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

November 24, 2014

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 - ISSUANCE OF AMENDMENT RE: ADOPTION OF TECHNICAL SPECIFICATION TASK FORCE (TSTF) CHANGE TRAVELER TSTF-500, REVISION 2, "DC ELECTRICAL REWRITE – UPDATE TO TSTF-360" (TAC NO. MF0596)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 250 to Renewed Facility Operating License No. DPR-51 for Arkansas Nuclear One, Unit 1. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated January 28, 2013, as supplemented by letter dated August 28, 2013.

The amendment revises TS requirements related to direct current (DC) electrical systems in TS Limiting Condition for Operation (LCO) 3.8.4, "DC Sources - Operating," LCO 3.8.5, "DC Sources - Shutdown," and LCO 3.8.6, "Battery Parameters." A new "Battery Monitoring and Maintenance Program" is being established for TS Section 5.5, "Administrative Controls - Programs and Manuals." These changes are consistent with the NRC-approved Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update to TSTF-360."

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

Sincerely,

AEGeorge

Andrea E. George, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosures:
1. Amendment No. 250 to DPR-51
2. Safety Evaluation

cc w/encls: Distribution via Listserv

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

ENTERGY ARKANSAS, INC.

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-313

ARKANSAS NUCLEAR ONE, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 250
License No. DPR-51

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

   A. The application for amendment by Entergy Operations, Inc. (EOI, the licensee), dated January 28, 2013, as supplemented by letter dated August 28, 2013, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations 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 license 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.

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 Renewed Facility Operating License No. DPR-51 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 250, are hereby incorporated in the renewed license. EOI shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective as of its date of issuance and shall be implemented within 90 days from the date of issuance. Implementation of the amendment shall include revision of the Safety Analysis Report as described in Attachment 3 to the licensee's letter dated January 28, 2013.

FOR THE NUCLEAR REGULATORY COMMISSION

Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. DPR-51
and Technical Specifications

Date of Issuance: November 24, 2014

ATTACHMENT TO LICENSE AMENDMENT NO. 250

RENEWED FACILITY OPERATING LICENSE NO. DPR-51

DOCKET NO. 50-313

Replace the following pages of the Renewed Facility Operating License No. DPR-51 and 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.

Operating License

REMOVE	INSERT
3	3

Technical Specifications

REMOVE	INSERT
3.8.4-1	3.8.4-1
3.8.4-2	3.8.4-2
3.8.5-1	3.8.5-1
3.8.5-2	3.8.5-2
3.8.6-1	3.8.6-1
3.8.6-2	3.8.6-2
3.8.6-3	3.8.6-3
3.8.6-4	-------
3.8.6-5	-------
5.0-10	5.0-10
5.0-11	5.0-11
5.0-12	5.0-12
5.0-13	5.0-13
5.0-14	5.0-14
5.0-15	5.0-15
5.0-16	5.0-16
5.0-17	5.0-17
5.0-18	5.0-18
5.0-19	5.0-19
5.0-20	5.0-20
5.0-21	5.0-21
5.0-22	5.0-22
5.0-23	5.0-23
5.0-24	5.0-24
5.0-25	5.0-25
5.0-26	5.0-26
-------	5.0-27

(5) EOI, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;

(6) EOI, pursuant to the Act and 10 CFR Parts 30 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

c. This renewed license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; 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

EOI is authorized to operate the facility at steady state reactor core power levels not in excess of 2568 megawatts thermal.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 250, are hereby incorporated in the renewed license. EOI shall operate the facility in accordance with the Technical Specifications.

(3) Safety Analysis Report

The licensee's SAR supplement submitted pursuant to 10 CFR 54.21(d), as revised on March 14, 2001, describes certain future inspection activities to be completed before the period of extended operation. The licensee shall complete these activities no later than May 20, 2014.

(4) Physical Protection

EOI shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans, including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The combined set of plans, which contains Safeguards Information protected under 10 CFR 73.21, is entitled: "Arkansas Nuclear One Physical Security Plan, Training and Qualifications Plan, and Safeguards Contingency Plan," as submitted on May 4, 2006.

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources - Operating

LCO 3.8.4 Both DC electrical power subsystems shall be OPERABLE.

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One DC electrical power subsystem inoperable.	A.1 Restore DC electrical power subsystem to OPERABLE status.	8 hours
B. Required Action and Associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	12 hours 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.	7 days
SR 3.8.4.2	Verify each battery charger supplies ≥ 300 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours. OR Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.	18 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.3	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR. ---------- 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 or a modified performance discharge test.	18 months

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The DC electrical power subsystem shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems – Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required battery charger on one subsystem inoperable. AND The required redundant subsystem battery and charger are 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.	2 hours Once per 12 hours
B. One or more required DC electrical power subsystems inoperable for reasons other than Condition A. OR Required Action and associated Completion Time of Condition A not met.	B.1.1 Suspend CORE ALTERATIONS. AND B.1.2 Suspend movement of irradiated fuel assemblies. AND B.1.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. AND	Immediately Immediately Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.1.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status. AND	Immediately
	B.1.5 Enter applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System," for LTOP features made inoperable by Condition B.	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, and 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 Train A and Train B 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 battery with one or more battery cells 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 battery 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

ACTIONS (continued)

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 battery 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 battery 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. Two batteries with battery parameters not within limits.	E.1 Restore at least one battery to within limits.	2 hours
F. Required Actions and associated Completion Times of Condition A, B, C, D, or E not met. OR One battery 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.	7 days
SR 3.8.6.2	Verify each battery pilot cell float voltage is ≥ 2.07 V.	31 days
SR 3.8.6.3	Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.	31 days
SR 3.8.6.4	Verify each battery pilot cell temperature is greater than or equal to minimum established design limits.	31 days
SR 3.8.6.5	Verify each battery connected cell float voltage is ≥ 2.07 V.	92 days
SR 3.8.6.6	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, 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 or a modified performance discharge test.	60 months AND 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating AND 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.6 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.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.7 Reactor Coolant Pump Flywheel Inspection Program

This program shall provide for the inspection of each reactor coolant pump flywheel. Surface and volumetric examination of the reactor coolant pump flywheels will be conducted coincident with refueling or maintenance shutdowns such that during 10 year intervals all four reactor coolant pump flywheels will be examined. Such examinations will be performed to the extent possible through the access ports, i.e., those areas of the flywheel accessible without motor disassembly. The surface and volumetric examination may be accomplished by Acoustic Emission Examination as an initial examination method. Should the results of the Acoustic Emission Examination indicate that additional examination is necessary to ensure the structural integrity of the flywheel, then other appropriate NDE methods will be performed on the area of concern.

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Reactor Coolant Pump Flywheel Inspection Program inspection frequencies.

5.5.8 Inservice Testing Program

This program provides controls for inservice testing of ASME Code Class 1, 2, and 3 components. The program shall include the following:

a. Testing frequencies applicable to the ASME Code For Operation and Maintenance (OM) of Nuclear Power Plants and applicable Addenda as follows:

ASME OM Code terminology for inservice testing activities	Required Frequencies for performing inservice testing activities
Monthly	At least once per 31 days
Every 6 weeks	At least once per 42 days
Quarterly or every 3 months	At least once per 92 days
Semiannually or every 6 months	At least once per 184 days
Every 9 months	At least once per 276 days
Yearly or annually	At least once per 366 days
Biennially or every 2 years	At least once per 731 days

b. The provisions of SR 3.0.2 are applicable to the above required Frequencies and to other normal and accelerated Frequencies specified as 2 years or less in the Inservice Testing Program for performing inservice testing activities;

c. The provisions of SR 3.0.3 are applicable to inservice testing activities; and

d. Nothing in the ASME OM Code shall be construed to supersede the requirements of any TS.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.9 Steam Generator (SG) Program

A Steam Generator Program shall be established and implemented to ensure that SG tube integrity is maintained. In addition, the Steam Generator Program shall include the following provisions:

a. Provisions for condition monitoring assessments. Condition monitoring assessment means an evaluation of the "as found" condition of the tubing with respect to the performance criteria for structural integrity and accident induced leakage. The "as found" condition refers to the condition of the tubing during an SG inspection outage, as determined from the inservice inspection results or by other means, prior to the plugging of tubes. Condition monitoring assessments shall be conducted during each outage during which the SG tubes are inspected or plugged to confirm that the performance criteria are being met.

b. Performance criteria for SG tube integrity. SG tube integrity shall be maintained by meeting the performance criteria for tube structural integrity, accident induced leakage, and operational LEAKAGE.

1. Structural integrity performance criterion: All in-service steam generator tubes shall retain structural integrity over the full range of normal operating conditions (including startup, operation in the power range, hot standby, and cool down and all anticipated transients included in the design specification) and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary to secondary pressure differential and a safety factor of 1.4 against burst applied to the design basis accident primary to secondary pressure differentials. Apart from the above requirements, additional loading conditions associated with the design basis accidents, or combination of accidents in accordance with the design and licensing basis, shall also be evaluated to determine if the associated loads contribute significantly to burst or collapse. In the assessment of tube integrity, those loads that do significantly affect burst or collapse shall be determined and assessed in combination with the loads due to pressure with a safety factor of 1.2 on the combined primary loads and 1.0 on axial secondary loads.

2. Accident induced leakage performance criterion: The primary to secondary accident induced leakage rate for any design basis accident, other than a SG tube rupture, shall not exceed the leakage rate assumed in the accident analysis in terms of total leakage rate for all SGs and leakage rate for an individual SG. Leakage is not to exceed 1 gpm.

3. The operational LEAKAGE performance criterion is specified in LCO 3.4.13, "RCS Operational LEAKAGE."

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

c. Provisions for SG tube repair criteria. Tubes found by inservice inspection to contain flaws with a depth equal to or exceeding 40% of the nominal tube wall thickness shall be plugged.

d. Provisions for SG tube inspections. Periodic SG tube inspections shall be performed. The number and portions of the tubes inspected and methods of inspection shall be performed with the objective of detecting flaws of any type (e.g., volumetric flaws, axial and circumferential cracks) that may be present along the length of the tube, from the tube-to-tubesheet weld at the tube inlet to the tube-to-tubesheet weld at the tube outlet, and that may satisfy the applicable tube repair criteria. The tube-to-tubesheet weld is not part of the tube. In addition to meeting the requirements of d.1, d.2, and d.3 below, the inspection scope, inspection methods, and inspection intervals shall be such as to ensure that SG tube integrity is maintained until the next SG inspection. An assessment of degradation shall be performed to determine the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations.

1. Inspect 100% of the tubes in each SG during the first refueling outage following SG replacement.

2. Inspect 100% of the tubes at sequential periods of 144, 108, 72, and, thereafter, 60 effective full power months. The first sequential period shall be considered to begin after the first inservice inspection of the SGs. In addition, inspect 50% of the tubes by the refueling outage nearest the midpoint of the period and the remaining 50% by the refueling outage nearest the end of the period. No SG shall operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.

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

e. Provisions for monitoring operational primary to secondary LEAKAGE.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.10 Secondary Water Chemistry

This program provides controls for monitoring secondary water chemistry to inhibit SG tube degradation. The program shall include:

a. Identification of a sampling schedule for the critical variables and control points for these variables;

b. Identification of the procedures used to measure the values of the critical variables;

c. Identification of process sampling points;

d. Procedures for the recording and management of data;

e. Procedures defining corrective actions for all off control point chemistry conditions; and

f. A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events required to initiate corrective action.

5.5.11 Ventilation Filter Testing Program (VFTP)

A program shall be established to implement the following required testing of Engineered Safeguards (ES) ventilation systems filters at the frequencies specified in Regulatory Guide 1.52, Revision 2. The VFTP is applicable to the Penetration Room Ventilation System (PRVS) and the Control Room Emergency Ventilation System (CREVS).

a. Demonstrate that an inplace cold DOP test of the high efficiency particulate (HEPA) filters shows:

1. $\geq$ 99% DOP removal for the PRVS when tested at the system design flowrate of 1800 scfm $\pm$ 10%; and

2. $\geq$ 99.95% DOP removal for the CREVS when tested in accordance with Regulatory Guide 1.52, Revision 2, at the system design flowrate of 2000 cfm $\pm$ 10%.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

b. Demonstrate that an inplace halogenated hydrocarbon test of the charcoal adsorbers shows:

1. ≥ 99% halogenated hydrocarbon removal for the PRVS when tested at the system design flowrate of 1800 cfm ± 10%; and

2. ≥ 99.95% halogenated hydrocarbon removal for the CREVS when tested in accordance with Regulatory Guide 1.52, Revision 2, at the system design flowrate of 2000 cfm ± 10%.

c. Demonstrate that a laboratory test of a sample of the charcoal adsorber meets the laboratory testing criteria of ASTM D3803-1989 when tested at 30°C and 95% relative humidity for a methyl iodide penetration of:

1. < 5% for the PRVS;

2. when obtained as described in Regulatory Guide 1.52, Revision 2, for CREVS

i. ≤ 2.5% for 2 inch charcoal adsorber beds; and

ii. ≤ 0.5% for 4 inch charcoal adsorber beds.

d. Demonstrate for the PRVS and CREVS, that the pressure drop across the combined HEPA filters, other filters in the system, and the charcoal adsorbers is < 6 inches of water when tested at the following system design flowrates ± 10%:

PRVS	1800 cfm
CREVS	2000 cfm

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the VFTP test frequencies.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.12 Explosive Gas and Storage Tank Radioactivity Monitoring Program

This program provides controls for potentially explosive gas mixtures contained in the Waste Gas System, the quantity of radioactivity contained in gas storage tanks, and the quantity of radioactivity contained in unprotected temporary outdoor liquid storage tanks. The gaseous radioactivity quantities shall be determined following the methodology in Branch Technical Position (BTP) ETSB 11-5, "Postulated Radioactive Release due to Waste Gas System Leak or Failure." The liquid radwaste quantities shall be determined in accordance with the ODCM.

The program shall include:

a. The limits for concentrations of hydrogen and oxygen in the Waste Gas System and a surveillance program to ensure the limits are maintained. Such limits shall be appropriate to the system's design criteria (i.e., whether or not the system is designed to withstand a hydrogen explosion);

b. A surveillance program to ensure that the quantity of radioactivity contained in each gas storage tank is less than the amount that would result in a whole body exposure of $\geq$ 0.5 rem to any individual in an unrestricted area, in the event of an uncontrolled release of the tanks' contents;

c. A surveillance program to ensure that the quantity of radioactivity contained in all temporary outdoor liquid radwaste tanks: 1) that are not surrounded by liners, dikes, or walls, capable of holding the tanks' contents; and 2) that do not have tank overflows and surrounding area drains connected to the Liquid Radwaste Treatment System is less than the amount that would result in concentrations equal to the limits of 10 CFR 20, Appendix B, Table 2, Column 2, at the nearest potable water supply and the nearest surface water supply in an unrestricted area, in the event of an uncontrolled release of the tanks' contents.

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Explosive Gas and Storage Tank Radioactivity Monitoring Program surveillance frequencies.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.13 Diesel Fuel Oil Testing Program

A diesel fuel oil testing program to implement required testing of both new fuel oil and stored fuel oil shall be established. The program shall include sampling and testing requirements, and acceptance criteria, all in accordance with applicable ASTM Standards. The purpose of the program is to establish the following:

a. Acceptability of new fuel oil for use prior to addition to storage tanks by determining that the fuel oil has:

   1. an API gravity or an absolute specific gravity within limits,

   2. a flash point and kinematic viscosity within limits for ASTM 2D fuel oil, and

   3. water and sediment within limits;

b. Within 31 days following addition of new fuel oil to storage tanks, verify that the properties of the new fuel oil, other than those addressed in a. above, are within limits for ASTM 2D fuel oil;

c. Total particulate concentration of the fuel oil is $\leq$ 10 mg/l when tested every 31 days based on ASTM D-2276, Method A-2 or A-3; and

d. The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the Diesel Fuel Oil Testing Program surveillance Frequencies.

5.5.14 Technical Specifications (TS) Bases Control Program

This program provides a means for processing changes to the Bases of these Technical Specifications.

a. Changes to the Bases of the TS shall be made under appropriate administrative controls and reviews.

b. Licensees may make changes to Bases without prior NRC approval provided the changes do not involve either of the following:

   1. A change in the TS incorporated in the license; or

   2. A change to the updated SAR or Bases that requires NRC approval pursuant to 10 CFR 50.59.

   Proposed changes that do meet these criteria shall be reviewed and approved by the NRC prior to implementation. Changes to the Bases implemented without prior NRC approval shall be provided to the NRC on a frequency consistent with 10 CFR 50.71(e).

c. The Bases Control Program shall contain provisions to ensure that the Bases are maintained consistent with the SAR.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.15 Safety Function Determination Program (SFDP)

This program ensures loss of safety function is detected and appropriate actions taken. Upon entry into LCO 3.0.6, an evaluation shall be made to determine if loss of safety function exists. Additionally, other appropriate limitations and remedial or compensatory actions may be identified to be taken as a result of the support system inoperability and corresponding exception to entering supported system Condition and Required Actions. This program implements the requirements of LCO 3.0.6. The SFDP shall contain the following:

a. Provisions for cross train checks to ensure a loss of the capability to perform the safety function assumed in the accident analysis does not go undetected;

b. Provisions for ensuring the plant is maintained in a safe condition if a loss of function condition exists;

c. Provisions to ensure that an inoperable supported system's Completion Time is not inappropriately extended as a result of multiple support system inoperabilities; and

d. Other appropriate limitations and remedial or compensatory actions.

A loss of safety function exists when, assuming no concurrent single failure, and assuming no concurrent loss of offsite power or loss of onsite diesel generator(s), a safety function assumed in the accident analysis cannot be performed. For the purpose of this program, a loss of safety function may exist when a support system is inoperable, and:

a. A required system redundant to the system(s) supported by the inoperable support system is also inoperable; or

b. A required system redundant to the system(s) in turn supported by the inoperable supported system is also inoperable; or

c. A required system redundant to the support system(s) for the supported systems (a) and (b) above is also inoperable.

The SFDP identifies where a loss of safety function exists. If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.16 Reactor Building Leakage Rate Testing Program

A program shall be established to implement the leakage rate testing of the reactor building as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995, except that the next Type A test performed after the April 16, 1992 Type A test shall be performed no later than April 15, 2007.

In addition, the reactor building purge supply and exhaust isolation valves shall be leakage rate tested once prior to entering MODE 4 from MODE 5 if not performed within the previous 92 days.

The peak calculated reactor building internal pressure for the design basis loss of coolant accident, P_a, is 54 psig.

The maximum allowable reactor building leakage rate, L_a, shall be 0.20% of containment air weight per day at P_a.

Leakage rate acceptance criteria are:

a. Reactor Building leakage rate acceptance criteria is $\leq 1.0\ L_a$. During the first unit startup following each test performed in accordance with this program, the leakage rate acceptance criteria are $< 0.60\ L_a$ for the Type B and Type C tests and $< 0.75\ L_a$ for Type A tests.

b. Air lock testing acceptance criteria are:

   1. Overall air lock leakage rate is $\leq 0.05\ L_a$ when tested at $\geq P_a$;

   2. For each door, leakage rate is $\leq 0.01\ L_a$ when tested at ≥ 10 psig.

The provisions of SR 3.0.2 do not apply to the test frequencies specified in the Reactor Building Leakage Rate Testing Program.

The provisions of SR 3.0.3 are applicable to the Reactor Building Leakage Rate Testing Program.

5.0 ADMINISTRATIVE CONTROLS

5.5 Programs and Manuals

5.5.17 Metamic Coupon Sampling Program

A coupon surveillance program will be implemented to maintain surveillance of the Metamic absorber material under the radiation, chemical, and thermal environment of the SFP. The purpose of the program is to establish the following:

- Coupons will be examined on a two year basis for the first three intervals with the first coupon retrieved for inspection being on or before February 2009 and thereafter at increasing intervals over the service life of the inserts.
- Measurements to be performed at each inspection will be as follows:
  - A) Physical observations of the surface appearance to detect pitting, swelling or other degradation,
  - B) Length, width, and thickness measurements to monitor for bulging and swelling
  - C) Weight and density to monitor for material loss, and
  - D) Neutron attenuation to confirm the B-10 concentration or destructive chemical testing to determine the boron content.
- The provisions of SR 3.0.2 are applicable to the Metamic Coupon Sampling Program.
- The provisions of SR 3.0.3 are not applicable to the Metamic Coupon Sampling Program.

5.0 ADMINISTRATIVE CONTROLS

5.6 Reporting Requirements

5.6.1 DELETED

5.6.2 Annual Radiological Environmental Operating Report

----------NOTE----------
A single submittal may be made for ANO. The submittal should combine sections common to both units.

The Annual Radiological Environmental Operating Report covering the operation of the unit during the previous calendar year shall be submitted by May 15 of each year. The report shall include summaries, interpretations, and analyses of trends of the results of the radiological environmental monitoring program for the reporting period. The material provided shall be consistent with the objectives outlined in the Offsite Dose Calculation Manual (ODCM), and in 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

5.6.2 Annual Radiological Environmental Operating Report (continued)

The Annual Radiological Environmental Operating Report shall include the results of analyses of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the table and figures in the ODCM, as well as summarized and tabulated results of these analyses and measurements. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radioactive Effluent Release Report

----------NOTE----------
A single submittal may be made for ANO. The submittal shall combine sections common to both units. The submittal shall specify the releases of radioactive material from each unit.

The Radioactive Effluent Release Report covering the operation of the unit in the previous year shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I, Section IV.B.1.

5.6.4 DELETED

5.0 ADMINISTRATIVE CONTROLS

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

2.1.1 Variable Low RCS Pressure – Temperature Protective Limits
3.1.1 SHUTDOWN MARGIN (SDM)
3.1.8 PHYSICS TESTS Exceptions – MODE 1
3.1.9 PHYSICS TEST Exceptions - MODE 2
3.2.1 Regulating Rod Insertion Limits
3.2.2 AXIAL POWER SHAPING RODS (APSR) Insertion Limits
3.2.3 AXIAL POWER IMBALANCE Operating Limits
3.2.4 QUADRANT POWER TILT (QPT)
3.2.5 Power Peaking
3.3.1 Reactor Protection System (RPS) Instrumentation
3.4.1 RCS Pressure, Temperature, and Flow DNB limits
3.4.4 RCS Loops – MODES 1 and 2
3.9.1 Boron Concentration

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

Babcock & Wilcox Topical Report BAW-10179-A, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses" (the approved revision at the time the reload analyses are performed). The approved revision number shall be identified in the COLR.

Entergy Topical Report ENEAD-01-P, "Qualification of Reactor Physics Methods for the Pressurized Water Reactors of the Entergy System" (the approved revision at the time the reload analyses are performed). The approved revision number shall be identified in the COLR.

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling System (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.0 ADMINISTRATIVE CONTROLS

5.6 Reporting Requirements

5.6.6 Reactor Building Inspection Report

Any degradation exceeding the acceptance criteria of the containment structure detected during the tests required by the Containment Inspection Program shall undergo an engineering evaluation within 60 days of the completion of the inspection surveillance. The results of the engineering evaluation shall be reported to the NRC within an additional 30 days of the time the evaluation is completed. The report shall include the cause of the condition that does not meet the acceptance criteria, the applicability of the conditions to the other unit, the acceptability of the concrete containment without repair of the item, whether or not repair or replacement is required and, if required, the extent, method, and completion date of necessary repairs, and the extent, nature, and frequency of additional examinations.

5.6.7 Steam Generator Tube Inspection Reports

A report shall be submitted within 180 days after the initial entry into MODE 4 following completion of an inspection performed in accordance with the Specification 5.5.9, Steam Generator (SG) Program. The report shall include:

a. The scope of inspections performed on each SG,

b. Active degradation mechanisms found,

c. Nondestructive examination techniques utilized for each degradation mechanism,

d. Location, orientation (if linear), and measured sizes (if available) of service induced indications,

e. Number of tubes plugged during the inspection outage for each active degradation mechanism,

f. Total number and percentage of tubes plugged to date,

g. The results of condition monitoring, including the results of tube pulls and in-situ testing.

5.0 ADMINISTRATIVE CONTROLS

5.7 High Radiation Area

As provided in paragraph 20.1601(c) of 10 CFR Part 20, the following controls shall be applied to high radiation areas in place of the controls required by paragraph 20.1601(a) and (b) of 10 CFR Part 20:

5.7.1 High Radiation Areas with Dose Rates Not Exceeding 1.0 rem/hour at 30 Centimeters from the Radiation Source or from any Surface Penetrated by the Radiation

a. Each entryway to such an area shall be barricaded and conspicuously posted as a high radiation area. Such barricades may be opened as necessary to permit entry or exit of personnel or equipment.

b. Access to, and activities in, each such area shall be controlled by means of Radiation Work Permit (RWP), or equivalent that includes specification of radiation dose rates in the immediate work area(s) and other appropriate radiation protection equipment and measures.

c. Individuals qualified in radiation protection procedures and personnel continuously escorted by such individuals may be exempted from the requirement for an RWP or equivalent while performing their assigned duties provided that they are otherwise following plant radiation protection procedures for entry to, exit from, and work in such areas.

d. Each individual or group entering such an area shall possess:

1. A radiation monitoring device that continuously displays radiation dose rates in the area; or

2. A radiation monitoring device that continuously integrates the radiation dose rates in the area and alarms when the device's dose alarm setpoint is reached, with an appropriate alarm setpoint, or

3. A radiation monitoring device that continuously transmits dose rate and cumulative dose information to a remote receiver monitored by radiation protection personnel responsible for controlling personnel radiation exposure within the area, or

5.0 ADMINISTRATIVE CONTROLS

5.7 High Radiation Area

4. A self-reading dosimeter (e.g., pocket ionization chamber or electronic dosimeter) and,

   (i) Be under the surveillance, as specified in the RWP or equivalent, while in the area, of an individual qualified in radiation protection procedures, equipped with a radiation monitoring device that continuously displays radiation dose rates in the area; who is responsible for controlling personnel exposure within the area, or

   (ii) Be under the surveillance as specified in the RWP or equivalent, while in the area, by means of closed circuit television, of personnel qualified in radiation protection procedures, responsible for controlling personnel radiation exposure in the area, and with the means to communicate with individuals in the area who are covered by such surveillance.

e. Except for individuals qualified in radiation protection procedures, or personnel continuously escorted by such individuals, entry into such areas shall be made only after dose rates in the area have been determined and entry personnel are knowledgeable of them. These continuously escorted personnel will receive a pre-job briefing prior to entry into such areas. This dose rate determination, knowledge, and pre-job briefing does not require documentation prior to initial entry.

5.7.2 <u>High Radiation Areas with Dose Rates Greater than 1.0 rem/hour at 30 Centimeters from the Radiation Source or from any Surface Penetrated by the Radiation, but less than 500 rads/hour at 1 Meter from the Radiation Source or from any Surface Penetrated by the Radiation</u>

a. Each entryway to such an area shall be conspicuously posted as a high radiation area and shall be provided with a locked or continuously guarded door or gate that prevents unauthorized entry, and, in addition:

   1. All such door and gate keys shall be maintained under the administrative control of the shift manager, radiation protection manager, or his or her designee.

   2. Doors and gates shall remain locked except during periods of personnel or equipment entry or exit.

b. Access to, and activities in, each such area shall be controlled by means of an RWP or equivalent that includes specification of radiation dose rates in the immediate work area(s) and other appropriate radiation protection equipment and measures.

5.0 ADMINISTRATIVE CONTROLS

5.7 High Radiation Area

c. Individuals qualified in radiation protection procedures may be exempted from the requirement for an RWP or equivalent while performing radiation surveys in such areas provided that they are otherwise following plant radiation protection procedures for entry to, exit from, and work in such areas.

d. Each individual or group entering such an area shall possess:

1. A radiation monitoring device that continuously integrates the radiation rates in the area and alarms when the device's dose alarm setpoint is reached, with an appropriate alarm setpoint, or

2. A radiation monitoring device that continuously transmits dose rate and cumulative dose information to a remote receiver monitored by radiation protection personnel responsible for controlling personnel radiation exposure within the area with the means to communicate with and control every individual in the area, or

3. A self-reading dosimeter (e.g., pocket ionization chamber or electronic dosimeter) and,

(i) Be under the surveillance, as specified in the RWP or equivalent, while in the area, of an individual qualified in radiation protection procedures, equipped with a radiation monitoring device that continuously displays radiation dose rates in the area; who is responsible for controlling personnel exposure within the area, or

(ii) Be under the surveillance as specified in the RWP, or equivalent, while in the area by means of closed circuit television, or personnel qualified in radiation protection procedures responsible for controlling personnel radiation exposure in the area and with the means to communicate with individuals in the area who are covered by such surveillance.

4. In those cases where options (2) and (3), above, are impractical or determined to be inconsistent with the "As Low As is Reasonably Achievable" principle, a radiation monitoring device that continuously displays radiation dose rates in the area.

5.0 ADMINISTRATIVE CONTROLS

5.7 High Radiation Area

e. Except for individuals qualified in radiation protection procedures, or personnel continuously escorted by such individuals, entry into such areas shall be made only after dose rates in the area have been determined and entry personnel are knowledgeable of them. These continuously escorted personnel will receive a pre-job briefing prior to entry into such areas. This dose rate determination, knowledge, and pre-job briefing does not require documentation prior to initial entry.

f. Such individual areas that are within a larger area where no enclosure exists for the purpose of locking and where no enclosure can reasonably be constructed around the individual area need not be controlled by a locked door or gate, nor continuously guarded, but shall be barricaded, conspicuously posted, and a clearly visible flashing light shall be activated at the area as a warning device.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 250 TO

RENEWED FACILITY OPERATING LICENSE NO. DPR-51

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 1

DOCKET NO. 50-313

1.0 INTRODUCTION

By application dated January 28, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13029A767), as supplemented by letter dated August 28, 2013 (ADAMS Accession No. ML13241A417), Entergy Operations, Inc. (Entergy, the licensee), requested changes to the Technical Specifications (TSs) for Arkansas Nuclear One, Unit 1 (ANO-1).

The proposed changes adopt the U.S. Nuclear Regulatory Commission (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, proposed new testing criteria for a battery charger for limiting condition for operation (LCO) 3.8.4, "DC Sources - Operating," and new actions for an inoperable battery charger for LCO 3.8.5, "DC Sources - Shutdown." 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 adding specific actions with associated Completion Times (CTs) for out-of-limits conditions for battery cell voltage, electrolyte level, and electrolyte temperature to the TS LCO 3.8.6. In addition, specific surveillance requirements (SRs) are being proposed for verification of these parameters.

The licensee proposed that the items to be relocated will be contained in the new Administrative Controls TS 5.5.6, "Battery Monitoring and Maintenance Program," for the maintenance and monitoring of station batteries.

The proposed changes include the following:

- Specification 3.8.4, "DC Sources - Operating," is revised to add a surveillance requirement for battery charger testing.

- Specification 3.8.5, "DC Sources - Shutdown," is revised to add Conditions for an inoperable battery charger.

- Specification 3.8.6, "Battery Cell Parameters," is renamed "Battery Parameters." Table 3.8.6-1 is deleted and current Conditions and Surveillances are replaced.

- Maintenance and monitoring of station batteries will be controlled by the new Administrative Controls TS 5.5.6, "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 (ADAMS Accession No. ML092670242), as part of the consolidated line item improvement process (CLIIP). This NOA was later corrected to delete the CLIIP statement. The corrected NOA was published in the *Federal Register* on November 8, 2011 (76 FR 69296), to announce the availability for adoption of the TSTF-500 not under the CLIIP.

The supplemental letter dated August 28, 2013, 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 April 30, 2013 (78 FR 25313).

Attachment 4 to the license amendment request (LAR) provided marked-up 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 5.5.14, "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 of the LAR:

For plants constructed before the promulgation of the Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix A, General Design Criterion (GDC), the Commission (with all Commissioners agreeing) approved an NRC staff proposal to not apply the GDC to plants with construction permits issued prior to May 21, 1971 (see Staff Requirements Memorandum (SRM), SECY-92-223, issued on September 18, 1992, available at ADAMS Accession No. ML003763736). The Commission also stated that compliance with the intent of the GDC is important. The ANO-1 construction permit was issued on December 6, 1968.

The regulation at 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 "electric 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," states, in part, that "[s]tructures, 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 regulation at 10 CFR 50.36, "Technical specifications," establishes the requirements related to the content of the TS. Pursuant to 10 CFR 50.36(c) TS are required to include items in five specific 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 proposed changes to the ANO-1 TS relate to the LCO, SR, and Administrative Controls categories.

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 50.65(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...."

NRC Regulatory Guide (RG) 1.75, Revision 3, "Criteria for Independence of Electrical Safety Systems," February 2005 (ADAMS Accession No. ML043630448), provides guidance with respect to the physical independence requirements of the circuits and electric equipment that comprise or are associated with safety systems.

NRC RG 1.129, Revision 2, "Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants," 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."

TSTF-500, Revision 2, "DC Electrical Rewrite – Update to TSTF-360," dated September 22, 2009 (ADAMS Accession No. ML092670242).

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

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 to AC power converters (i.e., inverters)). According to the ANO-1 Safety Analysis Report (SAR), Section 8.3.1, the plant was not licensed to the 10 CFR Part 50, Appendix A, GDC, but the plant

conforms with the provisions of GDCs 17 and 18 such that the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure.

The DC electrical power system at ANO-1 consists of two independent and redundant safety-related Class 1E 125-Volt DC electrical power subsystems. Each subsystem consists of one battery, one battery charger, and all the associated control equipment and interconnecting cabling. Each battery is sized to carry the continuous emergency DC and vital AC load for a minimum period of two hours in addition to supplying power for the operation of momentary loads during the 2 hour period. Each subsystem additionally contains a manual, standby, normally de-energized battery charger, which provides backup service in the event that a battery charger is out of service. Each charger is adequate to supply the normal continuous DC load connected to its respective control center and keep the associated battery in a fully charged condition.

According to Section 8.3.2 of the ANO-1 SAR, during normal operation, the DC load is powered from the inservice battery charger with the battery floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station battery.

Each 125-Volt DC Class 1E battery is separately housed in a ventilated room, separate from its related charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing of dedicated components between redundant Class 1E subsystems, such as batteries, battery chargers, or distribution panels.

As described in the ANO-1 SAR, each Class 1E battery is designed with additional capacity above that required by the design duty cycles to allow for temperature variations and other factors. As stated in the revised ANO-1 TS Bases, "the battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 120 Volt (V) for a 58 cell battery (i.e., cell voltage of 2.063 volts per cell (Vpc)). The open circuit voltage is the voltage maintained when there is no charging or discharging." Once fully charged with its open circuit voltage greater than or equal to 2.063 Vpc, the battery cell will maintain its capacity for 180 days without further charging per the manufacturer's instructions. The float voltage at the battery terminals is maintained between 2.20 and 2.25 Vpc.

Each battery charger is rated at 400 amperes (amp) and suitable for float charging or equalizing the associated battery. Each battery charger is normally in the float-charge mode. Float-charge is the condition in which the charger is supplying the connected loads and the battery cells are receiving adequate current to charge the battery optimally. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state. Each charger is adequate to prevent the battery from discharging back into any internal charger load in case of AC power supply failure or charger malfunction.

3.2 Evaluation of Proposed Changes

The proposed changes to the LCO Conditions, the associated Required Actions and CTs, and SRs are indicated by underlined text for additions/insertions and strikeout text for deletions to the current TS.

In the LAR, the licensee stated that portions of the TSTF-500 TS allowing 72-hour CT for an inoperable required battery charger are not applicable to ANO-1 because each safety-related electrical subsystem at ANO-1 contains a redundant battery charger that can be placed in service to meet the associated TS requirements should the in-service charger fail.

3.2.1 TS 3.8.4 (DC Sources - Operating) Changes

The licensee did not propose changes to the current TS 3.8.4 Conditions, Required Actions, and CTs. Current restoration time for an inoperable DC electrical power subsystem (including battery charger) is 8 hours.

The licensee proposed to revise TS 3.8.4 by modifying current SRs, adding a new SR for battery charger testing, and relocating an SR that requires verification of battery capacity. In its letter dated August 28, 2013, the licensee proposed updated changes to current SR 3.8.4.2.

3.2.1.1 TS 3.8.4; SR 3.8.4.1 (Revised); Change (1)

Current SR 3.8.4.1 states:

> Verify battery terminal voltage is ≥ 124.7 V on float charge.

Revised SR 3.8.4.1 would state

> Verify battery terminal voltage is greater than or equal to the minimum established float voltage.

The proposed change would delete the battery minimum established float voltage numerical value from the SR and relocate it to a licensee-controlled program.

Evaluation of TS 3.8.4; SR 3.8.4.1 (Revised); Change (1)

The purpose of SR 3.8.4.1 is to verify battery terminal voltage while the system is on a float charge to ensure the battery chargers are not degraded. The battery terminal voltage is the minimum voltage which ensures an optimum float charging voltage is applied to the battery. The voltage requirements are based on the nominal design voltage of the battery. As stated in the LAR, long-term performance of the ANO-1 batteries is supported by maintaining a float voltage greater than or equal to the minimum float voltage established by the manufacturer, which corresponds to 2.20 Vpc for a 58-cell battery or 127.6 V at the battery terminals. The minimum established float voltage will maintain the battery plates in a condition that supports optimizing battery grid life and will ensure that the battery is capable of providing its designed safety function.

Relocating the minimum established battery float voltage numerical value (design limit) to a licensee-controlled program will allow flexibility to monitor and control this limit at values directly related to the battery ability to perform its required safety function. In Attachment 6 of the LAR, the licensee provided a commitment to incorporate updates to the ANO-1 SAR which were included in Attachment 3 of the LAR. One of the required updates in LAR Attachment 3 is to include the minimum established design limit for the battery terminal float voltage into the ANO-1 SAR (see SE Section 4.0 for additional discussion regarding regulatory commitments). This provides additional reasonable assurance that the numerical value will be appropriately maintained by the licensee to accurately reflect the design of the plant battery system. The requirement to verify the battery terminal voltage "... greater than or equal to the minimum established float voltage" is added to this SR.

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 to meet the requirements of the LCOs, and is, therefore, acceptable.

3.2.1.2 TS 3.8.4; New SR 3.8.4.2 (Added); Change (2)

New SR 3.8.4.2 would state:

> Verify each battery charger supplies ≥ 300 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours.
>
> OR
>
> Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.

The frequency for new SR 3.8.4.2 would be "18 months."

Evaluation of TS 3.8.4; New SR 3.8.4.2 (Added); Change (2)

New SR 3.8.4.2 specifies battery charger current requirements for each DC source, and its purpose is to verify the design capacity of each battery charger. The ampere requirements are based on the output rating of the chargers. Each battery charger is rated at 400 amps. The licensee stated that the proposed current limit of greater than or equal to 300 amps demonstrates that each ANO-1 battery charger is capable of furnishing the energy needed for the largest combined demands of the various continuous steady state loads while restoring the battery capacity from the minimal charged state to the fully charged state. The proposed amperage limits ensure that the battery chargers will be capable of performing their designed function. The voltage requirements are based on the battery charger voltage level after a response to a loss of AC power. Battery manufacturers establish this voltage limit to provide the optimum charge on the battery and to maintain the battery plates in a condition that supports maintaining the battery grid life. Maintaining this voltage limit should ensure that the battery will

be capable of providing its designed safety function. In the LAR, the licensee stated that the proposed duration of greater than or equal to 8 hours is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours.

The licensee also proposed adding a revised alternative criterion to new SR 3.8.4.2. The proposed alternative criterion provides an alternate method for verifying the design capacity of each battery charger because normal battery loads may not be available following the battery service test and may need to be supplemented with additional loads. In its letter dated August 28, 2013, the licensee stated that the Class 1E batteries at ANO-1 would be fully recharged in less than 24 hours considering the capacity of the battery chargers (rated for 400 amps) and the relatively small amount of capacity (300 – 348.5 amps) removed from the batteries (rated for 1442 ampere-hours at the 8-hour rate to 1.81 Vpc) during a design basis event. The licensee further stated that this expectation is supported by empirical data indicating that the batteries are fully recharged in under 24 hours following a battery performance discharge test that fully depleted the battery (100 percent depth of discharge) while the battery charger is supplying normal continuous DC bus loads of ~100 amps. Based on this information, the NRC staff concludes that the proposed alternate testing criteria would satisfy the purpose of SR 3.8.4.2.

In the LAR, the licensee stated that the surveillance frequency of 18 months is consistent with the plant's expected fuel cycle lengths and is acceptable given the unit conditions required to perform the test following the first criterion and the other administrative controls current to ensure adequate charger performance during this period.

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.

3.2.1.3 TS 3.8.4; Current SR 3.8.4.2 (Revised and Renumbered as SR 3.8.4.3); Change (3)

Current SR 3.8.4.2 states:

> 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 or a modified performance discharge test.

Revised and renumbered as SR 3.8.4.3 would state:

> ----------NOTE----------
> This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this SR.
> ----------
>
> 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 or a modified performance discharge test.

Evaluation of TS 3.8.4; Current SR 3.8.4.2 (Revised and Renumbered as SR 3.8.4.3); Change (3)

The NRC staff concludes that renumbering current SR 3.8.4.2 to SR 3.8.4.3 is editorial in nature and is, therefore, acceptable.

Renumbered SR 3.8.4.3 would include a note that prohibits performance of the service test in Mode 1, 2, 3, or 4 and allows credit to be taken for unplanned events that satisfy this SR. In its letter dated August 28, 2013, the licensee stated that the battery service or discharging testing is not performed during plant operation because intentional entry into TS Conditions and Required Actions where CTs would be significantly challenged is not allowed at ANO-1. This note is added for greater consistency with TSTF-500. In the LAR, the licensee stated that the reason for the note is that performing the surveillance would perturb the electrical distribution system and challenge safety systems. The NRC staff concludes that the note associated with renumbered SR 3.8.4.3 does not change the intent of SR 3.8.4.3 and it reflects the current licensee procedures for the performance of this SR.

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.

3.2.1.4 TS 3.8.4; Current SR 3.8.4.3 (Deleted and Relocated to TS 3.8.6); Change (4)

The proposed change would delete current SR 3.8.4.3, which states:

> Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.
>
> FREQUENCY: 60 months
>
> AND
>
> 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating
>
> AND
>
> 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

Current SR 3.8.4.3 would be relocated to SR 3.8.6.6.

Evaluation of TS 3.8.4; Current SR 3.8.4.3 (Deleted and Relocated to TS 3.8.6); Change (4)

The licensee proposed deleting SR 3.8.4.3 and relocating the requirement to SR 3.8.6.6. The purpose of this SR is to demonstrate the operability of the battery; thus, this surveillance is

relocated to TS 3.8.6, "Battery Parameters." This change is discussed further in SE Section 3.2.3.

3.2.2 TS 3.8.5 (DC Sources - Shutdown) Changes

LCO 3.8.5 requires the DC electrical power subsystem (consisting of one battery, one battery charger, and the corresponding control equipment and interconnecting cabling within the subsystem) to be operable to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems – Shutdown." TS 3.8.5 is applicable in MODE 5 and 6 and during movement of irradiated fuel assemblies.

The licensee proposed revising TS 3.8.5 Conditions, Required Actions, and SRs. Currently, TS 3.8.5 contains one Condition A for one or more required DC electrical power subsystems inoperable. The licensee initially proposed to add a new Condition A to address battery charger operability with a Required Action A.1 to restore the battery terminal voltage to greater than or equal to the minimum established voltage. In its letter dated August 28, 2013, the licensee proposed an additional Required Action A.2 to verify battery float current. The changes to TS 3.8.5 are outlined below.

3.2.2.1 TS 3.8.5; New Condition A, Required Actions and CTs (Added); Change (1)

New TS 3.8.5 Condition A would state:

A. Required battery charger on one subsystem inoperable.

AND

The required redundant subsystem battery and charger are OPERABLE.

New TS 3.8.5 Required Actions A.1 and A.2 would state:

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.

New TS 3.8.5 CTs for Required Actions A.1 and A.2 would state "2 hours" and "Once per 12 hours," respectively.

Evaluation of TS 3.8.5; New Condition A (Added); Change (1)

The first part of new Condition A, which states "required battery charger on one subsystem inoperable," would be applicable when one DC electrical power subsystem is required to be operable. In addition, the second part of new Condition A, which states "the required redundant subsystem battery and charger are operable," would be applicable when LCO 3.8.10 requires

two independent DC electrical power subsystems to be operable in support of redundant trains of systems, structures, or components (SSCs) depending on the status of the plant. In the LAR, the licensee stated that the term "required" is added to new Condition A to bring consistency with LCO 3.8.5, which may not require two operable DC subsystems depending on plant conditions at the time. In its letter dated August 28, 2013, the licensee clarified that if a second independent DC electrical power subsystem is not "required" to support a specific SSC, the second part of new Condition A would not be applicable but the first part of the condition would remain applicable, and the Required Actions must be performed. The NRC staff concludes that adding "required" is acceptable because the condition satisfies the requirements of both LCOs 3.8.5 and 3.8.10.

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 DC control power to AC circuit breakers and thus supports the recovery of AC power following events such as loss-of-offsite power or station blackout. The 2-hour CT would provide time for the standby charger to be placed in service before more restrictive actions would be required to be implemented. This provides assurance that the battery will be restored to its fully charged condition from any discharge that might have occurred due to the battery charger being inoperable. At the end of the 2 hours, a terminal voltage of at least the minimum established float voltage provides indication that the battery is on the exponential charging current portion of its recharging cycle.

New Required Action A.2 would require that once per 12 hours, the battery float current be verified to be less than or equal to 2 amps. This would confirm that if the battery has been discharged as a result of an inoperable battery charger, it had been fully recharged. In its letter dated August 28, 2013, the licensee stated that the Class 1E batteries at ANO-1 would be expected to fully recharge in less than 12 hours to less than 2 amps considering the capacity of the battery chargers (rated for 400 amps) and the relatively small amount of capacity (240 amp-hours) removed from the batteries (rated for 1442 amp-hours at 8-hour rate) within the 2-hour allowed time to place a 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 subsystem is considered inoperable (see Section 3.2.3.4 of this SE for a more detailed discussion on the 2-amp float current value). This verification provides assurance that the battery has sufficient capacity to perform its safety function.

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.2.2 TS 3.8.5; Current Condition A (Revised and Renumbered as Condition B); Change (2)

Current TS 3.8.5 Condition A states:

A. One or more required DC electrical power subsystems inoperable.

Revised TS 3.8.5 Condition A, renumbered as Condition B, would state:

B. One or more required DC electrical power subsystems inoperable for reasons other than Condition A.

OR

Required Action and associated Completion Time of Condition A not met.

Current TS 3.8.5 Required Actions A.1.1, A.1.2, A.1.3, A.1.4, and A.1.5, revised and renumbered as Required Actions B.1.1, B.1.2, B.1.3, B.1.4, and B.1.5, respectively, would state:

B.1.1 Suspend CORE ALTERATIONS.

AND

B.1.2 Suspend movement of irradiated fuel assemblies.

AND

B.1.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

AND

B.1.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.

AND

B.1.5 Enter applicable Conditions and Required Actions of LCO 3.4.11, "Low Temperature Overpressure Protection (LTOP) System," for LTOP features made inoperable by Condition B.

Evaluation of TS 3.8.5; Current Condition A (Revised and Renumbered as Condition B); Change (2)

The purpose of this change is to reflect the addition of new Condition A. The Required Actions and CTs for current Condition A remain the same for renumbered Condition B. With the required DC electrical subsystem(s) inoperable either for reasons other than new Condition A or due to Required Actions and associated CTs of new Condition A not met, there may be insufficient capability to mitigate the consequences of a fuel handling accident. Therefore, sufficiently conservative actions are taken to minimize the probability of occurrence of a fuel handling accident (i.e., suspend Core Alterations, movement of irradiated fuel assemblies, and operations involving positive reactivity additions). Suspension of these activities does not preclude completion of actions to establish a safe, conservative condition. It is further required to initiate action to restore the required DC electrical power subsystem(s) to operable status

immediately. If a required low temperature overpressure protection (LTOP) system features is made inoperable by revised Condition B, Required Action B.1.5 requires entry into the appropriate LTOP Conditions and Required Actions. The CT of "immediately" is consistent with the required times for actions requiring prompt attention.

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 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 current TS 3.8.6 Conditions, Required Actions, SRs, deleting Table 3.8.6-1, and relocating some of the surveillances to the new TS 5.5.6, "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."

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; LCO 3.8.6 (Revised); Change (2)

Current LCO 3.8.6 states:

> Battery cell parameters shall be within limits.

Revised LCO 3.8.6 would state:

> Battery parameters for the Train A and Train B electrical power subsystem batteries shall be within limits.

Evaluation of TS 3.8.6; LCO 3.8.6 (Revised); Change (2)

Adding "Train A and Train B electrical power subsystem batteries" to the current LCO 3.8.6 does not change the intent of the LCO. The NRC staff concludes that the change is editorial in nature, and is, therefore, acceptable.

3.2.3.3 TS 3.8.6; Table 3.8.6-1 (Deleted); Change (3)

The proposed change would delete TS Table 3.8.6-1, "Battery Surveillance Requirements." Table 3.8.6-1 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 relocate Category A, B, and C limits of the table and the required actions associated with restoring the battery cell parameters to within limits to TS 5.5.6.

Evaluation of TS 3.8.6; Table 3.8.6-1 (Deleted); Change (3)

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 table requirements would be relocated to the TS 5.5.6, "Battery Monitoring and Maintenance Program."

The Category A and B limits of TS Table 3.8.6-1 represent appropriate monitoring levels and appropriate preventive maintenance levels for long-term battery quality and extended battery life. These limits will be relocated to the proposed TS 5.5.6, "Battery Monitoring and Maintenance Program," (see Section 3.2.4 of this SE for more details). By letter dated August 28, 2013, the licensee stated that the current TS Table 3.8.6-1 is included and used in the procedure for ANO-1 Class 1E batteries surveillance to verify battery electrolyte level, float voltage, and specific gravity; and the procedure along with the proposed TS 5.5.6 will be used to develop the new battery program required by adoption of TSTF-500. The NRC staff concludes that the information from the licensee provided assurance that the battery parameters values will continue to be controlled at their current level. Furthermore, the licensee stated that the procedure requires corrective actions to be taken to restore deficient values.

Category C limits for electrolyte level and float voltage will be moved to the proposed TS 3.8.6, Conditions C and A, respectively. In addition, the proposed new SRs 3.8.6.1, 3.8.6.3, and 3.8.6.5 will require monitoring of battery float current (instead of cells specific gravity), connected cell electrolyte level, and connected cell float voltage respectively (See SE Sections 3.2.3.11, 3.2.3.13, and 3.8.15 for the NRC staff evaluation of the new proposed SRs). These new SRs will satisfy the intent of the Category C limits.

The NRC staff concludes that relocating Category A, B, and C limits for the battery cell parameters and the required actions associated with restoration to the new TS Battery Monitoring and Maintenance Program is acceptable because (1) battery capacity is considered adequate when electrolyte level is above the top of the plates; (2) an individual battery cell float voltage criterion of greater than or equal to 2.13 V is a maintenance limit; (3) specific gravity measurement criteria are being replaced with float current monitoring; and (4) the licensee provided assurance that these battery parameter values will continue to be controlled at their current level, and that actions to restore deficient values will be implemented in accordance with the licensee's corrective action program. This relocation will continue to assure that the battery is maintained at current levels of performance, and that operators appropriately focus on monitoring the battery parameters for degradation.

Based on discussion above, the NRC staff concludes that relocating the battery parameters (Electrolyte Level, Float Voltage, Specific Gravity) to the proposed TS 5.5.6 Battery Monitoring and Maintenance Program and to TS 3.8.6 Conditions A and C is acceptable since these parameters will continue be controlled at their current level; therefore, the proposed change to delete TS Table 3.8.6-1 is acceptable.

3.2.3.4 TS 3.8.6; Float Current Monitoring (Added to Replace Specific Gravity Measurement); Change (4)

The proposed change would replace requirements to measure specific gravity to determine the battery state of charge with requirements to monitor float current and relocate requirements to obtain specific gravity readings to the new Battery Monitoring and Maintenance Program specified in TS 5.5.6.

Evaluation of TS 3.8.6; Float Current Monitoring (Added to Replace Specific Gravity Measurement); Change (4)

Currently, battery cell specific gravity verification is required by SRs 3.8.6.1 and 3.8.6.3. To determine the battery state of charge, the licensee proposed replacing the requirement to measure specific gravity with the requirement to monitor float current. Float current monitoring is recognized by the industry as being a more direct and expeditious method for determining battery state of charge than specific gravity monitoring. The licensee proposed a float current of 2 amps. In Attachment 2 of the LAR, the licensee provided a letter dated May 22, 2012, from the manufacturer, C&D Technologies, Inc. (C&D) of the ANO-1 Class 1E batteries used at ANO-1 verifying the acceptability of using float current monitoring instead of specific gravity monitoring as a reliable and accurate indication of a battery state of charge for the life of the battery. In its letter dated August 28, 2013, the licensee stated that it has verified via C&D that a charging current less than or equal to 2 amps is an indication that the battery is at least 98 percent charged; thus, maintaining an additional 2 percent design margin in the ANO-1 battery sizing calculation is needed to ensure that 100 percent battery capacity is available once charging current is 2 amps or less. This is equivalent to the battery being 100 percent charged because the sizing calculation ensures that the battery can perform its safety related function during a design basis event. In Attachment 6 of the LAR, the licensee provided a commitment to revise the SAR to provide a description of this capability (see Section 4.0 of this SE for additional discussion regarding regulatory commitments).

In Section 2.2 of the LAR, the licensee stated that the equipment that will be used to monitor float current under SR 3.8.6.1 has the necessary accuracy and capability to measure electrical currents in the expected range.

The NRC staff concludes that the licensee's verifications of the battery manufacturer specifications regarding the use of float current measurement to determine the battery's state of charge and the addition of 2 percent design margin to the battery sizing provide adequate assurance that replacing the specific gravity measurements with the float current monitoring will not have a significant impact on the ability to accurately determine the operability of the batteries. The NRC staff concludes that float current monitoring is a suitable replacement for specific gravity monitoring when used to determine a battery's state of charge.

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, battery performance discharge test, or modified performance discharge test in accordance with the new proposed Battery Monitoring and Maintenance Program in TS 5.5.6.

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.

3.2.3.5 TS 3.8.6; Current Condition A (Revised); Change (5)

Current TS 3.8.6 Condition A states:

A. One or more batteries with one or more battery cell parameters not within Table 3.8.6-1 Category A or B limits.

Revised TS 3.8.6 Condition A would state:

A. One battery with one or more battery cells float voltage < 2.07 V.

Current TS 3.8.6 Required Actions A.1, A.2, and A.3 state:

A.1 Verify pilot cell electrolyte level and float voltage meet Table 3.8.6-1 Category C limits.

AND

A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits.

AND

A.3 Restore battery cell parameters to Table 3.8.6-1 Category A and B limits.

Revised TS 3.8.6 Required Actions A.1, A.2, and A.3 would state:

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.

The current CTs for TS 3.8.6 Required Actions A.1, A.2, and A.3, which state "1 hour," "24 hours AND Once per 7 days thereafter," and "31 days," would be revised and would state: "2 hours," "24 hours," and "24 hours," respectively.

Evaluation of TS 3.8.6; Current Condition A (Revised); Change (5)

Current Condition A applies when one or more batteries is found with one or more battery cell parameters not within Table 3.8.6-1 Category A or B limits. This current Condition A is revised to delete the condition for battery cell parameters not within Table 3.8.6-1 Category A or B limits. This revision is consistent with the elimination of Table 3.8.6-1 from the TS. Therefore, the NRC staff concludes that this change is acceptable.

Revised Condition A would apply when one battery is found with one or more battery cells having a float voltage less than 2.07 V. In its letter dated August 28, 2013, the licensee stated that the float voltage limit of 2.07 V is based on the actual open circuit cell voltage provided by the manufacturer, which is 2.063 V. Condition A contains remedial measures (Required Actions) for the condition of a degraded battery cell. The Required Actions require the licensee to verify: (a) the battery terminal voltage to be greater than or equal to the minimum established float voltage (SR 3.8.4.1), and (b) each battery's float current is less than or equal to 2 amps (SR 3.8.6.1). The above actions ensure that there is still sufficient capacity for the battery to perform its intended function. Continued operations for up to 24 hours are proposed to allow the restoration of the affected cell(s) voltage to greater than or equal to 2.07 V. Based on the information provided by the licensee, the NRC staff concludes that the required actions and completion times are reasonable. In Attachment 6 of the LAR, the licensee provided a commitment to incorporate the minimum established design limit of the battery terminal float voltage into the ANO-1's SAR, providing reasonable assurance that the value will appropriately reflect accurately the design of the plant (see Section 4.0 of this SE for additional discussion regarding regulatory commitments).

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.3.6 TS 3.8.6; New Condition B (Added); Change (6)

New TS 3.8.6 Condition B would state:

B. One battery with float current > 2 amps.

New TS 3.8.6 Required Actions B.1 and B.2 would state:

B.1 Perform SR 3.8.4.1.

AND

B.2 Restore battery float current to ≤ 2 amps.

New TS 3.8.6 CTs for Required Actions B.1 and B.2 would state "2 hours" and "12 hours," respectively.

Evaluation of TS 3.8.6; New Condition B (Added); Change (6)

The proposed new Condition B would be applicable when one battery is found with a float current greater than 2 amps. A float current of greater than 2 amps provides an indication that a partial discharge has occurred. The Required Action B.1 is to verify within 2 hours that the battery terminal voltage is greater than or equal to the minimum established float voltage (SR 3.8.4.1), thus confirming battery charger operability. Required Action B.2 ensures that within 12 hours the battery will be restored to its fully charged condition (i.e., capable of performing its design function) from any discharge that might have occurred due to a temporary loss of the battery charger. By letter dated August 28, 2013, the licensee stated that the ANO-1 Class 1E batteries would be expected to fully recharge in less than 12 hours considering the capacity of the battery chargers (rated for 400 amps) and the relatively small amount of capacity (240 amp-hours) removed from the batteries (rated for 1442 amp-hours at 8-hour rate) within the 2-hour allowed time to place a battery charger on the battery.

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

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.3.7 TS 3.8.6; New Condition C (Added); Change (7)

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

> ----------NOTE----------
> Required Action C.2 shall be completed if electrolyte level was below the top of the plates.
> ----------
>
> C. One battery with one or more cells electrolyte level less than minimum established design limits.

New TS 3.8.6 Required Actions C.1, C.2, and C.3 would state:

> ----------NOTE----------
> Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of the plates.
> ----------
>
> 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.

New TS 3.8.6 CTs for Required Actions C.1, C.2, and C.3 would state: "8 hours," "12 hours," and "31 days," respectively.

Evaluation of TS 3.8.6; New Condition C (Added); Change (7)

The proposed new Condition C would apply when one battery is found with one or more cells with an electrolyte level less than the minimum established design limits. If the electrolyte level is above the top of the battery plates, but below the minimum limit (i.e., minimum level indication mark on the battery cell jar), the battery should still have sufficient capacity to perform its intended safety function. The affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Required Action C.3 restores the electrolyte level to greater than or equal to the minimum established design limits within 31 days.

With the electrolyte level below the top of the plates, there is a potential for dry-out and plate degradation. New Required Actions C.1 and C.2 restore the electrolyte level to above top of the plates within 8 hours and ensure that the cause of the loss of the electrolyte level is not due to a leak in the battery cell jar within 12 hours. These actions are modified by a note that indicates they are only applicable if electrolyte level is below the top of the plates. Additionally, provisions in the new Battery Monitoring and Maintenance Program in TS 5.5.6 initiate actions to equalize and test the battery cells that have been discovered with an electrolyte level below the top of the plates. Therefore, the new Required Actions ensure the batteries will be restored to an operable condition in a timely manner.

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.3.8 TS 3.8.6; New Condition D (Added); Change (8)

The proposed change would add new Condition D to address the electrolyte temperature of a pilot cell. New TS 3.8.6 Condition D would state:

> D. One battery with pilot cell electrolyte temperature less than minimum established design limits.

New Required Action D.1 would state:

> D.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits.

New TS 3.8.6 CT for Required Action D.1 would state: "12 hours."

Evaluation of TS 3.8.6; New Condition D (Added); Change (8)

The proposed new Condition D would apply when one battery is found with a pilot cell electrolyte temperature less than the minimum established design limit. A low electrolyte temperature limits the current and power available from the battery.

In the LAR, the licensee stated that the Class 1E batteries at ANO-1 are sized with 10 to 15 percent design margin as recommended by IEEE Standard 485, "Recommended Practice for Sizing Large Lead Storage Batteries for Generating Station and Substations," 80 percent aging factor and a temperature correction for 60 degrees Fahrenheit (°F). An additional 2 percent design margin will also be maintained to ensure that 100 percent battery capacity is available once charging current is 2 amps or less. Furthermore, by letter dated August 28, 2013, the licensee stated that the battery room temperature is monitored once per 12-hour shift through operator logs and at least once every three hours when an emergency cooling subsystem is operating, that areas just outside the battery rooms are continually monitored in the control room, and that operators respond to trouble alarms in accordance with plant procedures.

Based on the above considerations and the fact that batteries have very large thermal inertia, the NRC staff concludes that it is highly likely that a room temperature excursion would be corrected by the licensee prior to the battery electrolyte reaching its maximum or minimum design temperature.

Due to the use of pilot cell temperature in lieu of average cell temperature and the use of 2.07 V as the minimum limit for cell voltage, changes are necessary in the method pilot cells are selected. By letter dated August 28, 2013, the licensee stated that the pilot cell selection will be based on the lowest cell voltage in accordance with the new Battery Monitoring and Maintenance Program in TS 5.5.6 and will be verified using quarterly data obtained from required surveillance testing.

Based on this information, the NRC staff concludes that the pilot cell temperature is a sufficiently accurate representation of the temperature of the battery bank because: (1) batteries have very large thermal inertia; (2) ANO-1 batteries are designed with sufficient

margins (i.e., temperature, aging, and design); and (3) the licensee monitors and corrects low battery room temperatures. Therefore, the proposed 12-hour CT provides adequate time to restore the electrolyte temperature within established limits.

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.3.9 TS 3.8.6; New Condition E (Added); Change (9)

The proposed change would add new Condition E to address battery parameters. New TS 3.8.6 Condition E would state:

E. Two batteries with battery parameters not within limits.

New Required Action E.1 would state:

E.1 Restore at least one battery to within limits.

New TS 3.8.6 CT for Required Action E.1 would state: "2 hours."

Evaluation of TS 3.8.6; New Condition E (Added); Change (9)

The licensee proposed adding new TS 3.8.6 Condition E to address the condition where two batteries are found with battery parameters not within limits. If this condition exists, there is not sufficient assurance that the batteries will be capable of performing their intended safety function. With redundant batteries involved, loss of function is possible for multiple systems that depend upon the batteries. The licensee proposed that battery parameters for the affected battery in one subsystem be restored to within limits within 2 hours. The NRC staff considers the 2-hour time period to be reasonable considering the potential for loss of function of components that depend on the batteries (i.e., AC vital bus subsystem(s), electrical breaker control/position indication power). Accordingly, a relatively short duration is provided to resolve the condition.

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.3.10 TS 3.8.6; Current Condition B (Revised and Renumbered as Condition F); Change (10)

The proposed change would revise current Condition B to address conditions of battery inoperability and renumbered it as Condition F. Current TS 3.8.6 Condition B states:

> B. Required Action and associated Completion Time of Condition A not met.
>
> OR
>
> One or more batteries with pilot cell or average electrolyte temperature of the representative cells < 60°F.
>
> OR
>
> One or more batteries with one or more battery cell parameters not within Table 3.8.6-1 Category C values.

Revised and renumbered as TS 3.8.6 Condition F would state:

> F. Required Actions and associated Completion Times of Condition A, B, C, D, or E not met.
>
> OR
>
> One battery with one or more battery cells float voltage < 2.07 V and float current > 2 amps.

Current TS 3.8.6 Condition B.1 states:

> B.1 Declare associated battery inoperable.

Revised and renumbered as TS 3.8.6 Condition F.1 would state:

> F.1 Declare associated battery inoperable.

Evaluation of TS 3.8.6; Current Condition B (Revised and Renumbered as Condition F); Change (10)

Current Condition B describes three conditions of battery inoperability. The second entry condition is revised to delete "pilot cell or average electrolyte temperature of the representative cells less than 60°F." The out-of-limit condition for pilot cell electrolyte temperature is covered in the proposed new TS 3.8.6 Condition D. The licensee proposed to monitor pilot cell electrolyte temperature only (new SR 3.8.6.4) instead of the average electrolyte temperature of representative cells (current SR 3.8.6.4). The third entry condition (i.e., battery cells parameters not within Category C limits) is deleted. Deleting the third entry condition is consistent with the elimination of TS Table 3.8.6-1 from the TS. Therefore, the NRC staff concludes the revision of

the second entry condition and the elimination of the third entry condition of current Condition B acceptable.

The revised current Condition B, renumbered as Condition F, provides a default condition for battery parameters that fall outside the allowance of the Required Actions for Condition A, B, C, D, or E. Under this condition, it is assumed that there is insufficient capacity to supply the maximum expected load requirements. Condition F also addresses a new alternate condition where one battery is found with one or more battery cells having a float voltage less than 2.07 V (revised TS 3.8.6 Condition A) and a float current greater than 2 amps (new TS 3.8.6 Condition B). In this case, the battery may not have sufficient capacity to perform its intended design function. The Required Action for either of these entry conditions is to declare the associated battery inoperable immediately. The Required Action and associated CT are reasonable and consistent with battery inoperability specified in new Condition F.

Based on the above, the NRC staff concludes that the proposed change provides acceptable remedial actions as allowed by 10 CFR 50.36 and is, therefore, acceptable.

3.2.3.11 TS 3.8.6; Current SR 3.8.6.1 (Revised); Change (11)

Current SR 3.8.6.1 states:

> Verify battery cell parameters meet Table 3.8.6-1 Category A limits.

Revised SR 3.8.6.1 would state:

> ----------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.

Evaluation of TS 3.8.6; Current SR 3.8.6.1 (Revised); Change (11)

Current SR 3.8.6.1 requires verification of battery cell parameters meeting Table 3.8.6-1 Category A limits. The Category A limits do not represent a condition in which the batteries cannot perform their functions. As discussed in SE Section 3.2.3.3 above, the NRC staff concludes that relocating the TS Table 3.8.6-1 and the remedial actions associated with restoring the battery cell parameters to within limits is acceptable. The proposed change ensures the battery parameters (maintenance, testing, and monitoring levels) are appropriately monitored and maintained in accordance with the new Battery Monitoring and Maintenance Program, as specified in TS Section 5.5.6. Therefore, deleting the requirements of current SR 3.8.6.1 is consistent with the elimination of Table 3.8.6-1 from the TS.

Revised SR 3.8.6.1 would require verification of each battery float current to be 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 stated above in SE Section 3.2.3.4, the use of float current to determine the state of charge of the battery is consistent with the battery manufacturer's recommendations.

This SR is modified by a Note which states that SR 3.8.6.1 is not required to be met when the battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained, the Required Action of LCO 3.8.4 Action A is being taken, which provides the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of 2 amps is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

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.

3.2.3.12 TS 3.8.6; Current SR 3.8.6.2 (Revised); Change (12)

Current SR 3.8.6.2 states:

> Verify electrolyte temperature of the pilot cell is ≥°60°F.

Revised SR 3.8.6.2 would state:

> Verify each battery pilot cell float voltage is ≥ 2.07 V.

Evaluation of TS 3.8.6; Current SR 3.8.6.2 (Revised); Change (12)

Current SR 3.8.6.2 requires verification of the pilot cell electrolyte temperature. The intent of this SR is satisfied with the requirement of the revised SR 3.8.6.4 (see Section 3.2.3.14 of this SE for more details).

Revised SR 3.8.6.2 would require verification of each battery pilot cell float voltage to be greater than or equal to 2.07 V every 31 days. The voltage level represents the point at which battery operability cannot be assured. Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 127.6 V at the battery terminals, or 2.20 Vpc per cell for 58-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 the LAR, the licensee stated that the float voltage at the battery terminals is maintained between 2.20 and 2.25 Vpc. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in the new Battery Monitoring and Maintenance Program in TS 5.5.6. The program includes actions to restore battery cells with float voltage less than 2.13 V and actions to verify that the remaining cells are greater than or equal to 2.13 V when a cell or cells have been found to be less than 2.13 V. The 2.07 V individual cell limit reflects the operability

limit for the batteries. With all battery cells above 2.07 V, there is adequate assurance that the terminal voltage is at an acceptable threshold for establishing battery operability.

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.

3.2.3.13 TS 3.8.6; Current SR 3.8.6.3 (Revised); Change (13)

The proposed change would relocate the minimum established design limits for the battery electrolyte level to a licensee-controlled program. Current SR 3.8.6.3 states:

> Verify battery cell parameters meet Table 3.8.6-1 Category B limits.

Revised SR 3.8.6.3 would state:

> Verify each battery connected cell electrolyte level is greater than or equal to minimum established design limits.

The current frequency for SR 3.8.6.3 states:

> 92 days
>
> AND
>
> Once within 24 hours after a battery discharge < 110 V
>
> AND
>
> Once within 24 hours after a battery overcharge > 145 V

The revised frequency for SR 3.8.6.3 would state:

> 31 days

Evaluation of TS 3.8.6; Current SR 3.8.6.3 (Revised); Change (13)

Current SR 3.8.6.3 requires verification of battery cell parameters meeting Table 3.8.6-1 Category B limits. The Category B limits do not represent a condition in which the batteries cannot perform their functions. As discussed in Section 3.2.3.3 above, the NRC staff concludes that relocating the TS Table 3.8.6-1 and the remedial actions associated with restoring the battery cell parameters to within limits are acceptable. The proposed change ensures the battery parameters (maintenance, testing, and monitoring levels) are appropriately monitored and maintained in accordance with the new Battery Monitoring and Maintenance Program, as specified in TS Section 5.5.6. Therefore, deleting the requirements of current SR 3.8.6.3 is consistent with the elimination of Table 3.8.6-1 from the TS.

Revised SR 3.8.6.3 would require each battery connected cell's electrolyte level to be greater than or equal to the "minimum established design limits." Operation of the batteries at electrolyte levels greater than the minimum established design limit ensures that the battery plates do not suffer physical damage and continue to maintain adequate electron transfer capability. The surveillance frequency of 31 days is consistent with the recommendations provided in IEEE Std. 450-2002.

Relocating the minimum established design limits for the battery electrolyte level to a licensee-controlled program 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 has provided a commitment, as detailed in Attachment 6 of the LAR, to incorporate the minimum established design level limit into the ANO-1 SAR, which will provide additional reasonable assurance that the value will be appropriately maintained by the licensee to accurately reflect the design of the plant battery system (see Section 4.0 for additional discussion regarding regulatory commitments).

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.

3.2.3.14 TS 3.8.6; Current SR 3.8.6.4 (Revised); Change (14)

The proposed change would relocate the minimum established design limits for the pilot cell temperature to a licensee-controlled program. Current SR 3.8.6.4 states:

> Verify average electrolyte temperature of representative cells is ≥ 60°F.

Revised SR 3.8.6.4 would state:

> Verify each battery pilot cell temperature is greater than or equal to minimum established design limits.

The current frequency for SR 3.8.6.4 of "92 days" would be changed to "31 days."

Evaluation of TS 3.8.6; Current SR 3.8.6.4 (Revised); Change (14)

Revised SR 3.8.6.4 would require verifying the pilot cell (versus the average) electrolyte temperature every 92 days. Batteries have very large thermal inertia, ANO-1 batteries are designed with margins to account for factors affecting performance (i.e., temperature, aging), and there is monitoring to maintain optimum battery room temperatures. As a result, the pilot cell temperature is an accurate representation of the temperature of the battery bank and is adequate to ensure that the minimum electrolyte temperature is maintained. The surveillance frequency of 31 days is consistent with the recommendations provided in IEEE Std. 450-2002.

Each pilot cell would be required to be greater than or equal to minimum established design limits. Depending on the available excess capacity of the associated battery, the minimum temperature necessary to support operability of the battery can vary. Relocating the minimum

established design limit for the battery electrolyte temperature to the new Battery Monitoring and Maintenance Program in TS 5.5.6 will allow flexibility to monitor and control this limit at values directly related to the battery ability to perform its intended function. The licensee will also incorporate the minimum established design temperature limit into the ANO-1 SAR, which will also provide additional reasonable assurance that the value will be appropriately maintained by the licensee to accurately reflect the design of the plant battery system.

Based on the above, the NRC staff concludes that the pilot cell temperature is an accurate representation of the temperature of the battery bank. 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.

3.2.3.15 TS 3.8.6; New SR 3.8.6.5 (Added); Change (15)

The proposed change would add new SR 3.8.6.5. New SR 3.8.6.5 would state:

> Verify each battery connected cell float voltage is ≥ 2.07 V.

The frequency for new SR 3.8.6.5 would be "92 days."

Evaluation of TS 3.8.6; New SR 3.8.6.5 (Added); Change (15)

The voltage level of the new SR 3.8.6.5 represents the point at which battery operability cannot be assured. Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 127.6 V at the battery terminals, or 2.20 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self-discharge, which could eventually render the battery inoperable. In the LAR, the licensee stated that the float voltage at the battery terminals is maintained between 2.20 and 2.25 Vpc. Float voltages in this range or less but greater than 2.07 Vpc are addressed in the new Battery Monitoring and Maintenance Program in TS 5.5.6. The program will include actions to restore battery cells with float voltage less than 2.13 V and actions to verify that the remaining cells are greater than or equal to 2.13 V when a cell or cells have been found to be less than 2.13 V. The 2.07 V individual cell limit reflects the operability limit for the batteries. With all battery cells above 2.07 V, there is adequate assurance that that the terminal voltage is at an acceptable threshold for establishing battery operability. The surveillance frequency of 92 days is consistent with the recommendations provided in IEEE Std. 450-2002.

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.

3.2.3.16 TS 3.8.6; New SR 3.8.6.6 (Relocated - Current SR 3.8.4.3); Change (16)

The proposed change would relocate current SR 3.8.4.3 to new SR 3.8.6.6. New SR 3.8.6.6 would state:

> ----------NOTE----------
> This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, 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 or a modified performance discharge test.

The frequency for new SR 3.8.6.6 would state:

> 60 months
>
> AND
>
> 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating
>
> AND
>
> 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating

Evaluation of TS 3.8.6; New SR 3.8.6.6 (Relocated - Current SR 3.8.4.3); Change (16)

The licensee proposed relocating current SR 3.8.4.3 to new SR 3.8.6.6. The purpose of this SR is to demonstrate the operability of the battery; thus, this surveillance is relocated to TS 3.8.6, "Battery Parameters." New SR 3.8.6.6 contains surveillance frequencies based on guidance provided in the IEEE Std. 450-2002. These frequencies are based on the qualified life of safety-related batteries (typically 20 years) and known historical performance characteristics for vented lead-acid batteries. The SR 3.8.6.6 surveillance frequencies will provide adequate data points for trending in order to determine the state-of-health of the safety-related batteries given the expected service life. The surveillance frequencies are appropriate given the condition of the battery, allow sufficient time for corrective actions to be taken, and are consistent with the safety significance of safety-related batteries.

In its letter dated August 28, 2013, the licensee proposed to add the above note, which prohibits performance of new SR 3.8.6.6 in Mode 1, 2, 3, or 4 and allows credit to be taken for unplanned events that satisfy the SR, to the new SR 3.8.6.6. The reason for this note is that performing this SR in the above modes would perturb the electrical distribution system and challenge safety systems. The licensee stated that although the battery service test or performance discharge test is not performed during plant operation, this note is added to the new SR for greater consistency with TSTF-500 changes.

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.

3.2.4 TS 5.5.6, Battery Monitoring and Maintenance Program

The proposed change would add a new Battery Monitoring and Maintenance Program as TS Section 5.5.6. Current TS 5.5.6 states:

(Not Used).

New TS 5.5.6 would state:

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 5.5.6; New Battery Monitoring and Maintenance Program (Added)

The TS Battery Maintenance and Monitoring Program will 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 (listed in TS 5.5.6) are needed to make the RG requirements consistence with the proposed TS requirements, allow reasonable technical approaches, and be applicable to operating plants.

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

In the LAR, the licensee proposed a cell connection resistance limit of 50 micro ohms (μOhms) based on ANO-1 DC voltage drop calculations, which illustrate that the minimum DC voltage is maintained for all required loads assuming a resistance of 50 μOhms per connection. In its letter dated August 28, 2013, the licensee stated that the 50 μOhm limit is the resistance limit for each inter-cell, inter-tier, inter-rack, or terminal cable connection. The licensee also clarified that two resistance measurements are taken for each inter-cell, inter-rack, inter-tier, or terminal cable connection because ANO-1 batteries have two posts per pole. If either of these measurements exceeds the 50 μOhm limit, actions are taken to correct the condition. Furthermore, the licensee stated that the 50 μOhm connection resistance limit significantly minimizes potential

impact to overall battery performance (i.e., maintenance is not delayed to the point where many cells might indicate resistance values greater than that assumed in the calculations).

TS 5.4, "Procedures," requires written procedures be established, implemented, and maintained for the TS 5.5.6 Battery Monitoring and Maintenance Program. The TS 5.5.6 Battery Monitoring and Maintenance Program provides assurance that the battery parameters will be monitored and controlled in accordance with the program, and that actions to restore deficient parameters will be implemented in accordance with the licensee's corrective action program.

The NRC staff concludes that this change 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 Conclusions

Based on the above evaluation, the NRC staff concludes the proposed changes to the ANO-1 TS to adopt TSTF-500, Revision 2, provide assurance of the continued availability of the required DC power to shut down the reactor and to maintain the reactor in a safe condition after an anticipated operational occurrence or a postulated design-basis accident. The NRC staff also concludes that the proposed TS changes are in accordance with 10 CFR 50.36 and meet the intent of GDCs 1, 17, and 18. Therefore, the NRC staff concludes the proposed changes are acceptable.

4.0 REGULATORY COMMITMENTS

In its LAR, Attachment 6, the licensee made the following regulatory commitment, to be implemented with the amendment:

1. Entergy will revise the ANO-1 SAR to include those items described in Attachment 3 of this submittal.

As discussed in Section 4.4.1 of the NRC's Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-101, Revision 4, "License Amendment Review Procedures" (ADAMS Accession No. ML113200053), since commitments made by a licensee in support of a license amendment are not legally binding, the NRC staff's SE should not rely on commitments as a basis for any part of the NRC staff's approval of a proposed amendment. However, the staff may rely on a commitment if it is escalated into an obligation (e.g., license condition) or subsequently incorporated into a mandated licensing basis document (e.g., SAR). As discussed in this SE, the NRC staff has relied, in part, on the above commitment as part of the NRC staff's acceptance of the proposed amendment. Consistent with the guidance in NRR Office Instruction LIC-101, the NRC staff has determined that the commitment should be incorporated into the SAR. As such, the NRC staff has added the following words as a condition of the amendment to ensure that the SAR is revised as part of the amendment implementation:

Implementation of the amendment shall include revision of the Safety Analysis Report as described in Attachment 3 to the licensee's letter dated January 28, 2013.

The NRC staff notes that, following incorporation of the information listed in Attachment 3 into the SAR, future changes to the program will be under the provisions of 10 CFR 50.59.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 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. 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 April 30, 2013 (78 FR 25313). 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 amendment.

7.0 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.

Principal Contributors: A. Foli, NRR/DE/EEEB

Date: November 24, 2014

November 24, 2014

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 1 - ISSUANCE OF AMENDMENT RE: ADOPTION OF TECHNICAL SPECIFICATION TASK FORCE (TSTF) CHANGE TRAVELER TSTF-500, REVISION 2, "DC ELECTRICAL REWRITE – UPDATE TO TSTF-360" (TAC NO. MF0596)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 250 to Renewed Facility Operating License No. DPR-51 for Arkansas Nuclear One, Unit 1. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated January 28, 2013, as supplemented by letter dated August 28, 2013.

The amendment revises TS requirements related to direct current (DC) electrical systems in TS Limiting Condition for Operation (LCO) 3.8.4, "DC Sources - Operating," LCO 3.8.5, "DC Sources - Shutdown," and LCO 3.8.6, "Battery Parameters." A new "Battery Monitoring and Maintenance Program" is being established for TS Section 5.5, "Administrative Controls - Programs and Manuals." These changes are consistent with the NRC-approved Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update to TSTF-360."

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

Sincerely,

/RA/
Andrea E. George, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-313

Enclosures:
1. Amendment No. 250 to DPR-51
2. Safety Evaluation

cc w/encls: Distribution via Listserv

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ADAMS Accession No.: ML14254A133 *via memo

OFFICE	NRR/DORL/LPL4-1/PM	NRR/DORL/LPL4-1/LA	NRR/DE/EEEB/BC*	NRR/DSS/STSB/BC
NAME	AGeorge BSingal for	JBurkhardt	JZimmerman	REIliott MChernoff for
DATE	9/24/14	9/23/14	6/19/14	10/14/14

OFFICE	OGC	NRR/DORL/LPL4-1/BC	NRR/DORL/LPL4-1/PM
NAME	BHarris	MMarkley	AGeorge
DATE	10/21/14	11/21/14	11/24/14

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