020, submittal, the licensee stated that optimal long-term battery performance is obtained by maintaining a battery float voltage between 2.20 to 2.25 Vpc. Float voltages in this range or less, but greater than 2.07 Vpc would be addressed in TS 5.5.16. The program would include: (1) actions to restore battery cells with float voltage less than 2.13 V, and (2) actions to verify that the remaining cells are greater than or equal to 2.13 V when a cell or cells have been found to be less than 2.13 V. With all battery cells' float voltages above 2.07 V, there is adequate assurance that the battery's terminal voltage is at an acceptable threshold for establishing battery operability. Furthermore, in Enclosure A of the April 24, 2020, submittal, the licensee stated that the PNPP USAR will be revised to include how 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. Because future changes to this value would be subject to the requirements of 10 CFR 50.59, the NRC staff finds that there is reasonable assurance that the numerical value of the battery's minimum float voltage will be appropriately maintained by the licensee to accurately reflect the design of the batteries.

The licensee proposed to specify the surveillance frequency for new SR 3.8.6.5 in the SFCP required by TS 5.5.15 for consistency with the PNPP adoption of TSTF-425, Revision 3. The surveillance frequency for new SR 3.8.6.5 applies to the verification of connected cell float voltage. In accordance with TSTF-425, the frequency for new SR 3.8.6.5 does not reference other approved programs, is not event-driven, and is not related to a specific condition of the battery. Also, the TS Bases for new SR 3.8.6.5 will state that the surveillance frequency is controlled under the SFCP. The NRC staff finds that controlling the new SR 3.8.6.5 frequency under the SFCP is acceptable since this change is consistent with TSTF-425, Revision 3.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.6.5 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met, and is, therefore, acceptable.

3.2.1.18 TS 3.8.6, New SR 3.8.6.6 (Relocated – Current SR 3.8.4.8), Change (18)

The proposed change would add TS 3.8.6, SR 3.8.6.6 as follows:

SURVEILLANCE		FREQUENCY
SR 3.8.6.6	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.	In accordance with the Surveillance Frequency Control Program <u>AND</u> 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating <u>AND</u> 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

<u>Evaluation of TS 3.8.6, New (Relocated SR 3.8.6.6 (Relocated - Current SR 3.8.4.8), Change (18)</u>

The licensee proposed to relocate current SR 3.8.4.8 from TS 3.8.4 to TS 3.8.6 and renumber it as SR 3.8.6.6.

The current SR 3.8.4.8 is a battery capacity test with three surveillance frequencies, which depend on the battery's expected life, degradation, and capacity. These frequencies are based on the qualified life (typically 20 years) and known historical performance characteristics for vented lead-acid batteries as discussed in the IEEE Std. 450-2002. The proposed new SR 3.8.6.6 would verify battery capacity similar to the current SR 3.8.4.8.

Based on its review, the NRC staff finds that the surveillance frequencies are: (1) appropriate given the condition of the battery, (2) allow sufficient time for corrective actions to be taken, and (3) are consistent with the safety significance of safety-related batteries. Further, the NRC staff finds that the proposed new SR 3.8.6.6 is consistent with current SR 3.8.4.8 and is, therefore, acceptable.

Based on the above, the NRC staff concludes that the proposed revised SR 3.8.6.6 meets the 10 CFR 50.36(c)(3) requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met and is, therefore, acceptable.

3.2.4 TS 5.5.19, Battery Monitoring and Maintenance Program

The proposed change would add a new Battery Monitoring and Maintenance Program as TS Section 5.5.16.

New TS 5.5.16 would state:

5.5.16 Battery Monitoring and Maintenance Program

This Program provides controls for battery restoration and maintenance. The program shall be in accordance with 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 Regulatory Guide 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.

Evaluation of TS 5.5.16; New Battery Monitoring and Maintenance Program (Added)

A new program is being proposed for Section 5.5 of the Programs and Manuals for the maintenance and monitoring of station batteries. The items proposed to be relocated will be contained within this program "Battery Monitoring Maintenance Program." The proposed new Battery Maintenance and Monitoring Program would be in accordance with IEEE Std. 450-2002, as endorsed by RG 1.129, Revision 2. RG 1.129, Revision 2, provides guidance with respect to the maintenance, testing, and replacement of vented lead-acid storage batteries in nuclear power plants. The exceptions to RG 1.129, Revision 2, represent reasonable technical approaches and are appropriate for applying the RG provisions to the proposed TS requirements for operating plants.

In Enclosure A, Section 2.2, of the April 24, 2020, submittal, the licensee stated that the 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 the proposed new Battery Monitoring and Maintenance Program. The 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.

TS 5.4, "Procedures," requires written procedures to be established, implemented, and maintained for the proposed new Battery Monitoring and Maintenance Program in TS 5.5.16. The 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. 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 NRC staff finds that the proposed new Battery Monitoring and Maintenance Program is consistent with TSTF-500, Revision 2, and provides assurance that the battery will be maintained at required levels of performance and that pertinent battery parameters will be monitored.

The NRC staff concludes that the proposed new TS 5.5.16, Battery Monitoring and Maintenance Program, provides assurance that the battery is maintained at required levels of performance and that pertinent battery parameters are monitored. Based on the above, the NRC staff concludes that the proposed change meets 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met and is, therefore, acceptable.

3.3 Summary and Conclusion

Based on the above, the NRC staff concludes the proposed changes to the PNPP TS to adopt TSTF-500, Revision 2, provides 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 and meet the intent of GDCs 1, 17, and 18. Therefore, the NRC staff concludes the proposed changes acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of Ohio official was notified of the proposed issuance of the amendment on March 9, 2021. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes 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 changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on June 2, 2020 (85 FR 33752). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

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

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Date of issuance: April 27, 2021

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – ISSUANCE OF AMENDMENT NO. 193 REGARDING THE ADOPTION OF TSTF 500, "DC ELECTRICAL REWRITE – UPDATE TO TSTF 360" (EPID L-2020-LLA-0089) DATED APRIL 27, 2021

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