



Entergy Nuclear Northeast  
Entergy Nuclear Operations, Inc.  
James A. Fitzpatrick NPP  
P.O. Box 110  
Lycoming, NY 13093  
Tel 315 349 6024 Fax 315 349 6480

August 1, 2006  
JAFF-06-0119

Pete Dietrich  
Site Vice President - JAF

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

**Subject: James A. FitzPatrick Nuclear Power Plant  
Docket No. 50-333  
Response to Request for Additional Information (RAI) Regarding  
Amendment Application to Revise Technical Specifications on DC  
Electrical System Requirements (TAC No. MC7204)**

References:

1. Entergy Nuclear Operations, Inc. letter to USNRC (JAFF-05-0082), Proposed Technical Specification Amendment to DC Electrical System Requirements, dated April 27, 2005.
2. USNRC letter to Entergy Nuclear Operations, Inc., Request for Additional Information Regarding Amendment Application to Revise Technical Specifications on DC Electrical System Requirements, dated March 30, 2006 (TAC No. MC7204).

Dear Sir/Madam:

By letter dated April 27, 2005 (Reference 1), Entergy Nuclear Operations, Inc. (ENO) proposed to amend the Technical Specifications (TS) for the James A. FitzPatrick Nuclear Power Plant (JAFNPP) by revising TS 3.8.4, 3.8.5, 3.8.6 and 5.5.14, all of which deal with the DC electrical system. These proposed changes were based on TS Task Force (TSTF) Change Traveler TSTF-360 (Revision 1) that was approved generically for the boiling water reactor (BWR) Standard TS, NUREG-1433 (BWR/4).

ENO received a request for additional information (RAI) from the NRC (Reference 2). Attachment 1 to this letter provides the response to the RAI questions. As stated in the attached RAI response ENO no longer requests changes to TS sections 3.8.5, 3.8.6 and 5.5.14, due to generic industry issues associated with those proposed changes. The proposed changes are now limited to TS section 3.8.4.

This response only reduces the scope of the original application and does not change the conclusions of the No Significant Hazards Consideration or the Environmental Assessment, contained in Reference 1. There are no commitments made by the Licensee in this letter.

Attachment 2 provides existing TS pages marked-up to show the proposed changes. Attachment 3 provides typed TS pages with the proposed changes incorporated. Attachment 4 provides a draft copy of the associated TS Bases pages marked-up to show the proposed

A001

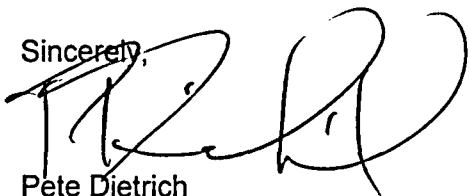
changes. These marked-up and retyped pages replace all of the marked-up and retyped pages in the original proposed amendment (Reference 1).

Should you have any questions or comments concerning this submittal, please contact Mr. James Costedio at (315) 349-6358.

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

Executed on this the 1<sup>st</sup> day of AUGUST 2006.

Sincerely,



Pete Dietrich  
Site Vice President

Attachments:

1. Response to Request for Additional Information
2. Proposed TS Pages (Mark-up)
3. Proposed TS Pages (Retyped)
4. Proposed TS Bases Changes (Mark-up)

cc: Regional Administrator, Region I  
U. S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, PA 19406-1415

Office of the Resident Inspector  
U. S. Nuclear Regulatory Commission  
P. O. Box 136  
Lycoming, NY 13093

Mr. John P. Boska  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
Mail Stop O-8-C2  
Washington, DC 20555-0001

Mr. Peter R. Smith, President  
NYSERDA  
17 Columbia Circle  
Albany, NY 12203-6399

Mr. Paul Eddy  
New York State Department  
of Public Service  
3 Empire State Plaza, 10<sup>th</sup> Floor  
Albany, New York 12223

**Attachment 1 to JAFP-06-0119**  
Entergy Nuclear Operations, Inc. – FitzPatrick  
Docket No. 50-333

**RAI 1**

“Specific gravity monitoring is used to measure the strength of a battery cell’s electrolyte, which is an important component of the battery’s chemical reaction, and provides an indication of the battery’s state-of-charge. Whereas, float current monitoring may or may not provide an accurate indication of the battery’s state-of-charge. Float current monitoring is based on a calculation that is dependent on several variables. The staff has a concern with two variables of this calculation: the applied charging voltage and cell resistance. A change in either of these variables may provide a false indication of the battery’s state-of-charge. Provide assurance that float current monitoring will provide an accurate indication of the battery’s state-of-charge.”

**RESPONSE**

The proposed amendment (Reference 1) changes to TS sections 3.8.5, 3.8.6 and 5.5.14 are no longer requested. The proposed changes are limited to TS section 3.8.4. Specific gravity monitoring is still being performed and will continue to provide indication of the battery state of charge.

**RAI 2**

“The battery pilot cell is representative of the average battery cell in the battery. Provide assurance that a battery with a battery pilot cell with a voltage of 2.07 volts or slightly greater will remain capable of performing its minimum designed function.”

**RESPONSE**

The proposed amendment (Reference 1) changes to TS sections 3.8.5, 3.8.6 and 5.5.14 are no longer requested. The proposed changes are limited to TS section 3.8.4. The current TS associated with the battery pilot cell voltage will remain unchanged.

**RAI 3**

“As mentioned in question 2, the battery pilot cell is representative of the average battery cell in the battery. Provide assurance that a battery with a battery pilot cell electrolyte temperature slightly greater than or equal to the minimum established design limit will remain capable of performing its minimum designed function.”

**RESPONSE**

The proposed amendment (Reference 1) changes to TS sections 3.8.5, 3.8.6 and 5.5.14 are no longer requested. The proposed changes are limited to TS section 3.8.4. The current TS associated with the pilot cell electrolyte temperature will remain unchanged.

**Attachment 1 to JAFP-06-0119**  
Entergy Nuclear Operations, Inc. – FitzPatrick  
Docket No. 50-333

**RAI 4**

“Consistency with 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,” was used throughout your submittal as the justification for approval. The most recent version of IEEE Standard 450 that has been endorsed by the NRC through Regulatory Guides (RGs) is IEEE Standard 450-1975. The RGs of mention are: RG 1.128, “Installation, Design, and Installation of Large Lead Storage Batteries for Nuclear Power Plants,” and RG 1.129, “Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants.

- a. Provide a plant specific technical justification for each proposed change in lieu of referencing consistency with the IEEE Standard 450-1995.
- b. Provide a copy of the proposed battery monitoring and maintenance program identified in TS 5.5.14.”

**RESPONSE**

The proposed amendment (Reference 1) changes to TS sections 3.8.5, 3.8.6 and 5.5.14 are no longer requested. The proposed changes are limited to TS section 3.8.4. As such, reference to IEEE 450-1995 (Reference 2) is no longer made, and a battery monitoring and maintenance program is no longer identified, in TS 5.5.14.

**REFERENCES**

1. Entergy Nuclear Operations, Inc. letter to USNRC (JAFP-05-0082), Proposed Technical Specification Amendment to DC Electrical System Requirements, dated April 27, 2005.
2. 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”

**Attachment 2 to JAFP-06-0119**  
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

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

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE	FREQUENCY
<p>SR 3.8.4.1    Verify battery terminal voltage on float charge is:</p> <p>    a.    <math>\geq 127.8</math> VDC for 125 VDC batteries, and</p> <p>    b.    <math>\geq 396.2</math> VDC for 419 VDC LPCI MOV independent power supply batteries.</p>	<p>7 days</p>
<p>SR 3.8.4.2    Verify each 125 VDC battery charger supplies <math>\geq 270</math> amps at <math>\geq 128</math> VDC for <math>\geq 4</math> hours.</p>	<p>24 months</p>
<p>SR 3.8.4.3    -----NOTE-----</p> <p>                  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.</p> <p>                  -----</p> <p>                  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.</p>	<p>24 months</p>

INSERT 2 →

(continued)

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

**Insert 1**

<p>A. One battery charger on one 125 VDC power subsystem inoperable.</p>	<p>A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage (127.8 VDC).</p>	<p>2 hours</p>
	<p><u>AND</u></p>	
	<p>A.2 Verify battery float current <math>\leq</math> 2 amps.</p>	<p>Once per 12 hours</p>
	<p><u>AND</u></p>	
	<p>A.3 Restore battery charger to OPERABLE status.</p>	<p>7 days</p>

**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.



**Attachment 3 to JAFP-06-0119**  
Entergy Nuclear Operations, Inc. – FitzPatrick  
Docket No. 50-333

**PROPOSED TECHNICAL SPECIFICATION PAGES (RETYPE)**

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
<p>A. One battery charger on One 125 VDC power subsystem inoperable.</p>	<p>A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage (127.8 VDC).</p>	<p>2 hours</p>
	<p><u>AND</u></p>	
	<p>A.2 Verify battery float current <math>\leq</math> 2 amps.</p>	<p>Once per 12 hours</p>
	<p><u>AND</u></p>	
	<p>A.3 Restore battery charger to OPERABLE status.</p>	<p>7 days</p>

(continued)

**ACTIONS (continued)**

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

**SURVEILLANCE REQUIREMENTS**

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	<p>Verify battery terminal voltage on float charge is:</p> <p>a. <math>\geq 127.8</math> VDC for 125 VDC batteries, and</p> <p>b. <math>\geq 396.2</math> VDC for 419 VDC LPCI MOV independent power supply batteries.</p>	7 days
SR 3.8.4.2	<p>Verify each 125 VDC battery charger supplies <math>\geq 270</math> amps at <math>\geq 128</math> VDC for <math>\geq 4</math> hours.</p> <p><u>OR</u></p> <p>Verify each battery charger can recharge the battery to the fully charged state within 24 hours while supplying the largest combined demands of the various continuous steady state loads, after a battery discharge to the bounding design basis event discharge state.</p>	24 months
SR 3.8.4.3	<p>----- NOTE -----</p> <p>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.</p> <p>-----</p> <p>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.</p>	24 months

(continued)

**Attachment 4 to JAFP-06-0119**  
Entergy Nuclear Operations, Inc. – FitzPatrick  
Docket No. 50-333

**PROPOSED TECHNICAL SPECIFICATION BASES CHANGES  
(MARKUP)**

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 (MOV) 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

INSERT 4

(B) A.1 (B)

Condition A 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

has

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 subsystems <sup>has</sup> have 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 B.1 and B.2 inoperable

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 L.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

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

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).

INSERT 5

(continued)

BASES

SURVEILLANCE  
REQUIREMENTS  
(continued)

SR 3.8.4.2

This SR verifies

battery

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.

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.

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.

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)

**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.