Entergy

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April 27, 2005
JAFP-05-0082

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

**SUBJECT:** **James A. FitzPatrick Nuclear Power Plant**
**Docket No. 50-333**
**Technical Specification Amendment to DC Electrical System Requirements**

Gentlemen:

Pursuant to 10 CFR 50.90, Entergy Nuclear Operations, Inc. (ENO) is submitting a request for amendment to the Technical Specifications (TS) for the James A. FitzPatrick Nuclear Power Plant (JAFNPP).

The proposed amendment would change specifications 3.8.4, 3.8.5 and 3.8.6, all of which deal with the DC electrical system. These changes are based on TS Task Force (TSTF) Change Traveler TSTF-360 (Revision 1) that has been approved generically for the boiling water reactor (BWR) Standard TS, NUREG-1433 (BWR/4).

There are no commitments made by the Licensee in this letter.

Attachment 1 provides a description and justification of the proposed changes.
Attachment 2 provides the no significant hazards consideration and environmental assessment.
Attachment 3 provides typed TS pages with the proposed changes incorporated.
Attachment 4 provides the existing TS pages marked-up to show the proposed changes.
Attachment 5 provides a draft copy of the associated TS Bases pages marked-up to show the proposed changes.

ENO requests approval of the proposed license amendment by February 15, 2006, with the amendment being implemented within 60 days. The requested approval date and implementation period will allow sufficient time for effective planning and scheduling of affected activities associated with this proposed amendment. Although the associated TS Bases change does not require NRC approval, a marked-up copy has been included with this transmittal for your convenience.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated New York State Official.

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Should you have any questions concerning this letter, please contact Mr. Richard Plasse at (315) 349-6793.

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

Executed on this the 26th day of May, 2005.

Sincerely,

T. A. Sullivan
Site Vice President

Attachments:
1. Description and Assessment
2. No Significant Hazards Consideration and Environmental Assessment
3. Proposed Technical Specification Pages (Retyped)
4. Proposed Technical Specification Changes (Mark-Up)
5. Proposed Technical Specification Bases Changes (Mark-Up)

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Attachment 1 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

**Description and Assessment**

Attachment 1 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

**Description and Assessment**

## 1.0 INTRODUCTION

The proposed license amendment requests new actions for an inoperable battery charger and alternate battery charger testing criteria for Limiting Condition for Operation (LCO) 3.8.4. Also, Technical Specifications (TS) Table 3.8.6-1, "Battery Cell Parameter Requirements," is to be relocated to a licensee controlled program, and specific actions with associated completion times for out-of-limits conditions for battery cell voltage, electrolyte level, and electrolyte temperature will be added to TS Section 3.8.6. In addition, specific Surveillance Requirements (SRs) are being proposed for verification of these parameters.

A new program is proposed for the maintenance and monitoring of station batteries based on the recommendations of the Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications." The items proposed to be relocated will be contained in this new program.

## 2.0 PROPOSED CHANGE

These changes are based on TS Task Force (TSTF) Change Traveler TSTF-360 (Revision 1) that has been approved generically for the boiling water reactor (BWR) Standard TS, NUREG-1433 (BWR/4). TSTF-360, Revision 1, "DC Electrical Rewrite," was approved for incorporation into Standard Technical Specifications (STS) by the NRC staff on December 18, 2000, as set forth in a letter from W. D. Beckner, NRC to A.R. Pietrangelo, NEI. This TSTF provides guidance for the rewrite of current TS requirements for Class 1E DC power supply systems as referenced in the STS NUREGs (including NUREG-1433 for General Electric BWR/4, and NUREG-1434 for General Electric BWR/6). In adopting the staff-approved TSTF-360, Revision 1, licensees are expected to address the following areas to be consistent with TSTF-360 during conversion of plant TS to the improved STS format of the above stated NUREGs:

(1) Provide specific actions and increased completion time for an inoperable battery charger.
(2) Provide alternative testing criteria for battery charger testing.
(3) Relocate SR 3.8.4.4 to SR 3.8.6.6
(4) Replace battery specific gravity monitoring with float current monitoring.
(5) Relocate limiting values for battery cell float voltage, electrolyte level and electrolyte temperature to a licensee controlled program.
(6) Create an administrative program under TS section 5.5.14 to reference actions for cell voltage and electrolyte level.
(7) Provide specific actions with increased completion times for out-of-limits conditions for cell voltage, electrolyte level and electrolyte temperature.

**Description and Assessment**

## 3.0 TECHNICAL ANALYSIS

The James A. FitzPatrick Nuclear Power Plant (JAFNPP) DC electrical power system consists of two 125 VDC electrical power subsystems, and two 419 VDC low pressure coolant injection (LPCI) Motor Operated Valve (MOV) independent power supply subsystems. Each subsystem consists of one battery, one battery charger, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus.

The 125 VDC power sources provide both motive and control power to selected safety related equipment, as well as circuit breaker control power for the nonsafety related 4160 VAC and selected 600 VAC distribution systems. Each 125 VDC subsystem is energized by one 125 VDC battery and one 125 VDC battery charger. Each battery is exclusively associated with a single 125 VDC bus. Each battery charger is exclusively associated with a 125 VDC subsystem and cannot be interconnected with any other 125 VDC subsystem. The chargers are supplied from the same AC load groups for which the associated 125 VDC subsystem supplies the control power. The loads between the redundant 125 VDC subsystem are not transferable except for the Automatic Depressurization System (ADS). The ADS valve solenoids are normally fed from the Division 1 125 VDC subsystem with the Division 2 125 VDC subsystem providing a backup source. In addition, the Division 1 125 VDC subsystem provides a backup source to the Division 2 ADS logic circuits.

The 419 VDC LPCI MOV independent power supply subsystems provide the 600 VAC LPCI Independent Power Supply System with a reliable source of power to operate the motor operated valves associated with the LPCI subsystems and provide power to one RCIC pump enclosure exhaust fan via the 600 VAC LPCI independent power supply inverters and associated distribution system. The 419 VDC LPCI MOV independent power supply system consists of two subsystems.

Each 419 VDC LPCI MOV independent power supply subsystem is energized by the associated 419 VDC battery or the associated 419 VDC rectifier/charger. Each battery and rectifier/charger is exclusively associated with a 419 VDC LPCI MOV independent power supply subsystem and cannot be interconnected with the other 419 VDC LPCI MOV independent power supply subsystem.

During normal operation, the DC loads are powered from the battery chargers with the batteries floating on the system. In cases where momentary loads are greater than the charger capability, or battery charger output voltage is low, or on loss of normal power to the battery charger, the DC loads are automatically powered from the batteries. Also, on a LPCI automatic actuation signal, the 419 VDC rectifier/charger AC input breakers will open and the 600 VAC LPCI independent power supply inverters will be powered from the 419 VDC LPCI MOV independent power supply batteries.

Entergy Nuclear Operations, Inc. (ENO) reviewed and evaluated the proposed changes to the TS as follows:

## Description and Assessment

Change 1: Provide Specific Actions and an Increased Completion Time for an Inoperable Battery Charger

New Condition A with its associated Required Actions and Completion Times would be added to TS 3.8.4 to address the condition where a required 125 VDC battery charger becomes inoperable.

Required Action A.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. Required Action A.2 requires verification that the battery float current be less than or equal to 2 amps once per 12 hours. Required Action A.3 limits the restoration time for the required inoperable battery charger to 7 days. Existing TS 3.8.4 Conditions A, B, and C are re-designated to reflect the addition of new Condition A.

This Condition addresses a situation where one required battery charger becomes inoperable. The revised LCO focuses on retaining battery capabilities based on the following:

1. Required Action A.1 assures the discharge is terminated by requiring that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. This time period provides an allowance for returning the inoperable charger to operable status or for establishing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. This provides assurance that the battery will be restored to its fully charged condition from any discharge that might have occurred due to the 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 of its recharging cycle. There is no comparable limitation in the current JAFNPP TS. As such, including this action provides for continued safe plant operation.
2. Required Action A.2 requires that once per 12 hours, battery float current be verified to be 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 has now been fully charged. If at the expiration of the 12-hour period, the battery float current is not less than or equal to 2 amps, there may be additional battery problems and the battery must be declared inoperable. This verification provides assurance that the battery has sufficient capacity to perform its assumed duty cycle.

Given that the DC bus remains energized, the battery discharge (i.e., if it were occurring) is terminated based on restoration of battery terminal voltage (i.e., Required Action A.1), and the battery is fully recharged based upon battery float current (i.e., Required Action A.2), there is reasonable basis for extending the restoration time for an inoperable charger beyond the existing 8-hour limit to 7 days (i.e., Required Action A.3). Required Action A.3 is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., portable temporary battery chargers).

The revised actions focus efforts on retaining battery capabilities, retaining the requirement for charger operability, and applying a reasonable restoration time for an inoperable battery charger to avoid an unnecessary plant shutdown transient. Therefore the licensee finds the proposed changes are reasonable,

**Description and Assessment**

meet 10 CFR 50.36 requirements, are consistent with the intent of NUREG 1433, Revision 3, and therefore are acceptable.

Change 2: Provide Alternative Testing Criteria for Battery Charger Testing

SR 3.8.4.2 provides the battery charger performance test acceptance criteria for the 125 VDC battery chargers. This test is intended to confirm the charger design capacity. Alternate acceptance criteria are proposed that would allow an actual in service demonstration that the charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state. This accomplishes the objective of the existing test and allows for normal in-place demonstration of the charger capability thereby minimizing the time when the charger would be disconnected from the DC bus.

SR 3.8.4.1 requires verification that battery terminal voltage is within limits. This provides assurances that the battery will be restored to its fully charged condition from any discharge that might have occurred due to charger inoperability. The battery is recharged when the measured charging current is less than or equal to 2 amps for the 125 VDC batteries and less than or equal to 1 amp for the LPCI MOV independent power supply batteries. The proposed changes relocate the specific terminal voltage values to the licensee controlled program being added as TS Section 5.5.14. Therefore, the licensee finds the proposed changes are reasonable, are consistent with the intent of NUREG 1433, Revision 3, and therefore are acceptable.

Change 3: Relocate SR 3.8.4.4 to SR 3.8.6.6

In the relocation of SR 3.8.4.4 (Battery Capacity Testing) to TS Section 3.8.6 (Battery Parameters) as SR 3.8.6.6, no changes are proposed to SR 3.8.4.4. TS Section 3.8.5 is being revised editorially to delete reference to SR 3.8.4.4. Therefore, the licensee finds the proposed change is consistent with the intent of NUREG 1433, Revision 3 and therefore is acceptable.

Change 4: Replace Battery Specific Gravity Monitoring with Float Current Monitoring

Existing SR 3.8.6.1 and SR 3.8.6.2, in conjunction with Table 3.8.6-1, require monitoring of individual cell specific gravity. However, the provision of Table 3.8.6-1, Footnote (c), allows the use of a battery charging current less than 2 amps for the 125 VDC batteries and less than 1 amp for the LPCI MOV independent power supply batteries when on float charge to be used to satisfy specific gravity requirements.

The use of float current is the most accurate indicator of the status of the battery. Specific gravity readings may not be accurate when the battery is on charge following a discharge or following the addition of water. Therefore, the licensee finds the proposed change is reasonable, meets 10 CFR 50.36 requirements, is consistent with the intent of NUREG 1433, Revision 3, and therefore is acceptable.

## Description and Assessment

Change 5: Relocate Limiting Values for Battery Cell Float Voltage, Electrolyte Level, and Electrolyte Temperature to a Licensee Controlled Program

The proposed change is to relocate TS 3.8.6 Condition A, SR 3.8.6.1, SR 3.8.6.2, SR 3.8.6.3, and Table 3.8.6-1 to the licensee controlled program described in proposed TS Section 5.5.14, with the exception that battery specific gravity monitoring is being replaced with float current monitoring, as described above.

Currently TS Table 3.8.6-1 has various categories (A, B, and C) of limitations on battery cell voltage, electrolyte level, and specific gravity parameters. Category A and Category B limits reflect nominal fully charged battery parameter values which provide significant margin above that required for declaration of an operable battery. These Category A and B values represent appropriate monitoring levels and appropriate preventive maintenance levels for long-term battery quality and extended battery life. The licensee proposes that these values and the actions associated with restoration of battery cell parameters be relocated to a licensee controlled program being added as TS Section 5.5.14 that is under the control of 10 CFR 50.59. Required Actions associated with Category C limits in TS Table 3.8.6-1 are retained in the TS as discussed in changes numbered 4 and 7.

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

The proposed change to delete the word "cell" from the title of TS Section 3.8.6 and to revise the wording of the LCO is editorial, and therefore, is acceptable.

The proposed changes ensure the battery parameters (maintenance, testing and monitoring) are performed in accordance with the "Battery Monitoring and Maintenance Program" as specified in Specification 5.5.14. Therefore, the licensee finds the proposed changes are reasonable, meet 10 CFR 50.36 requirements, are consistent with the intent of NUREG 1433, Revision 3, and therefore are acceptable.

Change 6: Create an Administrative Program Under TS Section 5.5.14 to Reference Actions for Cell Voltage and Electrolyte Level

The proposed change adds a new TS Section 5.5.14, "Battery Monitoring and Maintenance Program." The program will monitor various battery parameters and is based on the recommendation of IEEE 450-1995. This program will have the elements relocated from the affected TS LCOs, and changes to the program will be reviewed by the licensee under 10 CFR 50.59 to determine if the changes require prior NRC review and approval. This change contains the necessary elements to ensure that the batteries continue to be maintained in a highly reliable condition. Therefore, the licensee finds the proposed change reasonable, meets 10 CFR 50.36 requirements, is consistent with the intent of NUREG 1433, Revision 3, and therefore is acceptable.

## Description and Assessment

Change 7: Provide Specific Actions with Increased Completion Times for Out-of-Limits Conditions for Cell Voltage, Electrolyte Level, and Electrolyte Temperature

The licensee proposes Specific Actions for parameters that have a unique impact on the battery and its continued operability. The licensee proposes changes to TS Section 3.8.6 in order to provide increased Completion Times for Out-of-Limits Conditions for cell voltage, electrolyte level, and electrolyte temperature. These Completion Times recognize the margins available, the minimal impact on battery capacity and capability to perform its intended function, and the likelihood of effecting restoration in a timely fashion thereby avoiding unnecessary plant shutdown. In addition, SRs are proposed to verify that the batteries are maintained within the established limitations.

Condition A addresses the condition where a battery has one or more cells with a float voltage of less than 2.07 V. With a float voltage of less than 2.07 V, the battery cell must be considered degraded. Within 2 hours, verification of the required battery charger operability is made by monitoring the battery terminal voltage (i.e., performance of SR 3.8.4.1), and determining the overall state of charge by monitoring the battery float current (i.e., performance of SR 3.8.6.1).

These actions assure that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one or more batteries being less than 2.07 V, and continued operation is permitted for a limited period up to 24 hours. This is considered a reasonable time to effect restoration of the out-of-limit condition.

Condition B represents the condition where a battery is found with float current greater than 2 amps for the 125 VDC batteries or greater than 1 amp for the LPCI MOV independent power supply batteries. This indicates that a partial discharge of the battery has occurred. This may be due to a temporary loss of the battery charger, or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours, verification of the required battery charger operability is made by monitoring the battery terminal voltage (i.e., performance of SR 3.8.4.1). If the terminal voltage is found to be less than the minimum established float voltage, there are two possibilities: the battery charger is inoperable or is operating in the current limit mode. Condition A of LCO 3.8.4 addresses charger inoperability. If the charger is operating in the current limit mode after 2 hours, that is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, load on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. If the charge time is extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2) the battery must be declared inoperable.

If float voltage is satisfactory and there are no cells less than 2.07 V, there is assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action B.2) from any discharge that might have occurred due to a temporary loss of the battery charger. The time to return a battery to its fully charged state under this condition is a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus, there is assurance of fully recharging the battery within 12 hours, thereby avoiding a premature unit shutdown with its own attendant risk.

**Description and Assessment**

If the condition is due to one or more cells in a low voltage condition but still greater than 2.07 V, and float voltage is found to be satisfactory, this is not an indication of a substantially discharged battery and 12 hours is a reasonable time to restore float current prior to declaring the battery inoperable.

Condition C addresses the condition where a battery is found with the electrolyte level in one or more cells less than minimum established design limits. With the electrolyte level in one or more cells above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of the electrolyte level requirement not being met. Within 31 days, the minimum established design limits for electrolyte level must be restored. This is reasonable and acceptable.

With electrolyte level below the top of the plates, there is a potential for dryout and plate degradation. Required Actions C.1 and C.2 address this potential as well as provisions in TS Section 5.5.14. Required Actions C.1 and C.2 are only applicable if electrolyte level was below the top of the plates. The Required Action C.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.14, Item b, to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from Annex D of IEEE 450-1995. They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the testing, the battery may have to be declared inoperable and the affected cell(s) replaced. Therefore, the licensee finds the proposed change reasonable and acceptable.

Condition D addresses the condition where a battery is found with a pilot cell temperature less than the minimum established design limits. A low electrolyte temperature limits the current and power available from the battery. Since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not being met, and the 12 hour Completion Time provides a reasonable time to restore the temperature within established limits.

Condition E addresses the condition with one or more batteries in redundant subsystems with battery parameters not within limits. Given this condition, there is not sufficient assurance that battery capacity has not been affected to the degree that the batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved, this potentially could result in a total loss of function on multiple systems that rely upon the batteries. The longer completion times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one redundant subsystem within 2 hours.

Condition F specifies actions to take when the Required Action and associated Completion Time of Condition A, B, C, D or E are not met. When any battery parameter is outside the allowances of the Required Actions for Condition A, B, C, D or E, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding battery must be declared inoperable immediately. This Condition also specifies actions to take when a battery is found with one or more battery cells having a float voltage less than 2.07 V and float current greater than 2 amps for the 125 VDC battery (or greater than 1 amp for the LPCI MOV independent power supply battery). This indicates that the battery capacity

**Description and Assessment**

may not be sufficient to perform the intended functions. The battery must, therefore, be declared inoperable immediately.

SR 3.8.6.1 requires verification that each battery float current be less than or equal to 2 amps for the 125 VDC batteries and less than or equal to 1 amp for the LPCI MOV independent power supply batteries. Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and to maintain the battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery and the 7-day Surveillance Frequency is acceptable.

SR 3.8.6.2 and SR 3.8.6.5 verify that the cell voltage of either pilot cells or each connected cell are greater than or equal to the short-term absolute minimum voltage, representing the point where battery operability is in question. Optimal long-term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 130.2 V at the 125 VDC battery terminals and 403.6 V at the LPCI MOV independent power supply battery terminals, or 2.17 volts per cell (Vpc). This provides adequate over-potential, which limits the formation of lead sulfate and self-discharge, which could eventually render the battery inoperable. Float voltage in this range or less, but greater than 2.07 Vpc, is addressed in the program referenced in new TS Section 5.5.14. The Surveillance Frequency for cell voltage verification every 31 days for pilot cells and 92 days for each connected cell is consistent with IEEE 450-1995.

SR 3.8.6.3 requires verification that each battery connected cell electrolyte level be greater than or equal to minimum established design limits. The limits specified for electrolyte level ensures that the plates suffer no physical damage and that the cell maintains adequate electron transfer capability. The Surveillance Frequency of 31 days is consistent with IEEE 450-1995.

SR 3.8.6.4 requires verification that each battery pilot cell temperature be greater than or equal to the minimum established design limit (i.e., 65 °F for 125 VDC batteries and 50 °F for LPCI MOV independent power supply batteries). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Surveillance Frequency of 31 days is consistent with IEEE 450-1995.

Based on the above review, the licensee finds the proposed changes provide adequate assurance of system operability, meets 10CFR 50.36 requirements, is consistent with NUREG 1433, Revision 3, and therefore are acceptable.

Evaluation Summary

The proposed changes to the DC electrical power subsystems specifications TS 3.8.4, TS 3.8.5, and TS 3.8.6 and the addition of new TS administrative control program 5.5.14, "Battery Maintenance and Monitoring Program," based on the recommendations of IEEE Standard 450-1995, are consistent with the considerations and proposed changes provided in TSTF-360, Revision 1, as incorporated in NUREG-1433, Revision 3. The proposed changes do not affect the current design

requirements. Each of these proposed changes has been evaluated in accordance with the requirements of 10 CFR 50.36 and was determined not to adversely affect nuclear safety or continued safe plant operations. Therefore, the proposed changes are acceptable.

## 4.0 COMMITMENTS

There are no new commitments associated with this submittal.

## 5.0 REFERENCES

TS Task Force (TSTF) Change Traveler TSTF-360, Revision 1, DC Electrical Rewrite

Attachment 2 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

**No Significant Hazards Consideration and Environmental Assessment**

Attachment 2 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

## No Significant Hazards Consideration & Environmental Assessment

### NO SIGNIFICANT HAZARDS CONSIDERATION

According to 10 CFR 50.92(c), "Issuance of amendment," a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Entergy Nuclear Operations, Inc. (ENO) is proposing changes to the James A. FitzPatrick Nuclear Power Plant (JAFNPP) Technical Specifications (TS). The proposed changes are consistent with Technical Specifications Task Force (TSTF) Change Traveler TSTF-360, Revision 1. The proposed changes revise TS 3.8.4, "DC Sources - Operating," TS 3.8.5, "DC Sources -Shutdown," and TS 3.8.6, "Battery Cell Parameters."

The proposed changes associated with TSTF-360, Revision 1, revise TS 3.8.4, TS 3.8.5, and TS 3.8.6 and include the following changes. The proposed changes add new Required Actions and extend the Completion Time for an inoperable battery charger, as well as provide alternate battery charger testing criteria for TS 3.8.4. It is proposed that TS Table 3.8.6-1, "Battery Cell Parameter Requirements," be relocated to a licensee-controlled program, and specific Required Actions associated with out-of-limits conditions for battery cell float voltage, float current, electrolyte level, and electrolyte temperature be added to TS 3.8.6. In addition, specific SRs are being proposed for verification of these parameters. In accordance with TSTF-360, Revision 1, a new administrative TS program is being proposed for the maintenance and monitoring of station batteries based on the recommendations of Institute of Electrical and Electronics Engineers (IEEE) Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications." All of the items proposed to be relocated will be contained within this new program.

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

   The DC Sources and Battery Cell Parameters are not initiators of any accident sequence analyzed in JAFNPP's Updated Final Safety Analysis Report (UFSAR). As such, the proposed changes do not involve a significant increase in the probability of an accident previously evaluated.

## No Significant Hazards Consideration & Environmental Assessment

The initial conditions of the Design Basis Accident (DBA) and transient analyses in JAFNPP's UFSAR assume Engineered Safety Feature (ESF) systems are operable. The DC electrical power distribution system is designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, reactor coolant system, and containment design limits are not exceeded. The operability of the DC electrical power distribution system in accordance with the proposed TS is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant. Therefore, the proposed changes do not involve a significant increase in the consequences of an accident previously evaluated.

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

   The proposed changes do not involve any physical alteration of the JAFNPP. The temporary charger, when placed in service, will be powered from an emergency bus and have appropriate electrical isolation. Installed equipment is not being operated in a new or different manner. There are no setpoints at which protective or mitigative actions are initiated that are affected by the proposed changes. The operability of the DC electrical power distribution system in accordance with the proposed TS is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant. These proposed changes will not alter the manner in which equipment operation is initiated, nor will the functional demands on credited equipment be changed. No alteration in the procedures, which ensure the unit remains within analyzed limits, is proposed, and no change is being made to procedures relied upon to respond to an off-normal event. As such, no new failure modes are being introduced. The proposed changes do not alter assumptions made in the safety analyses. Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   The proposed changes will not adversely affect operation of plant equipment. These changes will not result in a change to the setpoints at which protective actions are initiated. Sufficient DC capacity to support operation of mitigation equipment is ensured. The changes associated with the new administrative TS program will ensure that the station batteries are maintained in a highly reliable manner. The equipment fed by the DC electrical power distribution system will continue to provide adequate power to safety-related loads in accordance with analyses assumptions. Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Therefore, based on the above evaluation, ENO has concluded that the proposed changes do not involve any significant hazards consideration.

## No Significant Hazards Consideration & Environmental Assessment

**ENVIRONMENTAL ASSESSMENT**

ENO has evaluated the proposed changes and determined the changes do not involve (1) a significant hazards consideration, (2) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (3) a significant increase in the individual or cumulative occupational exposure. Accordingly, the proposed changes meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9), and an environmental assessment of the proposed changes is not required.

Attachment 3 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

**PROPOSED TECHNICAL SPECIFICATION PAGES (RETYPED)**

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources - Operating

LCO 3.8.4 The following DC electrical power subsystems shall be OPERABLE:

a. Two 125 VDC subsystems; and

b. Two 419 VDC low pressure coolant injection (LPCI) MOV independent power supply subsystems.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One battery charger on one 125 VDC power subsystem inoperable. | A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. | 2 hours |
| | AND | |
| | A.2 Verify battery float current $\leq$ 2 amps. | Once per 12 hours |
| | AND | |
| | A.3 Restore battery charger to OPERABLE status. | 7 days |

(continued)

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. One 125 VDC electrical power subsystem inoperable for reasons other than Condition A. | B.1 Restore 125 VDC electrical power subsystem to OPERABLE status. | 8 hours |
| C. Required Action and associated Completion Time of Condition A or B not met. | C.1 Be in MODE 3.<br><br>AND<br><br>C.2 Be in MODE 4. | 12 hours<br><br><br><br>36 hours |
| D. One or both 419 VDC LPCI MOV independent power supply subsystems inoperable. | D.1 Declare associated LPCI subsystem(s) inoperable. | Immediately |

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 125 VDC battery charger supplies $\geq$ 270 amps at greater than or equal to the minimum established float voltage for $\geq$ 4 hours.<br><br>OR<br><br>Verify each 125 VDC 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 months |
| SR 3.8.4.3 | ----------NOTE----------<br>This Surveillance shall not normally be performed in MODE 1, 2, or 3 for the 125 VDC batteries. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR.<br>----------<br>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. | 24 months |

(continued)

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. (continued) | A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.<br><br>AND | Immediately |
| | A.2.4 Initiate action to restore required DC electrical power subsystem to OPERABLE status. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.5.1 | ----------NOTE----------<br>The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3.<br>---------- | |
| | For DC electrical power subsystem required to be OPERABLE the following SRs are applicable:<br><br>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 125 VDC and 419 VDC LPCI MOV independent power supply batteries shall be within limits.

AND

Battery cell average electrolyte temperature for the 125 VDC and 419 VDC LPCI MOV independent power supply 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 on one subsystem with one or more battery cells float voltage < 2.07 V. | A.1 Perform SR 3.8.4.1.<br>AND<br>A.2 Perform SR 3.8.6.1.<br>AND<br>A.3. Restore affected cell voltage ≥ 2.07 V. | 2 hours<br><br>2 hours<br><br>24 hours |
| B. One 125 VDC battery on one subsystem with float current > 2 amps<br>OR<br>One LPCI battery on one subsystem with float current > 1 amp | B.1 Perform 3.8.4.1<br>AND<br>B.2 Restore 125 VDC battery float current to ≤ 2 amps; Restore LPCI battery float current to ≤ 1 amp. | 2 hours<br><br>12 hours |

(continued)

ACTIONS (continued)

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

(continued)

ACTIONS (continued)

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| E. One battery in redundant subsystems with battery parameters not within limits. | E.1 Restore battery parameters in one redundant subsystem to within limits. | 2 hours |
| F. Required Action and associated Completion Time of Condition A, B, C, D or E not met.<br>OR<br>One battery on one subsystem with one or more battery cells float voltage < 2.07 V and float current: > 2 amps for 125 VDC battery; or > 1 amp for LPCI battery | F.1 Declare associated battery inoperable. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.6.1 | ----------NOTE----------<br>Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1.<br>----------<br>Verify each battery float current is:<br>a. ≤ 2 amps for 125 VDC battery; and<br>b. ≤ 1 amp for LPCI battery. | 7 days |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.8.6.2 | Verify each battery pilot cell voltage is $\geq$ 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 voltage is $\geq$ 2.07 V. | 92 days |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| | | |
|---|---|---|
| SR 3.8.6.6 | ----------NOTE----------<br>This Surveillance shall not normally be performed in MODE 1, 2, or 3 for the 125 VDC batteries. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR.<br>---------- | |
| | Verify battery capacity is $\geq$ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test. | 60 months<br><br>AND<br><br>12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating<br><br>AND<br><br>24 months when battery has reached 85% of the expected life with capacity $\geq$ 100% of manufacturer's rating |

5.5 Programs and Manuals

5.5.13 Configuration Risk Management Program (CRMP) (continued)

d. Provisions for assessing the need for additional actions after the discovery of additional equipment-out-of-service conditions while in the plant configuration described by the LCO Condition(s).

e. Provisions for considering other applicable risk-significant contributors such as Level 2 issues and external events, qualitatively or quantitatively.

5.5.14 Battery Monitoring and Maintenance Program

This program provides for battery restoration and maintenance, based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," including the following:

a. Actions to restore battery cells with float voltage < 2.13 V; and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

Attachment 4 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

**PROPOSED TECHNICAL SPECIFICATION CHANGES (MARK-UP)**

## 3.8 ELECTRICAL POWER SYSTEMS

### 3.8.4 DC Sources – Operating

LCO 3.8.4 The following DC electrical power subsystems shall be OPERABLE:

a. Two 125 VDC subsystems; and

b. Two 419 VDC low pressure coolant injection (LPCI) MOV independent power supply subsystems.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

INSERT 1

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| B. One 125 VDC electrical power subsystem inoperable for reasons other than Condition A. | B.1 Restore 125 VDC electrical power subsystem to OPERABLE status. | 8 hours |
| C. Required Action and associated Completion Time of Condition A not met. | C.1 Be in MODE 3.<br>AND<br>C.2 Be in MODE 4. | 12 hours<br><br>36 hours |
| D. One or both 419 VDC LPCI MOV independent power supply subsystems inoperable. | D.1 Declare associated LPCI subsystem(s) inoperable. | Immediately |

SURVEILLANCE REQUIREMENTS

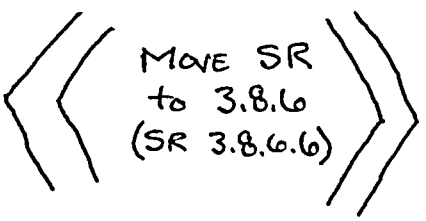
| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.8.4.1 | Verify battery terminal voltage ~~on float charge is:~~ is greater than or equal to the minimum established float voltage.<br>a. ≥ 127.8 VDC for 125 VDC batteries, and<br>b. ≥ 396.2 VDC for 419 VDC LPCI MOV independent power supply batteries. | 7 days |
| SR 3.8.4.2 | Verify each 125 VDC battery charger supplies ≥ 270 amps at ~~≥ 128 VDC~~ greater than or equal to the minimum established float voltage for ≥ 4 hours. | 24 months |
| SR 3.8.4.3 | ----------NOTE----------<br>This Surveillance shall not normally be performed in MODE 1, 2, or 3 for the 125 VDC batteries. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR.<br>----------<br>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. | 24 months |

INSERT 2

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | FREQUENCY |
|---|---|
| SR 3.8.~~4.4~~ 6.6 ----------NOTE---------- This Surveillance shall not normally be performed in MODE 1, 2, or 3 for the 125 VDC batteries. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. 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<br>AND<br>12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating<br>AND<br>24 months when battery has reached 85% of the expected life with capacity ≥ 100% of manufacturer's rating |



ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. (continued) | A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.<br><br>AND | Immediately |
| | A.2.4 Initiate action to restore required DC electrical power subsystem to OPERABLE status. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.5.1 | ----------NOTE----------<br>The following SRs are not required to be performed: SR 3.8.4.2, SR 3.8.4.3, and SR 3.8.4.4.<br>---------- | |
| | For DC electrical power subsystem required to be OPERABLE the following SRs are applicable:<br><br>SR 3.8.4.1, SR 3.8.4.2, SR 3.8.4.3, and SR 3.8.4.4. | In accordance with applicable SRs |

## 3.8 ELECTRICAL POWER SYSTEMS

### 3.8.6 Battery Cell Parameters

LCO 3.8.6 Battery cell parameters for the 125 VDC and 419 VDC LPCI MOV independent power supply batteries shall be within the limits of Table 3.8.6-1.

AND

Battery cell average electrolyte temperature for the 125 VDC and 419 VDC LPCI MOV independent power supply batteries shall be within required limits.

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

ACTIONS

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

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. One or more batteries with one or more battery cell parameters not within Category A or B limits. | A.1 Verify pilot cells electrolyte level and float voltage meet Table 3.8.6-1 Category C limits. | 1 hour |
| | AND | |
| | A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits. | 24 hours<br>AND<br>Once per 7 days thereafter |
| | AND | |
| | | (continued) |

INSERT 3

ACTIONS

| CONDITION | REQUIRED ACTION | COMPLETION TIME |
|---|---|---|
| A. (continued) | A.3 Restore battery cell parameters to Category A and B limits of Table 3.8.6-1. | 31 days |
| B. Required Action and associated Completion Time of Condition A not met.<br><br>OR<br><br>One or more batteries with average electrolyte temperature of the representative cells not within limits.<br><br>OR<br><br>One or more batteries with one or more battery cell parameters not within Category C limits. | B.1 Declare associated battery inoperable. | Immediately |

SURVEILLANCE REQUIREMENTS

| SURVEILLANCE | FREQUENCY |
|---|---|
| SR 3.8.6.1 Verify battery cell parameters meet Table 3.8.6-1 Category A limits. | 7 days |

(continued)

SURVEILLANCE REQUIREMENTS (continued)

| SURVEILLANCE | | FREQUENCY |
|---|---|---|
| SR 3.8.6.2 | Verify battery cell parameters meet Table 3.8.6-1 Category B limits. | 92 days |
| SR 3.8.6.3 | Verify average electrolyte temperature of representative cells is ≥ 65°F for each 125 VDC battery, and ≥ 50°F for each 419 VDC LPCI MOV independent power supply battery. | 92 days |

Move SR 3.8.6.6 from SR 3.8.4.4

Table 3.8.6-1 (page 1 of 1)
Battery Cell Parameter Requirements

| PARAMETER | CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL | CATEGORY B: LIMITS FOR EACH CONNECTED CELL | CATEGORY C: LIMITS FOR EACH CONNECTED CELL |
|---|---|---|---|
| Electrolyte Level | > Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark(a) | > Minimum level indication mark, and ≤ ¼ inch above maximum level indication mark(a) | Above top of plates, and not overflowing |
| Float Voltage | ≥ 2.13 V | ≥ 2.13 V | > 2.07 V |
| Specific Gravity(b)(c) | ≥ 1.195 | ≥ 1.195<br>AND<br>Average of all connected cells > 1.205 | Not more than 0.020 below average of all connected cells<br>AND<br>Average of all connected cells ≥ 1.195 |

(a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum level during and, for a limited time, following equalizing charges provided it is not overflowing.

(b) Corrected for electrolyte temperature and level. Level correction is not required, however, when on float charge and battery charging current is < 2 amps for 125 VDC batteries and < 1 amp for 419 VDC LPCI MOV independent power supply batteries.

(c) A battery charging current of < 2 amps for 125 VDC batteries and < 1 amp for 419 VDC LPCI MOV independent power supply batteries when on float charge is acceptable for meeting specific gravity limits following a battery recharge, for a maximum of 7 days. When charging current is used to satisfy specific gravity requirements, specific gravity of each connected cell shall be measured prior to expiration of the 7 day allowance.

5.5 Programs and Manuals

5.5.13 Configuration Risk Management Program (CRMP) (continued)

d. Provisions for assessing the need for additional actions after the discovery of additional equipment-out-of-service conditions while in the plant configuration described by the LCO Condition(s).

e. Provisions for considering other applicable risk-significant contributors such as Level 2 issues and external events, qualitatively or quantitatively.

INSERT 6

# TSTF-360
# Inserts for Technical Specifications Pages Mark-Up

## Insert 1

| | | | |
|---|---|---|---|
| A. One battery charger on one 125 VDC power subsystem inoperable. | A.1 | Restore battery terminal voltage to greater than or equal to the minimum established float voltage. | 2 hours |
| | AND | | |
| | A.2 | Verify battery float current $\leq$ 2 amps. | Once per 12 hours |
| | AND | | |
| | A.3 | Restore battery charger to OPERABLE status. | 7 days |

## Insert 2

OR

Verify each 125 VDC 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.

## Insert 3

| | | |
|---|---|---|
| A. One battery on one subsystem with one or more battery cells float voltage < 2.07 V. | A.1 Perform SR 3.8.4.1.<br>AND<br>A.2 Perform SR 3.8.6.1.<br>AND<br>A.3.Restore affected cell voltage ≥ 2.07 V. | 2 hours<br><br>2 hours<br><br>24 hours |
| B. One 125 VDC battery on one subsystem with float current > 2 amps.<br>OR<br>One LPCI battery on one subsystem with float current > 1 amp. | B.1 Perform 3.8.4.1.<br>AND<br>B.2 Restore 125 VDC battery float current to ≤ 2 amps; Restore LPCI battery float current to ≤ 1 amp. | 2 hours<br><br>12 hours |
| ----------NOTE----------<br>Required Action C.2 shall be completed if electrolyte level was below the top of plates.<br>----------<br>C. One battery on one subsystem with one or more cells electrolyte level less than minimum established design limits. | ----------NOTE----------<br>Required Action C.1 and C.2 are only applicable if electrolyte level was below the top of plates.<br>----------<br>C.1 Restore electrolyte to above top of plates.<br>AND<br>C.2 Verify no evidence of leakage.<br>AND<br>C.3 Restore electrolyte level to greater than or equal to minimum established design limits. | <br><br><br><br>8 hours<br><br>12 hours<br><br>31 days |
| D. One battery on one subsystem with pilot cell electrolyte temperature less than minimum established design limits. | D.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits. | 12 hours |
| E. One battery in redundant subsystems with battery parameters not within limits. | E.1 Restore battery parameters in one redundant subsystem to within limits | 2 hours |

## Insert 4

One battery on one subsystem with one or more battery cells float voltage < 2.07 V and float current: > 2 amps for 125 VDC battery; or > 1 amp for LPCI battery.

## Insert 5

| | | |
|---|---|---|
| SR 3.8.6.1 | ----------NOTE----------<br>Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1.<br>----------<br>Verify each battery float current is:<br>a. $\leq$ 2 amps for 125 VDC battery; and<br>b. $\leq$ 1 amp for LPCI battery. | 7 days |
| SR 3.8.6.2 | Verify each battery pilot cell voltage is $\geq$ 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 voltage is $\geq$ 2.07 V. | 92 days |

## Insert 6

5.5.14 Battery Monitoring and Maintenance Program

This program provides for battery restoration and maintenance, based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," including the following:

a. Actions to restore battery cells with float voltage < 2.13 V; and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

Attachment 5 to JAFP-05-0082
Entergy Nuclear Operations, Inc. – FitzPatrick
Docket No. 50-333

**PROPOSED TECHNICAL SPECIFICATION BASES CHANGES (MARK-UP)**

BASES

BACKGROUND (continued)

Each 419 VDC LPCI MOV independent power supply subsystem is energized by the associated 419 VDC battery or the associated 419 VDC rectifier/charger. Each battery and rectifier/charger is exclusively associated with a 419 VDC LPCI MOV independent power supply subsystem and cannot be interconnected with the other 419 VDC LPCI MOV independent power supply subsystem.

During normal operation, the DC loads are powered from the battery chargers with the batteries floating on the system. In cases where momentary loads are greater than the charger capability, or battery charger output voltage is low, or on loss of normal power to the battery charger, the DC loads are automatically powered from the batteries. Also, on a LPCI automatic actuation signal, the 419 VDC rectifier/charger AC input breakers will open and the 600 VAC LPCI independent power supply inverters will be powered from the 419 VDC LPCI MOV independent power supply batteries.

The DC power distribution system is described in more detail in Bases for LCO 3.8.7, "Distribution System - Operating," and LCO 3.8.8, "Distribution System - Shutdown."

INSERT 1 →

Each 125 VDC battery has adequate storage capacity to carry the required load continuously for approximately 2 hours (Ref. 4). Each 419 VDC LPCI MOV independent power supply battery has adequate storage capacity for one repositioning of the LPCI subsystem motor operated valves (MOVs) on its respective MOV bus.

Each 125 VDC and 419 VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from its redundant subsystem to ensure that a single failure in one subsystem does not cause a failure in the redundant subsystem. There is no sharing between redundant subsystems such as batteries, battery chargers, or distribution panels.

The 125 VDC batteries are sized to supply associated DC loads required for safe shutdown of the plant, following abnormal operational transients and postulated accidents, until AC power sources are restored (Ref. 4). The 419 VDC batteries are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. The minimum

(continued)

BASES

BACKGROUND (continued)

design voltage limit for each 125 VDC battery is established in References 10 and 11. The minimum design voltage limit of each 419 VDC LPCI MOV independent power supply battery is established in Reference 12.

INSERT 2

Each 125 VDC and 419 VDC battery charger has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each 125 VDC battery charger has sufficient capacity to restore the battery after discharging through its duty cycle to its fully charged state while supplying normal control loads (Ref. 4).

excess

INSERT 3

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the UFSAR, Chapter 6 (Ref. 5) and Chapter 14 (Ref. 6), assume that Engineered Safeguards systems are OPERABLE. The 125 VDC Power System provides normal and emergency DC electrical power for the EDGs, emergency auxiliaries, and control and switching during all MODES of operation. The 419 VDC LPCI MOV independent power supplies provide normal and emergency power for LPCI MOVs during all MODES of operation. The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant. This includes maintaining DC sources OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 7).

LCO

The 125 VDC and 419 VDC LPCI MOV independent power supply subsystems - with each subsystem consisting of one battery, one battery charger, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus - are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an abnormal operational transient or a postulated DBA. Loss of any DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4).

(continued)

BASES

APPLICABILITY

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

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

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

The DC electrical power requirements for MODES 4 and 5 and other specified conditions in which the DC electrical power sources are required are addressed in LCO 3.8.5, "DC Sources-Shutdown."

ACTIONS

B.1

INSERT 4

Condition B represents one division of the 125 VDC Power System 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 plant, minimizing the potential for complete loss of 125 VDC power to the affected division. The 8 hour limit is consistent with the allowed time for an inoperable DC Distribution System division.

for reasons other than Condition A

If one of the required 125 VDC power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger, or inoperable battery charger and associated inoperable battery), the remaining 125 VDC 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 minimum necessary 125 VDC power subsystems to mitigate a worst case accident, continued power operation should not exceed 8 hours. The 8 hour Completion Time reflects a reasonable time to assess plant status as a function of the inoperable 125 VDC power subsystem and, if the 125 VDC power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe plant shutdown.

(continued)

BASES

ACTIONS (continued)

C.1 and C.2

If the 125 VDC power subsystem cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the plant to MODE 4 is consistent with the time required in Regulatory Guide 1.93 (Ref. 8).

D.1

If one or both 419 VDC LPCI MOV independent power supply subsystems are inoperable (e.g., inoperable battery, inoperable battery charger, or inoperable battery charger and associated inoperable battery), the associated LPCI subsystem may be incapable of performing its intended function and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions for an inoperable LPCI subsystem, LCO 3.5.1.

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge for the batteries helps to ensure the effectiveness of the charging system and the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the connected loads and the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the initial voltages assumed in the battery sizing calculations. The 7 day Frequency is conservative when compared with manufacturer recommendations and IEEE-450 (Ref. 9).

battery chargers, which support the ability of the batteries to perform their intended function

INSERT 5

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.2

This SR verifies

Battery charger capability requirements are based on the design capacity of the chargers (Ref. 3). According to UFSAR, Section 8.7 (Ref. 4), the battery charger is sized to restore the battery after discharging through its duty cycle to the fully charged state, while supplying the normal control loads. The minimum required amperes and duration ensures that these requirements can be satisfied.

battery

INSERT 6

The Frequency is acceptable, given the plant conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 24 month intervals. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.

SR 3.8.4.3

A battery service test is a special test of the battery's capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length corresponds to the design duty cycle requirements (Ref. 10, 11, and 12).

The Frequency of 24 months is acceptable, given plant conditions required to perform the test and the other requirements existing to ensure adequate battery performance during this 24 month interval. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.

(SR 3.8.6.6)

A modified performance discharge test may be performed in lieu of a service test. This substitution is acceptable because a modified performance discharge test represents a more severe test of battery capacity than the service test.

Move & Insert to 3.8.6.6 Next Page

The modified performance discharge test is a complete test which envelopes both the service test and the performance discharge test requirements. The modified performance discharge test discharge current envelopes the peak duty cycle loads of the service test followed by a constant discharge current (temperature corrected) for the performance discharge test. Since the ampere-hours removed by peak duty cycle loads represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.3 (continued)

for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

Swap Order

The purpose of the modified performance discharge test is to demonstrate the battery has sufficient capacity to meet the system design requirements and to provide trendable performance data to compare the available capacity in the battery to previous capacity test results. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required 125 VDC power subsystem from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1, 2, or 3 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1, 2, or 3. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy the Surveillance.

Move To SR 3.8.6.6 Bases

SR 3.8.4.4 (6.6)

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.4 (continued)

A battery modified performance discharge test is described in the Bases for SR 3.8.4.3. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.4; however, only the modified performance discharge test may be used to satisfy SR 3.8.4.4 while satisfying the requirements of SR 3.8.4.3 at the same time.

Move From Previous Page

The acceptance criteria for this Surveillance is consistent with IEEE-450 (Ref. 9). This reference recommends that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

INSERT 7

The Frequency for this test is normally 60 months. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's rating. Degradation is indicated, according to IEEE-450 (Ref. 9), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is below 90% of the manufacturer's rating. All these Frequencies are consistent with the recommendations in IEEE-450 (Ref. 9).

Move to SR 3.8.6.6 Bases

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required 125 VDC power subsystem from service, perturb the electrical distribution system, and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1, 2, or 3 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.4 (6.6) (continued)

perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1, 2, or 3. Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy the Surveillance.

Move to SR 3.8.6.6 Bases

REFERENCES

1. UFSAR, Section 16.6.
2. Safety Guide 6, Independence Between Redundant Standby (Onsite) Power Sources And Between Their Distribution Systems, March 1971.
3. IEEE Standard 308, IEEE Standard Criteria for Class IE Electric Systems for Nuclear Power Generating Stations, 1971.
4. UFSAR, Section 8.7.
5. UFSAR, Chapter 6.
6. UFSAR, Chapter 14.
7. 10 CFR 50.36(c)(2)(ii).
8. Regulatory Guide 1.93, Availability Of Electric Power Sources, December 1974.
9. IEEE Standard 450, IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead - Acid Batteries for Stationary Applications, 1995.
10. JAF-CALC-ELEC-02609
11. JAF-CALC-ELEC-02610
12. JAF-CALC-ELEC-01857

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, and A.2.4 (continued)

assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel). Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystem and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.4. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC electrical power subsystem from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

REFERENCES

1. UFSAR, Chapter 6.
2. UFSAR, Chapter 14.
3. 10 CFR 50.36(c)(2)(ii).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery cell Parameters

BASES

BACKGROUND

This LCO delineates the limits on electrolyte temperature, level, float voltage, and specific gravity for the DC electrical power subsystems batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown."

battery float current as well as

INSERT 8

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in UFSAR, Chapter 6 (Ref. 1) and Chapter 14 (Ref. 2), assume Engineered Safeguards systems are OPERABLE. The DC electrical power subsystems provide normal and emergency DC electrical power for the emergency diesel generators (EDGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant as discussed in the Bases for LCO 3.8.4 and LCO 3.8.5.

Since battery cell parameters support the operation of the DC electrical power subsystems, they satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 3).

LCO

Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an abnormal operational transient or a postulated DBA. Electrolyte limits are conservatively established, allowing continued DC electrical system function even with Category A and B limits not met.

Battery parameter

INSERT 9

limits

APPLICABILITY

The battery cell parameters are required solely for the support of the associated DC electrical power subsystem. Therefore, these battery cell parameters are only required when the associated DC electrical power subsystem is required to be OPERABLE. Refer to the Applicability discussions in Bases for LCO 3.8.4 and LCO 3.8.5.

(continued)

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note which indicates that separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable DC subsystem. Complying with the Required Actions for one inoperable DC subsystem may allow for continued operation, and subsequent inoperable DC subsystems are governed by separate Condition entry and application of associated Required Actions.

A.1, A.2, and A.3

INSERT 10

With parameters of one or more cells in one or more batteries not within limits (i.e., Category A limits not met or Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of Category A or B limits not met, and continued operation is permitted for a limited period.

The pilot cell(s) electrolyte level and float voltage are required to be verified to meet the Category C limits within 1 hour (Required Action A.1). This check provides a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cell(s). One hour is considered a reasonable amount of time to perform the required verification.

Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at 7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the guidance provided in IEEE-450 (Ref. 4) of monitoring battery conditions at regular intervals (not to exceed one week) while completing corrective actions.

(continued)

BASES

ACTIONS

A.1, A.2, and A.3 (continued)

Continued operation is only permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. Taking into consideration that, while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable for operation prior to declaring the DC batteries inoperable.

F B.1

allowances of the Required Actions for Condition A, B, C, D, or E

When any battery parameter is outside the Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement is not ensured and the corresponding DC electrical power subsystem must be declared inoperable. Additionally, other potential conditions, such as any Required Action of Condition A and associated Completion Time not met, or average electrolyte temperature of representative cells < 65°F for each 125 VDC battery, or < 50°F for each 419 VDC LPCI MOV independent power supply battery, also are cause for immediately declaring the associated DC electrical power subsystem inoperable.

battery

INSERT 11

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 4), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.

INSERT 12

SR 3.8.6.2

The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 4), which recommends augmentation of the battery inspections conducted in SR 3.8.6.1 at least once per quarter by checking voltage, specific gravity and electrolyte temperature.

Move SR 3.8.6.6 From SR 3.8.4.8

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.3

This Surveillance verification that the average electrolyte temperature of representative cells (10% of total) is within limits is consistent with a recommendation of IEEE-450 (Ref. 4) that states that the temperature of electrolyte in representative cells should be determined on a quarterly basis.

Lower than normal electrolyte temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range, based on assumptions in the battery sizing analyses.

Table 3.8.6-1

This Table delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designated pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity approximate the state of charge of the entire battery.

The Category A limits specified for electrolyte level are based on manufacturer's recommendations and are consistent with the guidance in IEEE-450 (Ref. 4), with the extra ¼ inch allowance above the high water level indication for operating margin to account for temperature and charge effects. In addition to this allowance, footnote (a) to Table 3.8.6-1 permits the electrolyte level to be temporarily above the specified maximum level during and, for a limited time, following an equalizing charge (normally up to 3 days following the completion of an equalization charge to allow electrolyte stabilization), provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 4) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on the recommendation of IEEE-450 (Ref. 4), which states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells.
The Category A limit specified for specific gravity for each pilot cell is ≥ 1.195 (0.020 below the manufacturer's fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 4), the specific gravity readings are based on a temperature of 77°F (25°C).

The specific gravity readings are corrected for actual electrolyte temperature and level. For each 3°F (1.67°C) above 77°F (25°C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3°F below 77°F. The specific gravity of the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation. Level correction will be in accordance with manufacturer's recommendations.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any battery cell that may be jumpered out.

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer's fully charged, nominal specific gravity) with the average of all connected cells 1.205 (0.010 below the manufacturer's fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging with cells having higher specific gravities.

Category C defines the limits for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety. When any battery parameter is outside the Category C limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

(continued)

BASES

SURVEILLANCE REQUIREMENTS

Table 3.8.6-1 (continued)

The Category C limit specified for electrolyte level (above the top of the plates and not overflowing) ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limit for voltage is based on IEEE-450 Appendix C (Ref. 4), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.

The Category C limit on average specific gravity $\geq$ 1.195, is based on manufacturer's recommendations (0.020 below the manufacturer's recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must be no less than 0.020 below the average of all connected cells. This limit ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging with cells having higher specific gravities.

The footnotes to Table 3.8.6-1 that apply to specific gravity are applicable to Category A, B, and C specific gravity. Footnote (b) of Table 3.8.6-1 requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current, while on float charge, is < 2 amps for 125 VDC batteries and < 1.0 amp for 419 VDC LPCI MOV independent power supply batteries. This current provides, in general, an indication of acceptable overall battery condition.

Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charging current is an acceptable alternative to specific gravity measurement for determining the state of charge of the designated pilot cell. This phenomenon is discussed in IEEE-450 (Ref. 4). Footnote (c) to Table 3.8.6-1 allows the float charge current to be used as an alternate to specific gravity for up to 7 days following a battery recharge. Within 7 days, each connected cell's specific gravity must be measured to confirm the state of charge. Following a minor battery recharge (such as equalizing charge that does not follow a deep discharge) specific gravity gradients are not significant, and confirming measurements may be made in less than 7 days.

(continued)

BASES (continued)

REFERENCES

1. UFSAR, Chapter 6.

2. UFSAR, Chapter 14.

3. 10 CFR 50.36(c)(2)(ii).

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

5. IEEE Standard 485, 1983.

# TSTF-360
# Inserts for TS Bases Pages Mark-Up

## Insert 1

...meet the duty cycle(s) discussed in the UFSAR, Chapter 8 (Ref 4). The battery is designed with additional capacity above that required by the design duty cycle to allow for temperature variations and other factors.

## Insert 2

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 124V for a 60 cell battery (i.e., cell voltage of 2.065 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 $\geq$ 2.07 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage of 2.17 to 2.25 Vpc for the 125 VDC batteries and 2.17 to 2.26 Vpc for the LPCI MOV independent power supply batteries. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage for the 125 VDC batteries is 2.20 Vpc, which corresponds to a total float voltage output of 132 V for a 60 cell battery. The nominal float voltage for the LPCI MOV independent power supply batteries is 2.25 Vpc, which corresponds to a total float voltage output of 418.5 V for a 186 cell battery.

## Insert 3

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. Lead-calcium 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.

## Insert 4

A.1, A.2, and A.3

Condition A represents one division of the 125 VDC Power System with one battery charger inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained). The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Action A.1 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 charge condition (Required Action A.2) 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 capability 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 (Required Action A.2).

Required Action A.2 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 has now been fully recharged. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 2 amps, this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Action A.3 limits the restoration time for the inoperable battery charger to 7 days. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The 7 day Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to Operable status.

## Insert 5

..., while supplying the continuous steady state loads of the associated DC subsystem. On float charge, battery cells will receive adequate current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer (2.17 Vpc or 130.2 V at the 125 VDC battery terminals or 403.6 VDC for 419 VDC LPCI MOV independent power supply battery terminals). This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years).

## Insert 6

This SR provides two options. One option requires that each battery charger be capable of supplying 270 amps at the minimum established float voltage for 4 hours. The ampere requirements are based on the output rating of the chargers. The voltage requirements are based on the charger voltage level after a response to a loss of AC power. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours.

The other option requires that each battery charger be capable of recharging the battery after a service test coincident with supplying the largest coincident demands of the various continuous steady state loads (irrespective of the status of the plant during which these demands occur). This level of loading may not normally be available following the battery service test and will need to be supplemented with additional loads. The duration for this test may be longer than the charger sizing criteria since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is recharged when the measured charging current is $\leq 2$ amps.

## Insert 7

Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

## Insert 8

In addition to the limitations of the Specification, the Battery Monitoring and Maintenance Program also implements a program specified in Specification 5.5.14 for monitoring various battery parameters that is based on the recommendations of IEEE Standard 450, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications" (Ref. 4).

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 124V for a 60 cell battery (i.e., cell voltage of 2.065 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 $\geq$ 2.07 Vpc, the battery cell will maintain its capacity for 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage of 2.17 to 2.25 Vpc for the 125 VDC batteries and 2.17 to 2.26

Vpc for the LPCI MOV independent power supply batteries. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage for the 125 VDC batteries is 2.20 Vpc, which corresponds to a total float voltage output of 132 V for a 60 cell battery. The nominal float voltage for the LPCI MOV independent power supply batteries is 2.25 Vpc, which corresponds to a total float voltage output of 418.5 V for a 186 cell battery.

## Insert 9

Additional preventative maintenance, testing, and monitoring performed in accordance with the Battery Monitoring and Maintenance Program is conducted as specified in Specification 5.5.14.

## Insert 10

A.1, A.2, and A.3

With one or more cells in one battery in one subsystem < 2.07 V, the battery cell is degraded. Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage (SR 3.8.4.1) and of the overall battery state of charge by monitoring the battery float charge current (SR 3.8.6.1). This assures that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one or more batteries < 2.07 V, and continued operation is permitted for a limited period up to 24 hours.

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.6.1 acceptance criteria does not result in this Required Action not being met. However, if one of the SRs is failed, the appropriate Conditions(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed then there is not assurance that there is still sufficient battery capacity to perform the intended function and the battery must be declared inoperable immediately.

B.1 and B.2

One battery in one subsystem with float current > 2 amps for the 125 VDC battery or > 1 amp for the LPCI MOV independent power supply battery indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities. The battery charger is either inoperable or is operating in the current limit mode after 2 hours which is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery 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 (Required Action B.2). The battery must therefore be declared inoperable.

If the float voltage is found to be satisfactory but there are one or more battery cells with float voltage less than 2.07 V, the associated "OR" statement in Condition F is applicable and the

battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than 2.07 V there is good assurance that, within 12 hours, the battery will be restored to its fully charge condition (Required Action B.2) from any discharge that might have occurred due to a temporary loss of the battery charger. A discharged battery with float voltage (the charger setpoint) across its terminal 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 a good assurance of fully recharging the battery within 12 hours, avoiding a premature shutdown with its own attendant risk.

If the condition is due to one or more cells in a low voltage condition but still greater than 2.07 V and float voltage is found to be satisfactory, this is not indication of a substantially discharged battery and 12 hours is a reasonable time prior to declaring the battery inoperable.

Since Required Action B.1 only specifies "perform", a failure of SR 3.8.4.1 acceptance criteria does not result in the Required Action not being met. However, if SR 3.8.4.1 is failed, the appropriate Condition(s), depending on the cause of the failure, is entered.

C.1 and C.2 and C.3

With one battery in one subsystem with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days the minimum established design limits for electrolyte level must be re-established.

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions C.1 and C.2 address this potential (as well as provisions in Specification 5.5.14, Battery Monitoring and Maintenance Program). Required Actions C.1 and C.2 are modified by a Note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours, level is required to be restored to above the top of the plates. The Required Action C.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.14.b item to initiate action to equalize and test in accordance with manufacture's recommendation are taken from Annex D of IEEE Standard 450-1995. They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the battery may have to be declared inoperable and the affected cell(s) replaced.

D.1

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

E.1

With one or more batteries in redundant subsystems with battery parameters not within limits there is not sufficient assurance that battery capacity has not been affected to the degree that the

batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved, this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer completion times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one redundant subsystem within 2 hours.

## Insert 11

...discovering one battery in one subsystem with one or more battery cells float voltage less than 2.07 V and float current greater than 2 amps for the 125 VDC battery or greater than 1 amp for the LPCI MOV independent power supply battery indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately. This condition is intended to apply when the battery is in the float mode. For example, if an individual cell is discovered below the 2.07 V limit, a possible corrective action would be to place the battery in the equalize mode. In this condition, the charger amperage is elevated and a measurement of 'float' current may be above the stated limits with an individual cell below the 2.07 V criteria. This is an expected condition; therefore, in this case it is not appropriate to enter Condition F.

## Insert 12

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref. 4). The 7 day Frequency is consistent with IEEE-450 (Ref. 4).

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained for the 125 VDC battery, the Required Actions of LCO 3.8.4 ACTION A are being taken, which provide the necessary and appropriate verifications of the battery condition. When this float voltage is not maintained for the LPCI MOV independent power supply battery, the battery is considered inoperable and LCO 3.8.4 ACTION D is initiated. Furthermore, the float current limits of 2 amps for the 125 VDC battery and 1 amp for the LPCI MOV independent power supply battery are established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 130.2 V at the 125 VDC battery terminals and 403.6 V at the LPCI MOV independent power supply battery terminals, or 2.17 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltage in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.5.14. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are

greater than or equal to the short term absolute minimum voltage of 2.07 V. The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 4).

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The Frequency is consistent with IEEE-450 (Ref. 4).

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 65°F for 125 VDC battery and 50°F for the 419 VDC LPCI MOV independent power supply battery). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is consistent with IEEE-450 (Ref. 4).