



Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-20-013

August 6, 2020

10 CFR 50.90
10 CFR 50.91

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Browns Ferry Nuclear Plant, Units 1, 2, and 3
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68
NRC Docket Nos. 50-259, 50-260, and 50-296

Subject: **Application to Revise Browns Ferry Nuclear Plant, Units 1, 2, and 3,
Technical Specification 3.8.6, "Battery Cell Parameters" (TS-531)**

In accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.90, "Application for amendment of license, construction permit, or early site Permit," Tennessee Valley Authority (TVA) is submitting a request for an amendment to the Technical Specifications (TS) for the Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3. The proposed amendment would modify BFN TS 3.8.6, "Battery Cell Parameters," to clarify the operability requirements for the Unit, Shutdown Board, and Diesel Generator batteries.

The enclosure provides a description and evaluation of the proposed change. Attachment 1, 2, and 3 to the enclosure provides the existing BFN Unit 1, 2, and 3 TS pages, respectively, marked up to show the proposed change. Attachment 4 provides the proposed TS Bases changes for BFN Unit 1 for information only (the Unit 2 and 3 Bases are nearly identical in terms of what is being affected).

TVA requests approval of the proposed license amendment by one year from the date of this letter with implementation within 60 days following NRC approval.

TVA determined that there are no significant hazards consideration associated with the proposed change and that the TS change qualifies for a categorical exclusion from environmental review pursuant to the provisions of 10 CFR 51.22(c)(9). Additionally, in accordance with 10 CFR 50.91(b)(1), TVA is sending a copy of this letter and enclosure to the Alabama Department of Public Health.

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There are no new regulatory commitments associated with this request. Please address any questions regarding this submittal to Gordon R. Williams, Senior Manager, Fleet Licensing (Acting) at 423-751-2687.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 6th day of August 2020.

Respectfully,

A handwritten signature in black ink, appearing to read "James Barstow".

James Barstow
Vice President, Regulatory Affairs & Support Services

Enclosure:

Evaluation of the Proposed Change

cc (with Enclosure):

NRC Regional Administrator - Region II
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant
NRC Project Manager - Browns Ferry Nuclear Plant
State Health Officer, Alabama Department of Public Health

ENCLOSURE

Evaluation of the Proposed Change

Subject: Application to Revise Browns Ferry Nuclear Plant, Units 1, 2, and 3,
Technical Specification 3.8.6, "Battery Cell Parameters"

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ATTACHMENTS:

1. Technical Specification Page Markups (Unit 1)
2. Technical Specification Page Markups (Unit 2)
3. Technical Specification Page Markups (Unit 3)
4. Unit 1 Bases Page Markups (for information only)

1. SUMMARY DESCRIPTION

In accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.90, "Application for amendment of license, construction permit, or early site permit," Tennessee Valley Authority (TVA) is requesting a license amendment to the Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3, Technical Specifications (TS) 3.8.6, "Battery Cell Parameters," to clarify the operability requirements for the Unit, Shutdown Board, and Diesel Generator (DG) batteries. This change is submitted as a corrective action to remove ambiguity in the use of Table 3.8.6-1 of the technical specifications.

2. DETAILED DESCRIPTION

2.1 System Design and Operation

The 250-Volt (V) direct current (DC) power system consists of two subsystems, a six-battery plant system and a five-battery control power system (shutdown board batteries).

1. The plant batteries are further categorized as unit batteries (Batteries 1, 2, and 3) and station batteries (Batteries 4, 5, and 6). The Engineered Safeguards System loads for the three-unit plant are supplied from Unit Batteries 1, 2, and 3. Batteries 1, 2, and 3 also supply some non-safety-related loads, but Batteries 4, 5, and 6 only supply non-safety-related loads.

The 250-V DC unit system consists of three 120-cell lead-acid batteries (one Class 1E battery and battery charger per unit and one Class 1E spare battery charger common with the station system) together with the associated circuitry, switches, indicators, and alarms. The 250-V DC station system consists of three 120-cell lead-acid batteries (one Non-Class 1E battery and battery charger per unit and one Class 1E spare battery charger common with the Unit system) together with the associated circuitry, switches, indicators, and alarms.

On loss of power to the charger, the battery supplies all required loads. Each battery is equipped with a low-voltage alarm which is actuated before battery voltage falls to 240-V. The batteries in the 250-V plant DC system have the capacity to carry all their required selected loads for 30 minutes without recharging. Each charger is sized to recharge its battery from the design minimum charge, based on actual duty cycle ampere-hour discharge, in approximately 12 hours under normal load conditions.

2. The 250-V DC control power supply system (Shutdown Board Batteries SB-A, SB-B, SB-C, SB-D, and SB-3EB) consists of five 120-cell lead-acid batteries (one battery and battery charger for each shutdown board, and one spare battery charger), together with the associated circuitry, switches, indicators, and alarms. The batteries also supply 480-V shutdown boards for Units 1 and 2 and ATWS.

Each battery charger provides the 250-V DC supply during normal operations, keeps its associated battery charged at all times, and recharges the battery after a discharge. On loss of power to the charger, the battery supplies required loads. Each battery is equipped with a low-voltage alarm which is actuated before battery voltage falls to 240-V.

Control circuit voltage for the diesel generators is 125-V DC, with each diesel generator having its own battery. Each battery has a normal and an alternate battery charger that are powered from the 480-V diesel auxiliary boards. The diesel batteries are located in the Diesel Generator Building, and each battery consists of 60 single cell containers for a total of 60 cells.

The battery supplies all required 125-V DC loads, including the following.

- a. Control power
- b. Governor booster pumps
- c. Fuel pump
- d. Field flashing
- e. Diesel generator DC motor driven lube oil soakback pumps
- f. Diesel generator DC motor driven lube oil circulating pumps

2.2 Current Technical Specifications Requirements

Limiting Condition of Operation (LCO) 3.8.6 states, "Battery cell parameters for the Unit, Shutdown Board, and DG batteries shall be within the limits of Table 3.8.6-1." Table 3.8.6-1 provides values for electrolyte level, float voltage, and specific gravity for limits for each designated pilot cell (Category A), limits for each connected cell (Category B), and allowable values for each connected cell (Category C). Required actions are specified for conditions when the parameters are not within limits.

2.3 Reason for the Proposed Change

BFN TS 3.8.6, "Battery Cell Parameters," states, "Battery cell parameters for the Unit, Shutdown Board, and DG batteries shall be within the limits of Table 3.8.6-1." Table 3.8.6-1 requires, under Category C, that each connected cell's specific gravity is no less than 0.020 below the average of all connected cells. Table 3.8.6-1 also lists Category A and Category B limits.

While performing a quarterly check of the diesel generator C Battery in June 2018, the as-found specific gravity of a cell was found to not meet the Category C limit. A review of other test data found that cells in the Main Bank and Shutdown Board batteries had also not met the Category C limits at various times. These discrepancies were noted in the TVA Corrective Action Program system for tracking and resolution. In all of these cases, the Category A and B limits continued to be met.

The Bases for the Category C limits state,

The Category C limit on average specific gravity ≥ 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 the effect of a highly charged or new cell does not mask overall degradation of the battery.

When the average specific gravity of all connected cells is near the nominal, fully charged value, this limit provides a valid indication of a cell that may not be able to meet its design basis requirements. When the average specific gravity is high, having one cell more than 0.020 below the average of all connected is not necessarily an indication of a problem and is an invalid basis on which to declare the battery inoperable when all other parameter limits are met. Likewise,

because the acceptable range of specific gravity is wider than 0.020, the natural variance of specific gravity can cause a given cell to be lower than 0.020 below the average and still be acceptable, notwithstanding the LCO. The proposed change corrects this situation.

2.4 Description of the Proposed Change

This TS Change is proposed to clarify the usage of Condition B of TS 3.8.6 by modifying it, creating a new Condition C, and adding a new note to Table 3.8.6-1.

<p>OR</p> <p>One or more batteries with one or more battery cell parameters not within Category C values.</p>		
<p>C. One or more batteries with one or more battery cell parameters not within Category B limits.</p> <p><u>AND</u></p> <p>Any corresponding battery cell parameter for that battery not within its Category C limit.</p>	<p>C.1 Declare associated battery inoperable.</p>	<p>Immediately</p>

These changes include:

- Deleted last “OR” clause from Condition B regarding Category C limits.
- Created new Condition C for situations when battery cell parameters are not within Category C limits and also not within the corresponding Category B limits. This new condition has the same action as Condition B, to immediately declare the battery inoperable.
- Added new Note (e) to Table 3.8.6-1 to clarify that the Category C limits are not considered when the corresponding Category B limits are met.

Except for the deviation from the average specific gravity, the Category C limits are reduced values compared to the Category B limits and would not be reached unless the Category B limits are not met. Therefore, this new note has no effect on the other Category C limits.

This proposed change clarifies the usage of the Category C limits as allowable values that determine operability only if any of the corresponding Category B limits are not met. Marked-up TS pages are provided in Attachments 1, 2, and 3 of this enclosure for BFN, Units 1, 2, and 3, respectively.

3. TECHNICAL EVALUATION

3.1 History

The BFN Technical Specification 3.8.6, "Battery Cell Parameters," is based on NUREG-1433, Revision 0, "Standard Technical Specifications — General Electric Plants (BWR/4)." In this format, the technical specification contains Table 3.8.6-1 with three rows and three columns that present the battery cell parameter requirements. The three rows contain requirements for the parameters electrolyte level, float voltage, and specific gravity respectively. The column containing Category A requirements provides limits for each designated pilot cell. The column for Category B requirements provides limits for each connected cell. The column for Category C requirements provides allowable values for each connected cell.

The LCO for TS 3.8.6 states, "Battery cell parameters for the Unit, Shutdown Board, and DG batteries shall be within the limits of Table 3.8.6-1." Although there are actions that require the Category C limits to be checked when Category A and B limits are not met, there is no explicit wording that specifies that Category C limits are not applicable at all times.

NUREG-0123, Revision 4, "Standard technical specifications for General Electric boiling water reactors," was the last revision of the standard technical specifications for boiling water reactors before the transition to NUREG-1433. NUREG-0123 contained a corresponding table, Table 4.8.2.1-1, "Battery Surveillance Requirements," which provided the same information as the current Table 3.8.6-1. In the older table, the current Categories B limits and C allowable values were combined into one column, Category B, with a note (2) that stated, "For any Category B parameters outside the limit(s) shown, the battery may be considered OPERABLE provided that the Category B parameters are within their allowable values [the new Category C column] and provided the Category B parameter(s) are restored to within limits within 7 days."

Additionally, the TS in NUREG-0123 simply required the battery to be Operable, with additional information in the surveillance requirement on how to determine Operability of the battery. NUREG-1433 includes an LCO that requires the battery cell's parameters to be within the limits specified in Table 3.8.6-1 without any additional information on determining continued Operability. The explanation on use of the allowable values was not carried through from NUREG-0123 to NUREG-1433 and is causing ambiguity in the use of the table.

3.2 Category C Requirements

The Bases for LCO 3.8.6 state

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.

While in general this is true, there is an instance when a battery cell parameter may be outside the Category C limits and still maintain assurance of sufficient capacity. This can occur because one of the Category C limits for specific gravity is not simply a reduced limit, but instead is a difference from an average. For example, when the average specific gravity is above 1.22, a normally functioning and fully charged cell may be more than 0.020 below the average of the other connected cells, and thus, outside the Category C limit.

The Bases for LCO 3.8.6 additionally state

The Category C limit on average specific gravity ≥ 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 the effect of a highly charged or new cell does not mask overall degradation of the battery.

Therefore, this limit was intended to identify a cell or cells with reduced specific gravity indicative of possible cell deterioration. It was not intended to identify normal cells that are below a high average.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements

10 CFR 50.36, "Technical Specifications," requires that operating licenses for nuclear reactors must include TS that specify LCOs for equipment required for safe operation. Based on the assessments presented herein, the proposed changes to the BFN TS have no significant impact on the continued conformance with the requirements of 10 CFR 50.36.

Design Criteria

During the construction permit licensing process, each of the three BFN units were evaluated against the then-current draft of the Atomic Energy Commission (AEC) Proposed General Design Criteria. Units 1 and 2 were evaluated against the AEC-27 Criteria, while Unit 3 was evaluated against the AEC-70 Criteria. Although neither version of these proposed criteria had been adopted as regulatory requirements, the design, material procurement, and fabrication of each reactor unit was responsive to the respective applicable criteria for a construction permit. Although the later criteria (AEC-70) did not wholly complement the earlier AEC-27 criteria, and also contained many aspects which could have been modified or clarified before their formal adoption, the design bases of each unit were reevaluated (at the time of initial Final Safety Analysis Report preparation) against the draft of the AEC-70 criteria current at the time of operating license application.

Based on the understanding of the intent of the proposed criteria current at the time of operating license application, it was concluded that each BFN unit conforms to the intent of the AEC General Design Criteria for Nuclear Power Plant Construction Permits.

Criterion 17—Electric power systems

The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

The system is arranged and powered so that the probability of failure of power to any single battery board bus or shutdown board control bus is very low and that such a failure does not prevent the safe shutdown and cooldown of all three units in the event of the loss of offsite power and a design basis accident in any one unit. The system is designed to meet the intent of the IEEE criteria for nuclear power plant protection systems. The Unit, Shutdown Board, and

DG batteries were designed to IEEE-279 Standards, and they have been analyzed and meet IEEE-450 Standards, 1987.

Each battery, and its associated equipment, is easily accessible for inspection and testing. The DC system is ungrounded and has a ground detection alarm. The most probable mode of battery failure would be deterioration of a single cell which can be detected well in advance by standard, routine battery inspections and testing. The system is designed so that the batteries cannot be paralleled.

4.2 No Significant Hazards Consideration Analysis

A written evaluation of the significant hazards consideration of a proposed license amendment is required by 10 CFR 50.92. According to 10 CFR 50.92, 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

- Involve a significant increase in the probability or consequences of an accident previously evaluated; or
- Create the possibility of a new or different kind of accident from any accident previously evaluated; or
- Involve a significant reduction in a margin of safety.

As required by 10 CFR 50.91(a), the TVA analysis of the issue of no significant hazards consideration using the standards in 10 CFR 50.92 is presented below.

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

Response: No

The proposed changes revise TS 3.8.6 to clarify battery cell parameter limits. The proposed changes are not an initiator of any accident previously evaluated. As a result, the probability of an accident previously evaluated is not significantly increased. The proposed changes ensure that the Unit, Shutdown Board, and DG batteries continue to be capable of performing their safety function.

Therefore, these proposed changes do not involve a significant increase in the probability of consequences of an accident previously identified.

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

Response: No

The proposed changes clarify the applicability of Category C limits in Table 3.8.6-1. The proposed changes do not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. In addition, the proposed changes do not impose any new or different requirements that could initiate an accident.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Response: No

The proposed changes clarify the applicability of Category C limits in Table 3.8.6-1. The proposed changes do not adversely affect any current plant safety margins or the reliability of the equipment assumed in the safety analysis. Therefore, there are no changes being made to any safety analysis assumptions, safety limits or limiting safety system settings that would adversely affect plant safety as a result of the proposed changes.

Therefore, based on the above discussion, these proposed changes do not involve a reduction in the margin of safety.

4.3 Conclusions

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

5. ENVIRONMENTAL CONSIDERATION

TVA has evaluated the proposed amendment and determined that the amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

Attachment 1

Technical Specification Page Markups

Unit 1

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. <u>OR</u> One or more batteries with average electrolyte temperature of the representative cells not within limits.	B.1 Declare associated battery inoperable.	Immediately
<u>OR</u> One or more batteries with one or more battery cell parameters not within Category C values.	C.1 Declare associated battery inoperable.	Immediately

C. One or more batteries with one or more battery cell parameters not within Category B limits.

AND

Any corresponding battery cell parameter for that battery not within its Category C limit.

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: ALLOWABLE VALUE FOR EACH CONNECTED CELL ^(e)
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)(d)	≥ 1.20	≥ 1.195 <u>AND</u> Average of all connected cells > 1.205	Not more than 0.020 below average of all connected cells <u>AND</u> Average of all connected cells ≥ 1.195

- (a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum level during equalizing charges provided it is not overflowing.
- (b) Corrected for electrolyte temperature.
- (c) As an alternative to the specific gravity measurements, a battery charging current of < 1 amp for Unit and Shutdown Board batteries and < 0.5 amp for DG batteries when on float charge is acceptable only during a maximum of 7 days following a battery recharge. 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.
- (d) Alternate values may be used for a limited number of cells provided demonstrated battery capacity at the last discharge test meets the minimum qualifying value.
- (e) Category C battery cell parameters are not considered when the corresponding Category B cell parameters are met.

Attachment 2

Technical Specification Page Markups

Unit 2

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. <u>OR</u> One or more batteries with average electrolyte temperature of the representative cells not within limits.	B.1 Declare associated battery inoperable.	Immediately
<u>OR</u> One or more batteries with one or more battery cell parameters not within Category C values.	C.1 Declare associated battery inoperable.	Immediately

C. One or more batteries with one or more battery cell parameters not within Category B limits.

AND

Any corresponding battery cell parameter for that battery not within its Category C limit.

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: ALLOWABLE VALUE FOR EACH CONNECTED CELL(e)
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)(d)	≥ 1.20	≥ 1.195 <u>AND</u> Average of all connected cells > 1.205	Not more than 0.020 below average of all connected cells <u>AND</u> Average of all connected cells ≥ 1.195

- (a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum level during equalizing charges provided it is not overflowing.
- (b) Corrected for electrolyte temperature.
- (c) As an alternative to the specific gravity measurements, a battery charging current of < 1 amp for Unit and Shutdown Board batteries and < 0.5 amp for DG batteries when on float charge is acceptable only during a maximum of 7 days following a battery recharge. 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.
- (d) Alternate values may be used for a limited number of cells provided demonstrated battery capacity at the last discharge test meets the minimum qualifying value.
- (e) Category C battery cell parameters are not considered when the corresponding Category B cell parameters are met.

Attachment 3

Technical Specification Page Markups

Unit 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. <u>OR</u> One or more batteries with average electrolyte temperature of the representative cells not within limits.	B.1 Declare associated battery inoperable.	Immediately
<u>OR</u> <u>One or more batteries with one or more battery cell parameters not within Category C values.</u>	C.1 Declare associated battery inoperable.	Immediately

C. One or more batteries with one or more battery cell parameters not within Category B limits.

AND

Any corresponding battery cell parameter for that battery not within its Category C limit.

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: ALLOWABLE VALUE FOR EACH CONNECTED CELL(e)
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)(d)	≥ 1.20	≥ 1.195 <u>AND</u> Average of all connected cells > 1.205	Not more than 0.020 below average of all connected cells <u>AND</u> Average of all connected cells ≥ 1.195

- (a) It is acceptable for the electrolyte level to temporarily increase above the specified maximum level during equalizing charges provided it is not overflowing.
- (b) Corrected for electrolyte temperature.
- (c) As an alternative to the specific gravity measurements, a battery charging current of < 1 amp for Unit and Shutdown Board batteries and < 0.5 amp for DG batteries when on float charge is acceptable only during a maximum of 7 days following a battery recharge. 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.
- (d) Alternate values may be used for a limited number of cells provided demonstrated battery capacity at the last discharge test meets the minimum qualifying value.
- (e) Category C battery cell parameters are not considered when the corresponding Category B cell parameters are met.

Attachment 4

Unit 1 Bases Page Markups

For Information Only

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 associated DC battery inoperable.

B.1

~~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 potentially extreme conditions, such as not completing the Required Actions of Condition A within the required Completion Time or average electrolyte temperature of representative cells falling below 60°F for each Unit and Shutdown Board battery (except Shutdown Board battery 3EB) and 40°F for Shutdown Board battery 3EB and each DG battery, also are cause for immediately declaring the associated DC electrical power subsystem inoperable.~~

P

C.1

When any battery parameter is outside the Category B limit and that battery parameter is outside the corresponding 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.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

Table 3.8.6-1 (continued)

INSERT

, in addition to being
outside the corresponding
Category B limits

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.

INSERT

to supply the
maximum
expected load
requirement

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 Allowable Value for voltage is based on IEEE-450 (Ref. 3), 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 ≥ 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 the effect of a highly charged or new cell does not mask overall degradation of the battery.

INSERT

(the highest average to be considered is the
manufacturer recommended fully charged,
nominal specific gravity of 1.215).

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

Table 3.8.6-1 (continued)

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 temperature.

INSERT

When the average specific gravity of all connected cells is near the nominal, fully charged value, this limit provides a valid indication of a cell that may not be able to meet its design basis requirements. When the average specific gravity is high, having one cell more than 0.020 below the average of all connected is not necessarily an indication of a problem and is an invalid basis on which to declare the battery inoperable when all other parameter limits are met. Likewise, because the acceptable range of specific gravity is wider than 0.020, the natural variance of specific gravity can cause a given cell to be lower than 0.020 below the average and still be acceptable.

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 charger 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. 3). 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. Footnote (d) to Table 3.8.6-1 allows alternate values recommended by the manufacturer to be used for specific gravity as appropriate (Ref. 6). For the DG and Shutdown batteries, up to 10 cells for each DG battery and up to 20 cells for each Shutdown battery can have specific gravities of 1.180 to 1.200 provided the demonstrated battery capacity at the last discharge test is ≥ 81.2 percent. For the Unit batteries, up to 12 cells for each battery can have specific gravities of 1.180 to 1.200 provided the demonstrated battery capacity at the last discharge test is ≥ 80.7 percent.

(continued)