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2CAN091301

September 16, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Response to Request for Additional Information
Adoption of Technical Specification Task Force (TSTF)-500, Revision 2
"DC Electrical Rewrite - Update to TSTF-360"
Arkansas Nuclear One, Unit 2
Docket No. 50-368
License No. NPF-6

REFERENCES:

1. Entergy letter dated November 8, 2007, "Pending License Amendment Requests Affected by TSTF-500" (CNRO-2007-00039) (ML# 073180400)

2. Entergy letter dated January 28, 2013, *License Amendment Request – Adoption of Technical Specification Task Force (TSTF)-500, Revision 2, "DC Electrical Rewrite - Update to TSTF-360"* (TAC No. MF0595) (ML13029A770)

3. NRC email dated August 6, 2013, *Arkansas Nuclear One, Unit 2 – Request for Additional Information Regarding License Amendment Request for Adoption of Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, DC Electrical Rewrite – Update to TSTF-360* (TAC No. MF0595) (ML13218A227)

Dear Sir or Madam:

By email (Reference 3) the NRC requested additional information associated with the Entergy Operations, Inc. (Entergy) request to amend the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TS) consistent with TSTF-500, Revision 2. Entergy's response is included in Attachment 1 of this letter.

Changes, as detailed in this letter, to the original Entergy request have been reviewed and Entergy has determined that the changes do not invalidate the no significant hazards consideration included in the Reference 2 letter.

In accordance with 10 CFR 50.91(b)(1), a copy of this application and the reasoned analysis about no significant hazards consideration is being provided to the designated Arkansas state official.

No new commitments have been identified in this letter.

If you have any questions or require additional information, please contact Stephenie Pyle at 479-858-4704.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on September 16, 2013.

Sincerely,

ORIGINAL SIGNED BY JEREMY G. BROWNING

JGB/dbb

Attachments:

1. Response to Request for Additional Information – ANO-2 Adoption of TSTF-500
2. Replacement Technical Specification and Bases Changes (mark-up)
3. Replacement Revised (clean) Technical Specification Pages

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Attachment 1 to

2CAN091301

Response to Request for Additional Information
ANO-2 Adoption of TSTF-500

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
ANO-2 Adoption of TSTF-500

By email dated August 6, 2013 (Reference 2), the NRC requested additional information associated with the Entergy Operations, Inc. (Entergy) request to amend the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TSs) consistent with Technical Specification Task Force (TSTF) Traveler TSTF-500, Revision 2 (Reference 1). Questions provided by the NRC in the subject email are included below, followed by the respective Entergy response.

Electrical Engineering

E1. In Attachment 1, Section 1 of the license amendment request (LAR) dated January 28, 2013, the licensee proposed relocating the requirements of Technical Specification (TS) Table 4.8-2, "Battery Surveillance Requirements," to the new TS 6.5.15, "Battery Monitoring and Maintenance Program."

Please confirm that the Table 4.8-2 Categories A and B values (electrolyte level, float voltage, specific gravity) that will be relocated to TS 6.5.15 will continue to be controlled at their current levels in the Battery Monitoring and Maintenance Program and that action to restore deficient values will be implemented in accordance with the licensee's corrective action program.

Response

Procedures OP-2307.016, "2D-11, 2D-12, & 2D-13 Battery Pilot Cell Test," OP-2403.024, "2D11 Quarterly Surveillance," and OP-2403.023, "2D12 Quarterly Surveillance," verify battery electrolyte level, float voltage, and specific gravity in accordance with current ANO-2 TS Table 4.8-2. These procedures are being used as the basis for developing the new battery program in accordance with proposed TS 6.5.15, "Battery Monitoring and Maintenance Program," required by adoption of TSTF-500. These procedures establish normal operating limits that are conservative to the TS limits, such that corrective action is initiated prior to reaching a TS limit. The procedures require Electrical and Operations supervision to be notified, condition reports be initiated (and work orders, if required), and immediately refers the user to other procedures to correct conditions adverse to quality (procedures to correct temperature, eliminate corrosion, adjust specific gravity, and equalize the battery, as necessary).

E2. In Attachment 1, Section 2.2 of the LAR, the licensee commits to revise the ANO-2 Safety Analysis Report (SAR) to include how a 2 percent design margin for the batteries corresponds to a 2 amperes (amps) float current value indicating that the battery is 98 percent charged.

a) Please provide the bases for the 2-amp float current at which ANO-2 batteries are capable of performing its design function.

b) Please explain how maintaining a "2 percent design margin indicating that the battery is 98 percent charge" will ensure that the ANO-2 safety-related batteries are fully charged (i.e., capable of performing their design function).

Response – Part E2.a

IEEE 450-2002 A.2 states:

> "As the cells approach full charge, the battery voltage rises to approach the charger output voltage, and the charging current decreases. When the charging current has stabilized at the charging voltage for three consecutive hourly measurements, the battery is near full charge. The expected charging current range applicable to each model may be verified by test or in consultation with the manufacturer."

Entergy has verified via the battery manufacturer (C&D) that a charging current ≤ 2 amps is an indication that the battery is at least 98% charged. Therefore, the fully charged float current applicable to the battery model at ANO-2 is 2 amps or less.

Response – Part E2.b

Entergy has verified via the battery manufacturer (C&D) that a charging current ≤ 2 amps is an indication that the battery is at least 98% charged. Therefore, maintaining an additional 2% design margin in the ANO-2 battery sizing calculation is needed to ensure that 100% battery capacity is available once charging current is 2 amps or less. This is equivalent to the battery being 100% charged because the sizing calculation ensures that the battery can perform its safety related function during a design bases event.

E3. In Attachment 4 of the LAR, the licensee proposed TS LCO 3.8.2.3, new Action "a", which would require restoring the battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours when one of the required full capacity chargers is inoperable.

a) Please explain how the licensee would ensure that the battery was returned to its fully charged state, from any discharge that might have occurred due to the charger inoperability, without verifying battery float current.

b) ANO-2 TS LCO 3.8.2.3 existing Action "b" requires the performance of SR 4.8.2.3.a.1 within 1 hour and at least once per 8 hours thereafter when one of the required full capacity chargers is inoperable. Please provide the basis for changing the Completion Time (CT) from 1 hour to 2 hours.

Response – Part E3.a

As discussed in the NRC-approved TSTF-500 TS 3.8.4 Action A Bases, the *capability* of restoring the battery to the fully charged state is verified when float voltage has returned to greater than or equal to the minimum established float voltage. This would require a fully capable battery charger to be placed in service. The Action (as discussed in the Bases) is focused on ensuring a capable battery charger is, or is placed, in service.

With float current beyond limits, Limiting Condition for Operation (LCO) 3.8.3 Action "b" requires verification of float voltage every two hours until float current is restored to ≤ 2 amps. Surveillance Requirement (SR) 4.8.3.1 establishes this float current as an operability limit, which verifies the battery is fully charged (see response to Question 2E.a

above). The SR 4.8.3.1 Bases state that verification of float current represents the "state of charge" of the battery. Therefore, LCO 3.8.3 Action "b" should ensure the battery is returned to the fully charged state.

Notwithstanding the above, Entergy proposes to adopt TSTF-500, LCO 3.8.4, Required Action A.2, which verifies float current is returned to ≤ 2 amps within 12 hours. Adoption of this verification into ANO-2 LCO 3.8.2.3, Action "a.ii" ensures the battery will be verified to be returned to a fully charged state. The current proposed Action "b" requiring verification of float voltage is relabeled as Action "a.i". As a result of these changes, revised markup TS and TS Bases pages are included in Attachment 2 of this letter, and a revised (clean) TS page is included in Attachment 3 of this letter.

Response – Part E3.b

SR 4.8.2.3.a.1 refers to verification of current TS Table 4.8.2 values. This Table is deleted per TSTF-500. Therefore, there is no change from 1 hour to 2 hours in this regard. Nevertheless, neither the 1-hour CT nor the NRC-approved TSTF-500 2-hour CT has an analytical bases. Such time constraints are chosen based on a reasonable expectation that the action can be successfully performed within the stated time, and that the qualitative risk to unit operation is assumed to be reasonably low, given the probability of an accident during any 2-hour period. This is supported by the TSTF-500 Bases for this CT, which states:

> *This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage.*

E4. In Attachment 4 of the LAR, the licensee proposed TS LCO 3.8.2.3, new Actions "b" and "c" with requirements which are to be completed within 2 hours. In TSTF-500, both Conditions B and C are to be included in TS 3.8.4 if the plant design supports different CTs when a battery is inoperable but the charger is operable. Otherwise, only Condition C is used in the TS.

Please provide justification for including both Actions "b" and "c" in TS 3.8.2.3.

Response

Note that the ANO-2 TSs have not been converted to the improved TSs (ITS) contained in NUREG-1432. The non-ITS ANO-2 TS currently contain an Action "a" and "b", similar to Conditions A and B of the ITS. ANO-2 LCO 3.8.2.3 Action "a" also includes the equivalent of ITS LCO 3.8.4 Condition D. Entergy believes it to be inappropriate to combine Actions "a" and "b" since the response to an inoperable battery charger differs from that of an inoperable battery. An inoperable charger requires verification of float voltage and float current. An inoperable battery requires restoration within 2 hours with no other allowance. ANO-2 Action "c" and ITS Condition C cover the loss of the DC bus itself. It is important to recognize that individual scenarios are often necessary in the TSs since a condition not describe would require entry into LCO 3.0.3. In addition, TSTF-500 did not directly add these Conditions; the markup of NUREG 1432, Revision 1, includes the additions, but the markup of NUREG 1432, Revision 3.1, clearly shows these Conditions were already present in ITS prior to TSTF-500 approval.

E5. In Attachment 4 of the LAR, the licensee proposed TS LCO 3.8.2.3, new Action "c" to essentially match TSTF-500, TS 3.8.4 Condition C with 2 hours completion time (CT). The licensee stated that the 2-hour allowed outage time (AOT) is based on Regulatory Guide (RG) 1.93. The staff notes that the licensee omitted RG 1.93 from the Bases for TS LCO 3.8.2.3.

Please clarify whether ANO-2 is committed to RG 1.93 and provide the basis for the 2-hr AOT.

Response

ANO has made no particular commitment to RG 1.93, "Availability of Electrical Power Sources." The RG simply provides information regarding standard out-of-service periods for power sources, including offsite power, onsite AC, and onsite DC. The ANO-2 TSs currently contain AOTs consistent with the RG. The RG also discusses risk assessments of various configurations involving out-of-service power sources and points to the Maintenance Rule. All sites must maintain compliance with the TSs (10 CFR 50.36) and the Maintenance Rule (10 CFR 50.65), which are actual regulatory *requirements* versus regulatory *guidance*. In addition, the NRC accepted the ANO (common) response to Generic Letter 2006-02, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," dated April 19, 2007, which addressed not only offsite power sources, but also station blackout capability.

Based on the above, Entergy believes a commitment to RG 1.93 is unnecessary; nevertheless, Entergy has revised the subject TS Bases to include reference to the RG. A revised markup of the TS Bases page is included in Attachment 2 of this letter.

The 2-hour AOT established for Action "c" is consistent with that already approved for an inoperable battery (current Action "a"), RG 1.93, and the ITS. TS LCOs provide a period of time to take action when equipment important to safety is inoperable. The period of time may support recovery efforts or time to prepare for an orderly shutdown of the unit. Note that the 2-hour ITS Completion Time is not based on analysis, but on a deterministic basis for the plant condition, in light of the reasonable assumption of the low probability of an accident occurring in any 2-hour period. The ITS Bases also applies to ANO-2:

> *If one of the required DC electrical power subsystems is inoperable for reasons other than Condition A or B (e.g., inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of the minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 7) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.*

Based on the above, Entergy believes the 2-hour AOT for one inoperable DC subsystem is reasonable and appropriate for ANO-2.

E6. In Attachment 4 of the LAR, the licensee proposed an alternative criterion for new SR 4.8.2.3.2 which states, "by verifying that 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." 24 hours is bracketed in TSTF-500.

Please explain how 24 hours is applicable to ANO-2.

Response

The 2D-11 and 2D-12 battery duty cycle calculation indicates that the 2D-11 amp-hours utilized during a design basis event (emergency duty cycle) is 1441 amp-hours. For 2D-12, the amp-hours utilized during a design basis event is 1239 amp-hours. Assuming 110% of the amp-hours utilized will need to be replaced to fully recharge the battery, 2D-11 will require 1585 amp-hours (1441 x 1.1) and 2D-12 will require 1363 amp-hours (1239 x 1.1). Using the battery charger surveillance tested capacity of 300 amps (actual battery charger current limit rating is 400 amps) and a continuous DC bus load of 125 amps, 175 amps remain available to recharge the battery (300 amps – 125 amps). Using 2D-11 as an example (worst case), approximately 9.1 hours (1585 amp-hours / 175 amps) are required to recharge 2D-11 assuming the battery would accept the full 175 amps continuously during the recharge. However, because the battery chargers are constant voltage chargers rather than constant current chargers, it is recognized that the battery charging current will taper off from the initial maximum current that the charger can supply to a final value of < 2 amps. ANO does not possess battery recharge current characteristic curves, but it is considered reasonable to expect that the battery would be fully recharged in < 20 hours to < 2 amps charging current given the above charger capacity and approximately 60% – 70% capacity removed from the batteries (2D-11 and 2D-12 batteries, C&D Technologies model LCR-31, are rated for 2069 amp-hours at the 8-hour rate to 1.81 volts-per-cell). This expectation is further supported by NUREG/CR 7148, "Confirmatory Battery Testing: The Use of Float Current Monitoring to Determine Battery State-of-Charge," Figures 3-20 and 3-21, which provide a graph of an LCR-33 battery type recharge at 180 amps, with recharge (< 2 amps) completed within ~20 hours following full 100% depth of discharge at the 4-hour discharge rate (~2000 amp-hours discharged). This battery type is of the same design and just slightly larger (2206 amp-hour at the 8-hour rate vs. 2069 amp-hour) than the ANO-2 LCR-31 type batteries.

E7. In Attachment 4 of the LAR, the licensee proposed SR 4.8.2.3.3 to essentially match TSTF-500 TS SR 3.8.4.3. The proposed SR 4.8.2.3.3 allows the battery performance discharge test required by SR 3.8.3.6 to be performed in lieu of the battery service test once per 60 months.

a) The licensee did not include TS SR 3.8.3.6 in the LAR. Please provide TS SR 3.8.3.6.

b) TSTF-500 TS SR 3.8.4.3 Note 1 allows the modified performance discharge test, not the performance discharge test, to be performed in lieu of the service test. Please provide the technical basis for substituting the battery performance discharge test for the service test.

Response – Part E7.a

The reference in SR 4.8.2.3.3 to SR 3.8.3.6 is incorrect. The correct reference is SR 4.8.3.6. As a result, a revised markup TS page is included in Attachment 2 of this letter, and a revised (clean) TS page is included in Attachment 3 of this letter. No change to the TS Bases is required.

Response – Part E7.b

Substituting the performance discharge test in lieu of the battery service test is currently permitted by the ANO-2 TSs on a once per 60-month interval (see current ANO-2 SR 4.8.2.3.e). The NRC approved this substitution in ANO-2 TS Amendment 54 based on the standards of the time. Entergy is not proposing any new exception to the battery service test not previously approved by the NRC. In addition, TSTF-500 did not add this exception (Note) to the ITS. Entergy is not converting the ANO-2 TS to the ITS version under the proposed amendment to adopt TSTF-500 as such a conversion would be highly complex and well beyond the scope of TSTF-500.

E8. In Attachment 4 of the LAR, the licensee proposed a battery performance discharge test SR 4.8.3.6 with test interval of 60 months, 12 months and 24 months consistent with TSTF-500 TS SR 3.8.6.6. These test intervals are based on guidance provided in the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 450-2002.

a) Please confirm whether ANO-2 is committed to IEEE Std. 450-2002.

b) SR 4.8.3.6.b proposed a 24-month test interval when the battery shows degradation. However, IEEE Std. 450-2002, Section 6.3.c recommends a 24-month test interval when the battery has reached 85 percent of service life with a capacity ≥ 100 percent of manufacture's rating, and has shown no signs of degradation. Please provide justification for the deviation from IEEE Std. 450-2002 recommendation and from TSTF-500.

Response – Part E8.a

Entergy believes no commitment is needed. Adoption of the new Battery Monitoring and Maintenance Program in ANO-2 TS 6.5.15 (in accordance with TSTF-500) requires the batteries to be maintained in accordance with IEEE Std. 450-2002:

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…

Because the TSs represent a license condition and, therefore, regulatory requirement, a commitment to the subject IEEE is not required.

Response – Part E8.b

No deviation was intended. Entergy is removing the “no degradation” wording from SR 4.8.3.6.b. The original markup of the associated TS Bases correctly incorporated the TSTF-500 requirement; therefore, no change to the TS Bases markup page is necessary. A revised markup TS page is included in Attachment 2 of this letter, and a revised (clean) TS page is included in Attachment 3 of this letter.

E9. In Attachment 4 of the LAR, the licensee proposed TS LCO 3.8.2.4 Action “a” which applies when the required battery charger is inoperable to adopt the 2 hours completion time of TSTF-500 TS 3.8.5, Condition A, Required Action (RA) A.1. The licensee stated that the 2-hour period would provide time for the standby charger to be placed in service before more restrictive actions would be required to be implemented. TSTF-500 TS 3.8.5, Condition A applies to redundant subsystems and is included only when the plant-specific implementation of TS 3.8.5 may require both subsystems of the DC electrical power system to be operable.

a) ANO-2 TS LCO 3.8.2.4 requires only one DC electrical power subsystem to be operable in Modes 5 and 6. Please provide justification for adopting new LCO 3.8.2.4 Action “a”.

b) ANO-2 TS LCO 3.8.2.4, Action “a” requires restoring the battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours when the required battery charger is inoperable. Please explain how the licensee would ensure that the battery was returned to its fully charged state from any discharge that might have occurred due to the charger inoperability.

Response – Part E9.a

The following ANO-2 TSs are applicable in Mode 5 and/or 6 and, depending on plant conditions, could require two DC trains to support operability of these structures, systems, or components (SSCs):

LCO 3.7.6.1 "Control Room Emergency Ventilation and Air Conditioning System"

LCO 3.9.2 "Instrumentation” (Source Range Neutron Flux Monitors)

The standard TS (NUREG 1432) NRC-approved Bases associated with DC Sources – Shutdown, state that the assumption of single failure or concurrent loss of offsite power is not required when the unit is shutdown. In this regard, many of the above LCOs can be met via a single DC train. In lieu of discussing each individual LCO listed above, the question permits focusing on any example that would require two independent trains of DC electrical power subsystems to be available while operating in Mode 5 or 6.

One example is LCO 3.7.6.1, which requires both Control Room Emergency Ventilation System (CREVS) trains to be operable during the movement of irradiated fuel assemblies. This provides radiological protection for station Operators should a fuel handling accident occur, regardless of the plant operating mode. This restriction applies to the movement of irradiated fuel in the Spent Fuel Pool (SFP) area as well as in the

reactor cavity or refueling canal. In addition, the CREVS trains are shared with ANO, Unit 1 (ANO-1). ANO-1 is normally operating in Mode 1 when ANO-2 is in a shutdown condition. Like the ANO-2 TSs, the corresponding ANO-1 CREVS LCO requires two CREVS trains to be operable in Modes 1-4 and during the movement of irradiated fuel. Because single failure criterion is required to be met when operating in Modes 1-4, the SSCs which support CREVS operability must be operable and independent. Therefore, two independent DC electrical power subsystems must be operable to meet the aforementioned CREVS LCOs in nearly all operating conditions. The only exception would be if both units were operating in Mode 5 or 6 simultaneously and no fuel movement were in progress on either unit.

ANO-2 LCO 3.8.2.4 does not specifically address the possible need for two trains of DC equipment in Modes 5 and 6 (other than the phrase "As a minimum…" in the LCO statement); however, the TS definition of operability requires all necessary power and support SSCs to be operable to support operability of the subject TS component. In the example above, a CREVS train that does not have an operable DC power train supporting its operability would be declared inoperable and the associated actions of LCO 3.7.6.1 entered accordingly.

Response – Part E9.b

See response to Question E3.a above. Entergy proposes to adopt TSTF-500, LCO 3.8.5, Required Action A.2, which verifies float current is returned to ≤ 2 amps within 12 hours. Adoption of this verification into ANO-2 LCO 3.8.2.4, new Action "a.ii" ensures the battery will be verified to be returned to a fully charged state. The current proposed Action "a" requiring verification of float voltage is relabeled as Action "a.i". As a result of these changes, revised markup TS and TS Bases pages are included in Attachment 2 of this letter, and a revised (clean) TS page is included in Attachment 3 of this letter.

E10. In Attachment 4 of the LAR, the licensee proposed adding new Action "d" to TS 3.8.3 which would apply to a battery found with a pilot cell electrolyte temperature less than the minimum established design limits. The requirements associated with new Action "d" would require the licensee to restore the pilot cell electrolyte temperature to greater than or equal to minimum established design limits within 12 hours.

a) Please discuss how the battery room temperature is periodically monitored at ANO-2 and provide the minimum frequency at which the temperature of the battery room is monitored.

b) Please explain how the licensee would restore battery room temperature if it was outside the temperature design limits.

c) Provide the method of selection of pilot cells at ANO-2.

Response – Part E10.a

Thermometers, controlled in accordance with the ANO Maintenance & Test Equipment (M&TE) program, are installed in each vital battery room. Operation's logs require verification of room temperature to be between 65 °F and 105 °F once every shift.

Response – Part E10.b

The battery rooms are cooled via respective vital-powered exhaust fans (the red battery room has both a red and green train powered fan) that draw cool air into the room from the surrounding vital electrical area. The surrounding area is normally supplied by non-vital Auxiliary Building Supply Fan 2 2VSF-7B, which contains a heating and cooling coil. OP-2104.035, "Ventilation System Operations," Attachment G, provides guidance to control battery room temperature between 70 °F (10 °F above operability limit) and 105 °F when one or more exhaust fans are out of service. This can include the use of fans in adjacent areas, opening doors, or installation of temporary blowers. Similar guidance is provided in OP-2107.004, "DC Electrical System Operation," where more frequent room temperature monitoring is required once every 2 hours under certain equipment configurations.

Low room temperatures may also be offset by opening doors to surrounding areas if those areas, at the time of the condition, are warmer than that of the battery rooms. The battery room exhaust fans may also be secured, along with surrounding area cooling subsystems as necessary. Plant heating water would also be verified to be operating properly with respect to area supply fans that incorporate both cooling and heating coils.

Response – Part E10.c

In accordance with the battery monitoring and maintenance program, which is proposed for inclusion in new ANO-2 TS 6.5.15 in accordance with TSTF-500, the cell having the lowest voltage will be selected as the pilot cell. Pilot cell selection will be verified using quarterly data obtained from required surveillance testing.

E11. In Attachment 4 of the LAR, the licensee proposed TS 3.8.2.4, Action 'b' that does not include the required actions (RAs) B.1 to declare affected required feature(s) inoperable immediately and B.2.4 to initiate action to restore required DC electrical power subsystems to operable status immediately of TSTF-500 TS 3.8.5.

Provide justification for the deviation from TSTF-500 TS 3.8.5.

Response

TSTF-500 did not add the action to declare required features inoperable or to immediately initiate action to restore the subject DC equipment. In addition, Entergy is not converting the ANO-2 TS to ITS under the proposed amendment to adopt TSTF-500; such a conversion would be highly complex and well beyond the scope of TSTF-500.

RA B.1 is associated with the wording of the ITS LCO, which requires DC equipment to be operable in support of features associated with ITS LCO 3.8.10. ANO-2 has no ITS LCO 3.8.10 equivalent. In addition, the TS Definition of Operable/Operability requires normal and emergency power sources to be Operable if the supported equipment is to be considered Operable. Therefore, the loss of any TS power source requires verification of supported equipment operability with or without RA B.1. With regard to RA B.2.4, a loss of all DC is of significance and station process inherently require immediate action to restore at least one DC train, with or without a specific TS action providing such direction.

Based on the above, Entergy believes no deviation from TSTF-500 exists with respect to the subject RAs because:

- Adoption of the subject RAs are beyond the scope of TSTF-500,
- Equivalent action is enveloped within TS usage rules or station processes, and
- Entergy is not converting the ANO-2 TSs to the ITS under this amendment request.

Technical Specifications

TS1. The battery manufacturer letter does not refer specifically to either ANO Unit 1 or 2. Please provide the basis for applying this letter to ANO-2?

Response

Entergy contacted the vendor and confirmed that the letter is applicable to both ANO units (i.e., both the ANO-1 LCR 21 and ANO-2 LCR 31 battery types).

TS2. There are two unexplained references to ANO-1 in the Assessment section of the LAR. Please clarify their purpose.

a) Paragraph "LCO 3.8.5 – RAs A.2 and A.3" (page 4 of Attachment 1)

b) Last paragraph on page 5 in Attachment 1, along with reference to an ANO-1 LCO number.

Response

Paragraph "LCO 3.8.5 – RAs A.2 and A.3" (Page 4 of Attachment 1) should reference "ANO-2." The last paragraph on Page 5 in Attachment 1, along with reference to an ANO-1 LCO number, should reference "ANO-2" and LCO number "3.8.2.4."

TS3. The proposed SR 4.8.2.3.3 last sentence states, "The battery performance discharge test required by Surveillance Requirement 3.8.3.6 may be performed in lieu of the battery service test once per 60 months." Since ANO-2 Surveillance Requirements all begin with "4," is "3.8.6.3" a typographical error? If not, please explain.

Response

Please see response to Question E7, Part 'a', above.

TS4. TSTF-500 removed the performance discharge test frequency “once per 60 months” from SR 3.8.4.3. Please explain the basis for its inclusion in proposed SR 4.8.2.3.3.

Response

The TSTF refers to the “modified” performance discharge test. The NRC approved substituting the performance discharge test in lieu of the battery service test for ANO-2 on a once per 60-month basis. Because Entergy is not converting the ANO-2 TSs to the ITS version at this time, it is believed that the current NRC-approved requirement (tied to a 60-month basis) be retained (also see response to Question E7, Part ‘b’, above).

TS5. The approved TSTF-500 TS 3.8.6 Actions note states, “Separate Condition entry is allowed for each battery.” Please provide the basis for not including it in the proposed TS 3.8.3.

Response

The Action Note was not added by TSTF-500. Entergy is not converting the ANO-2 TS to the ITS version under the proposed amendment to adopt TSTF-500 as such a conversion would be highly complex and well beyond the scope of TSTF-500. In addition, the associated Actions are very component and train specific (i.e., each Action refers to either one or both train components); therefore, it is unclear as to the purpose of the reference Action Note in light of the specific Action wording.

TS6. TSTF-500 Conditions 3.8.6.A, 3.8.6.B, and 3.8.6.C each have “and” between all of the Required Action statements explicitly indicating that each sub-action is required. Proposed Actions 3.8.3.a, 3.8.3.b, and 3.8.3.c do not have “and” linking the respective sub-action statements. Please explain the purpose of and basis for this deviation.

Response

The “and” connector has been added in response to this question. As a result, a revised markup TS page is included in Attachment 2 of this letter, and a revised (clean) TS page is included in Attachment 3 of this letter. This change did not impact the associated TS Bases page.

TS7. Proposed Action 3.8.3.e contains the phrase, “With both batteries with battery parameters not within limits...” TSTF-500 Condition 3.8.6E uses, “One or more batteries in redundant subsystems with battery parameters not within limits.” Please explain this deviation and provide the basis for it, since “one or more” is not equivalent to “both.” (Note: in submitted Bases 3/4.8 changes, the first paragraph on page B 3/4 8-13 also begins, “With both batteries…”)

Response

TSTF-500 Condition 3.8.6E clearly states that the Action is associated with batteries on "redundant" (both) trains being affected. The purpose of the TSTF wording is to envelope those plants that have more than one battery in each train. ANO-2 has only one battery in each train; therefore, the intent of Condition E is met by inserting the term "both" in lieu of "one or more." The wording proposed by Entergy eliminates potential confusion for Operators since it would not be clear why an ANO-2 TS would refer to more than one battery in a given train.

TS8. TSTF-500 TS SR 3.8.6.6 states, in part: "…24 months when battery has reached [85] percent of the expected life with capacity ≥ 100 percent of manufacturer's rating." Proposed SR 4.8.3.6.b states, "At least once per 24 months when battery shows degradation, or has reached 85 percent of the expected life with capacity ≥ 100 percent of manufacturer's rating." Please explain the basis for this deviation. (Note: the proposed SR conflicts with the submitted Bases changes in the last paragraph on page B 3/4 8-14.)

Response

Please see response to Question E8, Part 'b', above.

Summary

Based on changes proposed above, Entergy requests the corresponding TS and TS Bases markup pages, and the corresponding TS revised (clean) pages contained in the original ANO-2 LAR (Reference 1) be replaced with those included in Attachments 2 and 3 of this letter.

5.0 REFERENCE

1. Entergy letter dated January 28, 2013, *License Amendment Request – Adoption of Technical Specification Task Force (TSTF)-500, Revision 2, "DC Electrical Rewrite - Update to TSTF-360"* (TAC No. MF0595) (ML13029A770)

2. NRC email dated August 6, 2013, *Arkansas Nuclear One, Unit 2 – Request for Additional Information Regarding License Amendment Request for Adoption of Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, DC Electrical Rewrite – Update to TSTF-360* (TAC No. MF0595) (ML13218A227)

Attachment 2 to

2CAN091301

Replacement Technical Specification and Bases Changes (mark-up)

D.C. SOURCESDISTRIBUTION – OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 As a minimum, Tthe Train A and Train Bfollowing D.C. electrical power subsystemssources shall be OPERABLE.:

TRAIN "A" consisting of 125-volt D.C. bus No. 1, 125-volt D.C. battery bank No. 1 and a full capacity charger.

TRAIN "B" consisting of 125-volt D.C. bus No. 2, 125-volt D.C. battery bank No. 2 and a full capacity charger.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

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

ab. With one of the required full capacity chargers inoperable:,

i. Restore the battery terminal voltage to greater than or equal to the minimum established float voltagedemonstrate the OPERABILITY of its associated battery bank by performing Surveillance Requirement 4.8.2.3.a.1 within 2one hours and at least once per 8 hours thereafter. If any Category A limit in Table 4.8-2 is not met, declare the battery inoperable, and

ii. Verify battery float current ≤ 2 amps once per 12 hours.

c. With one DC electrical power subsystem inoperable for reasons other than ACTION 'a' or 'b' above, restore the inoperable DC electrical power subsystem to OPERABLE status within 2 hours.

Otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

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

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

1. The parameters in Table 4.8-2 meet the Category A LIMITS, and

2. tThe total battery terminal voltage is greater than or equal to the minimum established float voltage129 volts on float charge for a 60 cell battery bank and greater than or equal to 124.7 volts on float charge for a 58 cell battery bank.

b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110 volts, or battery overcharge with battery terminal voltage above 150 volts, by verifying that:

1. The parameters in Table 4.8-2 meet the Category B LIMITS,

2. ~~There is no visible corrosion at battery terminals and connectors, or the connection resistance of these items is ≤ 150 x 10^{-6} ohm, and~~

3. ~~The average electrolyte temperature of 12 of the connected cells is above 60°F.~~

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

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

2. ~~The cell-to-cell and terminal connections are clean, tight, and coated with anti-corrosion material,~~

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

4. each~~The~~ battery charger ~~will~~ supplies~~y~~ ≥ 300 amp~~ere~~s at greater than or equal to the minimum established float voltage~~≥ 125 volts~~ for ≥ 8 hours or, by verifying that 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.

4.8.2.3.3~~d.~~ At least once per 18 months~~, during shutdown,~~ by verifying that the battery capacity is adequate to supply, and maintain in OPERABLE status, ~~all of~~ required~~the actual or simulated~~ emergency loads for the design duty cycle when ~~the battery is~~ subjected to a battery service test. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this Surveillance. The battery performance discharge test required by Surveillance Requirement 4.8.3.6 may be performed in lieu of the battery service test once per 60 months.

~~e. At least once per 60 months, during shutdown, by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. Once per 60-month interval this performance discharge test may be performed in lieu of the battery service test.~~

~~f. At least once per 18 months, during shutdown, performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.~~

D.C. SOURCESDISTRIBUTION – SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.4 As a minimum, the following D.C. electrical equipment and bus shall be energized and OPERABLE:

1 - 125-volt D.C. bus, and

1 - 125-volt battery bank and charger supplying the above D.C. bus.

APPLICABILITY: MODES 5 and 6.

ACTION:

a. With the required battery charger inoperable:

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

ii. Verify battery float current ≤ 2 amps once per 12 hours.

b. With the requirements of ACTION 'a' not met or withless than the above complement of D.C. equipment and bus otherwise inoperableOPERABLE, immediately suspend the movement of recently irradiated fuel assemblies, the movement of new fuel assemblies over recently irradiated fuel assemblies, and operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

SURVEILLANCE REQUIREMENTS

4.8.2.4.1 The above required 125-volt D.C. bus shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and indicated power availability.

4.8.2.4.2 The above required 125-volt battery bank and charger shall be demonstrated OPERABLE per Surveillance Requirements 4.8.2.3.1, 4.8.2.3.2, and 4.8.2.3.3; however, while each of these Surveillance Requirements must be met, Surveillance Requirements 4.8.2.3.2 and 4.8.2.3.3 are not required to be performed.

ELECTRICAL POWER SYSTEMS

BATTERY PARAMETERS

LIMITING CONDITION FOR OPERATION

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

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

ACTION:

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

   i. Within 2 hours perform Surveillance Requirements 4.8.2.3.1 and 4.8.3.1, and

   ii. Within 24 hours restore affected cell voltage to ≥ 2.07 V.

b. With one battery with float current > 2 amps:

   i. Within 2 hours perform Surveillance Requirement 4.8.2.3.1, and

   ii. Within 12 hours restore battery float current to ≤ 2 amps.

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

   i. Within 8 hours restore electrolyte level to above top of plates[1], and

   ii. Within 12 hours verify no evidence of leakage[1], and

   iii. Within 31 days restore electrolyte level to greater than or equal to minimum established design limits.

d. With one battery with pilot cell electrolyte temperature less than minimum established design limits, restore battery pilot cell electrolyte temperature to greater than or equal to minimum established design limits within 12 hours.

e. With both batteries with battery parameters not within limits, restore battery parameters for at least one battery to within limits within 2 hours.

f. With the requirements of ACTION 'a', 'b', 'c', 'd', or 'e' not met, or with one battery with one or more battery cells float voltage < 2.07 V and float current > 2 amps, immediately declare the battery inoperable.

Note 1: Only required if electrolyte level is below the top of the plates. If electrolyte level is below the top of the plates, ACTION c.ii shall be performed.

SURVEILLANCE REQUIREMENTS

4.8.3.1 At least once per 7 days by verifying that each battery float current is ≤ 2 amps. This Surveillance is not required when battery terminal voltage is less than the minimum established float voltage of Surveillance Requirement 4.8.2.3.1.

4.8.3.2 At least once per 31 days by verifying that each battery pilot cell float voltage is ≥ 2.07 V.

4.8.3.3 At least once per 31 days by verifying that each battery connected cell electrolyte level is greater than or equal to minimum established design limits.

4.8.3.4 At least once per 31 days by verifying that each battery pilot cell temperature is greater than or equal to minimum established design limits.

4.8.3.5 At least once per 92 days by verifying that each battery connected cell float voltage is ≥ 2.07 V.

4.8.3.6 At least once per 60 months by verifying the battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this Surveillance. In addition to the 60-month test interval, the performance discharge test shall be performed:

a. At least once per 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating, and

b. At least once per 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating.

The 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 optimally charge the battery. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Leadcalcium batteries have recharge efficiencies of greater than 95%, so once at least 105% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery. ~~TS 3.8.2.3 ACTION b requires the performance of SR 4.8.2.3.a.1 within one hour and at leastonce per 8 hours thereafter for a loss of one of the required full capacity chargers. If any Category A limit in Table 4.8-2 is not met while a charger is inoperable, the associated battery bank shall be declared inoperable and ACTION a entered. The Category A limits in Table 4.8-2 specify the normal limits for electrolyte level, float voltage and specific gravity for each designated pilot cell. When TS 3.8.2.3 ACTION b is entered without the associated battery bank being on float (i.e. charger not connected to the bus), pilot cell float voltage is determined by measuring pilot cell voltage. The term "full capacity charger" as used in TS 3.8.2.3 is defined as a charger that is capable of supplying an output of ≥ 300 amperes.~~

TS 3.8.2.3 DC Sources – Operating

ACTION "a" represents one subsystem with one battery charger inoperable (e.g., the voltage limit of SR 4.8.2.3.1 is not maintained). The ACTION provides a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. ACTION "a.i" requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the battery will be restored to its fully charged condition (ACTION "a.ii") from any discharge that might have occurred due to the charger inoperability.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

If established battery terminal float voltage cannot be restored to greater than or equal to the minimum established float voltage within 2 hours, and the charger is not operating in the

current-limiting mode, a faulty charger is indicated. A faulty charger that is incapable of maintaining established battery terminal float voltage does not provide assurance that it can revert to and operate properly in the current limit mode that is necessary during the recovery period following a battery discharge event that the DC system is designed for.

If the charger is operating in the current limit mode after 2 hours, that is an indication that the battery is partially discharged and its capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (ACTION “a.ii”).

ACTION “a.ii” requires that the battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it is now fully capable of supplying the maximum expected load requirement. The 2-amp value is based on returning the battery to 98% charge and assumes a 2% design margin for the battery. If at the expiration of the initial 12-hour period the battery float current is not less than or equal to 2 amps, this indicates there may be additional battery problems and the battery must be declared inoperable.

ACTION “b” represents one subsystem with one battery inoperable. With one battery inoperable, the DC bus is being supplied by the OPERABLE battery chargers. Any event that results in a loss of the AC bus supporting the battery charger will also result in loss of DC to that subsystem. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output circuit breakers, etc.) likely rely upon the battery. In addition the energization transients of any DC loads that are beyond the capability of the battery charger and normally require the assistance of the battery will not be able to be brought online. The 2-hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.2.3, 3.8.2.4, and 3.8.3 together with additional specific AOTs.

ACTION “c” represents one subsystem with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected subsystem. The 2-hour limit is consistent with the allowed time for an inoperable DC distribution subsystem.

If one of the required DC electrical power subsystems is inoperable for reasons other than ACTION “a” or “b” (e.g., inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of the minimum necessary DC electrical subsystems to mitigate a worst case accident, continued power operation should not exceed 2 hours. The 2-hour AOT is based on Regulatory Guide (RG) 1.93 and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

If the inoperable DC electrical power subsystem cannot be restored to OPERABLE status within the required AOT, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within the following 30 hours. The AOTs are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. The AOT to bring the unit to MODE 5 is consistent with the time required in RG 1.93.

Cascading to other TSs is not required solely due to a single station battery inoperability. In accordance with TS 3.0.5, the DC bus remains OPERABLE if its redundant power source (vital AC source via its battery charger) is OPERABLE and the redundant DC bus is fully OPERABLE (both vital AC and DC are available to supply the bus). Therefore, all DC loads associated with the affected train, including the respective EDG, remain OPERABLE. The 2-hour restoration period sufficiently takes into account the importance of the battery source and the vulnerability of supported equipment when a battery bank is out of service.

A performance discharge test may be performed in lieu of a service test. The performance discharge test required by SR 3.8.3.6 may be performed in lieu of the battery service test on a once per 60-month basis.

TS 3.8.2.4 DC Sources – Shutdown

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

ACTION “a”, similar to that of TS 3.8.2.3, provides the opportunity to place the standby battery charger in service to restore the battery terminal voltage to greater than or equal to the minimum established float voltage, when degradation or inoperability is associated with an in-service battery charger. The ACTION provides a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Refer to TS 3.8.2.3 ACTION “a” Bases for further detail. The 2-hour AOT also may be utilized to place the redundant train or subsystem in service. With the time requirement of ACTION “a” not met or with the required DC distribution system otherwise inoperable, actions must be taken to suspend the movement of recently irradiated fuel assemblies (i.e., fuel that has occupied part of a critical reactor core within the previous 100 hours), the movement of new fuel assemblies over recently irradiated fuel assemblies, and activities that could result in loss of required SDM (Mode 5) or boron concentration (Mode 6), which act to minimize the probability of the occurrence of postulated events. Suspension of these activities shall not preclude placing fuel assemblies in a safe position. Due to radioactive decay, AC/DC electrical power and associated distribution systems are only required to mitigate fuel handling accidents involving movement of recently irradiated fuel assemblies (i.e., fuel that has occupied part of a critical reactor core within the previous 100 hours) or the movement of new fuel assemblies over recently irradiated fuel assemblies.

Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

SR 4.8.2.4.2 relies on SRs 4.8.2.3.1, 4.8.2.3.2, and 4.8.2.3.3 to demonstrate OPERABILITY of the required shutdown DC source. While all three SRs must be met, SRs 4.8.2.3.2 and 4.8.2.3.3 are not required to be performed. Due to the long period of time in which an outage may ensue, the specified Frequency of SRs 4.8.2.3.2 and 4.8.2.3.3 may expire prior to restart. Provided these SRs were satisfactorily met when previously performed and no modifications or maintenance have occurred that would require these tests to be performed to verify OPERABILITY, the SRs are not required to be performed in MODE 5 or 6 solely due to expiration of the specified Frequency.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. Credit may be taken for unplanned events that satisfy this SR.

REFERENCES

1. SAR, Chapters 8 and 14.

2. 10 CFR 50.36.

3. IEEE-450-1995, "Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications."

Attachment 3 to

2CAN091301

Replacement Revised (clean) Technical Specification Pages

ELECTRICAL POWER SYSTEMS

DC SOURCES – OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 The Train A and Train B DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one of the required full capacity chargers inoperable:

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

   ii. Verify battery float current ≤ 2 amps once per 12 hours.

b. With one of the required battery banks inoperable, restore the inoperable battery bank to OPERABLE status within 2 hours.

c. With one DC electrical power subsystem inoperable for reasons other than ACTION ‘a’ or ‘b’ above, restore the inoperable DC electrical power subsystem to OPERABLE status within 2 hours.

Otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

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

SURVEILLANCE REQUIREMENTS (Continued)

4.8.2.3.2 At least once per 18 months by verifying that each battery charger supplies ≥ 300 amps at greater than or equal to the minimum established float voltage for ≥ 8 hours or, by verifying that 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.

4.8.2.3.3 At least once per 18 months by verifying that the battery capacity is adequate to supply, and maintain in OPERABLE status, required emergency loads for the design duty cycle when subjected to a battery service test. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this Surveillance. The battery performance discharge test required by Surveillance Requirement 4.8.3.6 may be performed in lieu of the battery service test once per 60 months.

ELECTRICAL POWER SYSTEMS

DC SOURCES – SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.4 As a minimum, the following DC electrical equipment and bus shall be energized and OPERABLE:

1 - 125-volt DC bus, and

1 - 125-volt battery bank and charger supplying the above DC bus.

APPLICABILITY: MODES 5 and 6.

ACTION:

a. With the required battery charger inoperable:

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

ii. Verify battery float current ≤ 2 amps once per 12 hours.

b. With the requirements of ACTION 'a' not met or with the above complement of DC equipment and bus otherwise inoperable, immediately suspend the movement of recently irradiated fuel assemblies, the movement of new fuel assemblies over recently irradiated fuel assemblies, and operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

SURVEILLANCE REQUIREMENTS

4.8.2.4.1 The above required 125-volt D.C. bus shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and indicated power availability.

4.8.2.4.2 The above required 125-volt battery bank and charger shall be demonstrated OPERABLE per Surveillance Requirements 4.8.2.3.1, 4.8.2.3.2, and 4.8.2.3.3; however, while each of these Surveillance Requirements must be met, Surveillance Requirements 4.8.2.3.2 and 4.8.2.3.3 are not required to be performed.

ELECTRICAL POWER SYSTEMS

BATTERY PARAMETERS

LIMITING CONDITION FOR OPERATION

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

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

ACTION:

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

   i. Within 2 hours perform Surveillance Requirements 4.8.2.3.1 and 4.8.3.1, and

   ii. Within 24 hours restore affected cell voltage to ≥ 2.07 V.

b. With one battery with float current > 2 amps:

   i. Within 2 hours perform Surveillance Requirement 4.8.2.3.1, and

   ii. Within 12 hours restore battery float current to ≤ 2 amps.

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

   i. Within 8 hours restore electrolyte level to above top of plates[1], and

   ii. Within 12 hours verify no evidence of leakage[1], and

   iii. Within 31 days restore electrolyte level to greater than or equal to minimum established design limits.

d. With one battery with pilot cell electrolyte temperature less than minimum established design limits, restore battery pilot cell electrolyte temperature to greater than or equal to minimum established design limits within 12 hours.

e. With both batteries with battery parameters not within limits, restore battery parameters for at least one battery to within limits within 2 hours.

f. With the requirements of ACTION ‘a’, ‘b’, ‘c’, ‘d’, or ‘e’ not met, or with one battery with one or more battery cells float voltage < 2.07 V and float current > 2 amps, immediately declare the battery inoperable.

Note 1: Only required if electrolyte level is below the top of the plates. If electrolyte level is below the top of the plates, ACTION c.ii shall be performed.

SURVEILLANCE REQUIREMENTS

4.8.3.1 At least once per 7 days by verifying that each battery float current is ≤ 2 amps. This Surveillance is not required when battery terminal voltage is less than the minimum established float voltage of Surveillance Requirement 4.8.2.3.1.

4.8.3.2 At least once per 31 days by verifying that each battery pilot cell float voltage is ≥ 2.07 V.

4.8.3.3 At least once per 31 days by verifying that each battery connected cell electrolyte level is greater than or equal to minimum established design limits.

4.8.3.4 At least once per 31 days by verifying that each battery pilot cell temperature is greater than or equal to minimum established design limits.

4.8.3.5 At least once per 92 days by verifying that each battery connected cell float voltage is ≥ 2.07 V.

4.8.3.6 At least once per 60 months by verifying the battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test. This Surveillance shall not be performed in MODE 1, 2, 3, or 4. However, credit may be taken for unplanned events that satisfy this Surveillance. In addition to the 60-month test interval, the performance discharge test shall be performed:

a. At least once per 12 months when battery shows degradation, or has reached 85% of the expected life with capacity < 100% of manufacturer's rating, and

b. At least once per 24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating.