March 22, 2012

NG-12-0028
10 CFR 50.90

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

Duane Arnold Energy Center
Docket No. 50-331
Renewed Op. License No. DPR-49

License Amendment Request (TSCR-132): Application for Technical Specification Change Regarding Battery Terminal and Charger Voltage and Amperage
Section Affected: 3.8.4

Pursuant to 10 CFR 50.90, NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) hereby requests revision to the Technical Specifications (TS) for the Duane Arnold Energy Center (DAEC).

The proposed amendment would revise the DAEC TS by modifying existing Surveillance Requirements (SRs) regarding the battery terminal and charger voltages and amperage provided in SR 3.8.4.1 and SR 3.8.4.6.

Attachment 1 provides a description of the proposed change. Attachment 2 provides the existing TS pages marked up to show the proposed changes. Attachment 3 provides the new typed TS pages showing the proposed changes. Attachment 4 provides the proposed TS Bases changes for information only.

NextEra Energy Duane Arnold requests NRC review and approval of the proposed license amendment by March 22, 2013. NextEra Energy Duane Arnold is requesting a 60 day implementation period to implement this license amendment.

This application has been reviewed by the DAEC Onsite Review Group. A copy of this submittal, along with the 10 CFR 50.92 evaluation of "No Significant Hazards Consideration," is being forwarded to our appointed state official pursuant to 10 CFR 50.91.

This letter makes no new commitments or changes to any existing commitments.

If you have any questions or require additional information, please contact Steve Catron at 319-851-7234.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on March 22, 2012.

for

Peter Wells
Vice President, Duane Arnold Energy Center
NextEra Energy Duane Arnold, LLC

Attachments:
1. Description and Assessment
2. Proposed Technical Specification Changes (Mark-ups)
3. Proposed Technical Specification Changes (Clean, typed)
4. Proposed Technical Specification Bases Changes (Mark-ups, for information only)

cc: M. Rasmusson (State of Iowa)

TSCR-132: Application for Technical Specification Change Regarding Battery Terminal and Charger Voltage and Amperage
Section Affected: 3.8.4

DESCRIPTION AND ASSESSMENT

1.0 SUMMARY DESCRIPTION

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1.0 SUMMARY DESCRIPTION

The proposed amendment would modify Technical Specifications (TS) by revising the Duane Arnold Energy Center (DAEC) TS by modifying existing Surveillance Requirements (SRs) regarding the battery terminal and charger voltages and amperage provided in SR 3.8.4.1 and SR 3.8.4.6.

The proposed amendment modifies SR 3.8.4.1 to verify battery terminal voltage is ≥ 130.5 V (instead of the current value of ≥ 126 V) on float charge for the 125 VDC batteries. The proposed amendment also modifies SR 3.8.4.6 to verify each required battery charger supplies ≥ 293 amps at ≥ 132.5 V (instead of the current value of 300 amps at ≥ 129 V) for the 125 VDC system.

NextEra Energy Duane Arnold requests NRC review and approval of the proposed license amendment by March 22, 2013.

2.0 DETAILED DESCRIPTION

The proposed amendment modifies SR 3.8.4.1 to verify battery terminal voltage is ≥ 130.5 V (instead of the current value of ≥ 126 V) on float charge for the 125 VDC batteries. The proposed amendment also modifies SR 3.8.4.6 to verify each required battery charger supplies ≥ 293 amps at ≥ 132.5 V (instead of the current value of 300 amps at ≥ 129 V) for the 125 VDC system.

TS Bases associated with these Surveillance Requirements will be revised to describe revised voltage limits. Revised Bases pages are attached for information only and do not require NRC approval. The final TS Bases pages will be submitted with a future update in accordance with TS 5.5.10, "Technical Specifications (TS) Bases Control Program." It should be noted that Bases pages B 3.8-46 and B 3.8.49 have no changes associated with this amendment request, but are included for clarity.

A Site Engineering Change (EC) proposes to add two additional cells to each of the existing DAEC 125 VDC Safety Related Station Batteries (1D1 & 1D2). The existing DAEC 125 VDC Electrical Power Supply calculation indicates that for the present 58 Cell batteries, there is an insufficient voltage to allow a single cell to be taken out of service on either battery and still maintain the battery operable. Adding two cells will provide that margin.

However, to maintain the batteries with 60 cells within their optimum per cell voltage range it has been determined that the charging voltages need to be raised, which require changes to DAEC Technical Specifications (TS) SRs 3.8.4.1 and 3.8.4.6.

It is proposed to revise SR 3.8.4.1 to state:

> "Verify battery terminal voltage is ≥ 130.5 V on float charge for the 125 VDC battery and ≥ 252 V for the 250 VDC battery."

It is proposed to revise SR 3.8.4.6 to state:

> "Verify each required battery charger supplies ≥ 293 amps at ≥ 132.5 V for the 125 VDC subsystem and ≥ 200 amps at ≥ 258 V for the 250 VDC subsystem."

3.0 TECHNICAL EVALUATION

3.1 System Description

A Site EC proposes to add two additional cells to each of the existing DAEC 125 VDC Safety Related Station Batteries (1D1 & 1D2). The existing DAEC 125 VDC Electrical Power Supply calculation indicates that for the present 58 Cell batteries, there is an insufficient voltage to allow a single cell to be taken out of service on either battery and still maintain the battery operable. Adding two cells will provide that margin.

Two separate 125 V plant batteries are furnished, each with its own static-type battery charger, circuit breakers, and bus. One spare battery charger is provided that can be connected to either of the two batteries for servicing and as a backup to the normal power supply charger.

Each battery (currently with a minimum of 58 cells for the 125 VDC batteries) has adequate storage capacity to carry the control and essential instrumentation power continuously for approximately 4 hours and the emergency motor loads for their required length of time.

3.2 Operating Experience

A Site EC proposes to add two additional cells to each of the existing DAEC 125 VDC Safety Related Station Batteries (1D1 & 1D2). The existing DAEC 125 VDC Electrical Power Supply calculation indicates that for the present 58 Cell batteries, there is an insufficient voltage to allow a single cell to be taken out of service on either battery and still maintain the battery operable. Adding two cells will provide that margin.

By adding two cells, the battery voltage margin will be improved and a single cell will be able to be taken out of service, leaving 59 cells, without declaring the battery inoperable. Per the calculation and 10 CFR 50.59 screening performed for the EC, the batteries themselves as well as the equipment that supply power to or receive power from the 125 VDC batteries will remain within their design requirements after the new cells are added.

During normal operation, the DC loads are powered from the battery chargers with the batteries floating on the system, acting as a voltage regulator. If a battery is disconnected from its distribution bus and only a charger is supplying bus voltage, the associated Distribution System shall be considered inoperable, as it cannot supply the peak power required for some event scenarios. In case of loss of power to any battery charger, the DC loads are automatically powered from the battery until the redundant charger or swing charger is placed in service by operator action.

3.3 Technical Evaluation

SR 3.8.4.1:

Technical Specification Surveillance Requirement SR 3.8.4.1 presently requires that the battery terminal voltage be ≥126 V in float charge for the 125 VDC Battery (1D1 and 1D2). The TS Bases indicate that this voltage is "based on the nominal design voltage of the battery." Exactly how the "nominal design voltage of the battery" is determined is not explained further in the TS Bases.

The actual minimum design voltage for the DAEC battery needs to be based on the manufacturer's recommendations of the voltage which will allow for optimum service from the battery.

The DAEC's existing battery cells were manufactured by C&D Charter Power System. They are type LCR-17 (Lead Calcium Cells – 17 Plates per Cell) with a Specific Gravity of 1.215. Per the C&D Instruction Manual (Publication Number 12-800, Dated 1994), the recommended average charge voltage per cell (Vpc) should be as follows:

- Minimum Float = 2.17 Vpc
- Nominal Float = 2.20-2.25 Vpc
- Minimum Equalize = 2.13 Vpc
- Nominal Equalize = 2.33-2.38 Vpc

The Float Voltage is the voltage that the batteries are normally charged to and the Equalize Voltage is the voltage used for short periods of time to charge or recharge the batteries after they have been used/discharged. The new LRC-17 cells are identical to the existing cells and have the same recommended nominal voltage values as above (with the exception that the minimum equalize voltage has been improved to 2.12 Vpc), as documented on the manufacturer's current Instruction Manuals (Publication Number RS-1476, Section 12-800, Dated 2003 & 2010).

Thus, per the manufacturer, the battery cells should be maintained ≥ 2.17 Vpc for long term charging and at 2.20-2.25 Vpc for long term use.

Thus, while NextEra Energy Duane Arnold should base its nominal battery voltage value on the manufacturer's nominal recommendation, NextEra Energy Duane Arnold's SR requirement should be based on the manufacturer's minimum float value. Float voltages below the minimum float could potentially mean that the battery would operate outside of its optimum performance range, upon which the various manufacturer battery analyses and DAEC 125 VDC System calculations are based. The minimum technical specification value should be based on 2.17 Vpc.

Existing SR 3.8.4.1:

For the existing 58 Cell batteries. the 2.17 Vpc equates to a total battery voltage of 125.86 V (58 × 2.17). Since the instrumentation used to verify this voltage is accurate to at least 0.1 V, at least that much voltage should be added to the requirement, resulting in 125.96 V. Rounding the voltage up from 125.96 results in a required voltage of 126 V. The existing Surveillance Requirement for the "battery terminal voltage is ≥ 126 V on float charge for the 125 VDC battery."

Proposed SR 3.8.4.1:

For the new 60 Cell batteries, the 2.17 Vpc equates to a total battery voltage of 130.2 V (60 × 2.17). Since the instrumentation used to verify this voltage is accurate to at least 0.1 V, at least that much voltage should be added to the requirement, resulting in 130.3 V. Rounding up to the nearest 0.5 volts results in a required voltage of 130.5 V.

The 250 VDC Battery is not impacted by the EC and the portion of the surveillance requirement dealing with it is unaffected.

SR 3.8.4.6:

Technical Specification Surveillance Requirement SR 3.8.4.6 presently requires that the battery charger testing "verify each required battery charger supplies ≥ 300 amps at ≥ 129 V for each 125 VDC subsystem." The bases states that the "requirements are based on the design capacity of the chargers."

The nominal design capacity output ratings for the chargers are: 300 amps; 130 V; 39,000 Watts per the Charger Instruction Manual, Product Specification A9186200018E.

As indicated in the discussion for SR 3.8.4.1 above, the manufacturer's recommended nominal float for a battery is 2.20-2.25 Vpc. For the surveillance requirement to demonstrate that the chargers can supply the electrical output for which they are designed and required, it needs to show that they can provide the design capacity current at the nominal voltage that the chargers are normally set to, which is the float voltage. Under high current demand applications, the chargers are designed to automatically lower the output current to the maximum current that will not overburden the chargers.

Existing SR 3.8.4.6:

For the existing 58 Cell batteries, the 2.20-2.25 Vpc recommendation equates to a total battery voltage of 127.6-130.5 V (58 × 2.20-2.25). NextEra Energy Duane Arnold chose to set the plant requirement at 129.0-130.5 V which is where the plant maintenance procedures set and test the charger float voltage. In addition, for this design the nominal battery voltage is considered to be 130 V. Thus the charger design capacity for the demand becomes 300 amps (39000 W ÷ 130 V = 300 A). The existing Surveillance Requirement is to "verify each required battery charger supplies ≥ 300 amps at ≥ 129 V for each 125 VDC subsystem."

Proposed SR 3.8.4.6:

For the proposed 60 Cell batteries, the 2.20-2.25 Vpc recommendation equates to a total battery voltage of 132.0-135.0 V (60 × 2.20-2.25). NextEra Energy Duane Arnold plans to set the plant requirement (which is where the plant maintenance procedures set and test the charger float voltage) to 132.5-133.5V for a nominal voltage of 133 V. This range will minimize the voltage increase on the battery system while still providing a 0.5 V margin between the minimum plant required voltage (132.5 V) and the minimum vendor recommended voltage (132.0 V). Thus the charger design capacity for the 60 Cell battery becomes 293 amps (39000 W ÷ 133 V = 293 A).

The 250 VDC Battery is not impacted by the EC and the portion of the surveillance requirement dealing with it is unaffected.

Conclusions:

A calculation was performed to evaluate the impacts on the current system described in the calculation of record for adding the two additional cells to each 125 VDC Battery on the Duane Arnold Safety Related 125VDC electrical distribution system during worst case design conditions.

Analyses include the following:

- Load flow analyses were performed for the DC system to determine the bus voltages for the most limiting design basis conditions.
- Voltage drop calculations were performed using the ETAP Control System Diagrams (CSD) module to determine the voltages for selected safety related components. These calculations are used to determine the minimum volt/cell value used to size the battery.
- Battery sizing calculations were performed to verify adequate battery capacity exists for the most limiting design basis conditions. Sizing was performed using the most conservative battery temperature and the highest aging factor value for each scenario that still results in positive margin remaining for the battery, up to a maximum of 125%. The battery will be sized to the minimum required battery terminal voltage determined as part of the voltage drop section described above. The battery sizing will be evaluated with 60 cells.
- Short circuit analyses were performed for the worst case scenarios. The available short circuit currents are compared to the protective device settings to ensure the short circuit ratings of buses and protective devices are not exceeded by the available fault currents.
- Selective coordination was evaluated between the various breakers and fuses on the main DC buses and distribution panels. This analysis verified that a fault downstream of a load breaker/fuse on the main buses and the distribution panels will not result in tripping of the entire bus. Cables in the system were evaluated to ensure they are protected against thermal damage.
- Battery charger sizing was evaluated to determine the ability of each battery charger to power its DC system and to recharge the associated battery within a reasonable time.
- These analyses were performed on a 60 Cell Battery as it will exist after the two additional cells are installed.

The sizing and voltage drop results were determined to be valid for 60 cell batteries with an aging factor of 125% and a minimum battery temperature of 18.3°C. Reviews of sizing and voltage drop results for Station Blackout (SBO) and Small Break Loss of Coolant Accident (SBLOCA) revealed that all loads have adequate voltage and each battery has positive margin. The short circuit analysis revealed that no breakers were identified as overdutied. Each battery charger is capable of recharging the battery within 3.8 hrs following a worst case 4 hr emergency discharge while supplying normal steady state load on the 125V system.

Heating, Ventilation and Air Conditioning (HVAC) system impacts, Appendix R impacts, hydrogen generation, and heat up calculations have been documented. The addition of the new battery cells will not require any design changes to the battery room or its ventilation system.

Walkdowns and analyses have been performed that verify that the existing battery racks were designed for and can accommodate the two additional cells.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements

10 CFR 50.36 requires in part that the operating license of a nuclear production facility include technical specifications. Paragraph (c)(2)(ii) of that part requires that a Limiting Condition For Operation (LCO) of a nuclear reactor must be established for each item meeting one or more of four criteria. The DC Sources identified in LCO 3.8.4 meet Criterion 3, "A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier." Paragraph (c)(3) further requires the establishment of Surveillance Requirements, "relating to test, calibration, or inspection to assure ... that the limiting conditions for operation will be met." As discussed above, the proposed changes in the SRs for the 125 V batteries and chargers are sufficient to demonstrate Operability of the battery and chargers and therefore, are sufficient to ensure that the LCO is met.

4.2 Precedent

Plants have performed battery modifications that have affected these SRs. For example:

- Letter from Patrick D. Milano (USNRC) to Michael Kansler (Entergy) dated January 17, 2002, Indian Point Nuclear Generating Unit No. 3 - Issuance of Amendment Re: Technical Specifications Surveillance Requirement Regarding Station Battery 31 Terminal Voltage (TAC NO. MB3356) (ML20090661).

- Letter from Lawrence W. Rossbach (USNRC) to John L. Skolds (Exelon) dated June 6, 2002, Dresden Nuclear Power Station, Unit 2 - Issuance of Amendment for Alternate Battery Float Charge (TAC NO. MB2880) (ML021230651)

4.3 No Significant Hazards Consideration Determination

NextEra Energy Duane Arnold has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) using the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed 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 modify Surveillance Requirements (SRs) regarding the battery terminal and charger voltages and amperage provided in SR 3.8.4.1 and SR 3.8.4.6. Accidents are initiated by the malfunction of plant equipment, or the catastrophic failure of plant structures, systems, or components. The performance of battery testing is not a precursor to any accident previously evaluated and does not change the manner in which the batteries are operated. The proposed testing requirements will not contribute to the failure of the batteries nor any plant structure, system, or component. NextEra Energy Duane Arnold has determined that the proposed change in testing provides an equivalent level of assurance that the batteries are capable of performing their intended safety functions. Thus, the proposed changes do not affect the probability of an accident previously evaluated.

   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. The proposed changes involve the manner in which the subject batteries are tested or maintained, and have no effect on the types or amounts of radiation released or the predicted offsite doses in the event of an accident. The proposed testing requirements are sufficient to provide confidence that these batteries are capable of performing their intended safety functions. Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

This TS SR change for the batteries is based upon the addition of two additional cells to each of the existing DAEC 125 VDC Safety Related Station Batteries (1D1 & 1D2). The improved batteries with 60 cells are at least equivalent to the existing 58-cell batteries. The batteries, with the added cells, provide an acceptable design margin to the existing batteries. Battery circuit coordination is not adversely affected by the addition of this improved battery with 60 cells. The proposed changes to these TS SRs do not introduce any new accident initiators or precursors, or any new design assumptions for those components used to mitigate the consequences of 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 improvement of the existing batteries with the addition of 2 cells and the subsequent TS SR changes that verify higher minimum terminal voltage on float charge in SR 3.8.4.1 and higher 125 VDC battery charger voltage with lower amperage in SR 3.4.3.6, the improved batteries and, the requirements associated with verifying their design functionality will not involve a significant reduction in the margin of safety. The improved batteries are at least equivalent to the existing batteries. The additional cells in the proposed improved batteries provide an acceptable design margin. The increase in the number of cells from 58 to 60 will result in a small increase in battery terminal voltage on float charge. These proposed TS SRs simply document the verification of the new minimum voltage and amperage values. Accordingly, there is no significant reduction in the margin of safety. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, NextEra Energy Duane Arnold concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

4.4 Conclusions

In conclusion, 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.

5.0 ENVIRONMENTAL CONSIDERATION

10 CFR Section 51.22(c)(9) identifies certain licensing and regulatory actions which are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and (3) result in a significant increase in individual or cumulative occupational radiation exposure. NextEra Energy Duane Arnold has reviewed this request and determined that the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR Section 51.22(c)(9). Pursuant to 10 CFR Section 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the amendment. The basis for this determination follows.

<u>Basis</u>

The change meets the eligibility criteria for categorical exclusion set forth in 10 CFR Section 51.22(c)(9) for the following reasons:

1. As demonstrated in the 10 CFR 50.92 evaluation included in Section 4.3, the proposed amendment does not involve a significant hazards consideration.

2. The proposed changes do not result in an increase in power level, do not increase the production, nor alter the flow path or method of disposal of radioactive waste or byproducts. There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

3. The proposed changes do not result in changes in the level of control or methodology used for processing of radioactive effluents or handling of solid radioactive waste nor will the proposal result in any change in the normal radiation levels within the plant. There is no significant increase in individual or cumulative occupational radiation exposure.

Attachment 2

TSCR-132

Technical Specification Pages

(Markups)

2 pages to follow

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ≥ *130.5* ~~126~~ V on float charge for the 125 VDC battery and ≥ 252 V for the 250 VDC battery.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.2	Verify no visible corrosion at battery terminals and connectors. <u>OR</u> Verify battery connection resistance within limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.4	Remove visible corrosion and verify battery cell to cell and terminal connections are coated with anti-corrosion material.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.5	Verify battery connection resistance within limits.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.6	------------------------NOTE------------------------ This Surveillance shall not be performed on the required battery chargers in MODE 1, 2 or 3. However, credit may be taken for unplanned events that satisfy this SR. -- Verify each required battery charger supplies ≥ *293* ~~300~~ amps at ≥ *132.5* ~~129~~ V for the 125 VDC subsystem and ≥ 200 amps at ≥ 258 V for the 250 VDC subsystem.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.7	------------------------NOTES------------------------ 1. The modified performance discharge test in SR 3.8.4.8 may be performed in lieu of the service test in SR 3.8.4.7. 2. This Surveillance shall not be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. -- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	In accordance with the Surveillance Frequency Control Program

(continued)

Attachment 3

TSCR-132

Technical Specification Pages

(Clean, typed)

2 pages to follow

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is $\geq$ 130.5 V on float charge for the 125 VDC battery and $\geq$ 252 V for the 250 VDC battery.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.2	Verify no visible corrosion at battery terminals and connectors. <u>OR</u> Verify battery connection resistance within limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	Verify battery cells, cell plates, and racks show no visual indication of physical damage or abnormal deterioration that could degrade battery performance.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.4	Remove visible corrosion and verify battery cell to cell and terminal connections are coated with anti-corrosion material.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.5	Verify battery connection resistance within limits.	In accordance with the Surveillance Frequency Control Program

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SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.4.6	------------------------NOTE------------------------------- This Surveillance shall not be performed on the required battery chargers in MODE 1, 2 or 3. However, credit may be taken for unplanned events that satisfy this SR. --- Verify each required battery charger supplies ≥ 293 amps at ≥ 132.5 V for the 125 VDC subsystem and ≥ 200 amps at ≥ 258 V for the 250 VDC subsystem.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.7	-------------------------NOTES---------------------------- 3. The modified performance discharge test in SR 3.8.4.8 may be performed in lieu of the service test in SR 3.8.4.7. 4. This Surveillance shall not be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. --- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	In accordance with the Surveillance Frequency Control Program

(continued)

Attachment 4

TSCR-132

Technical Specification BASES pages

(Markups)

FOR INFORMATION ONLY

6 pages to follow

BASES

BACKGROUND (continued)

During normal operation, the DC loads are powered from the battery chargers with the batteries floating on the system, acting as a voltage regulator. If a battery is disconnected from its distribution bus and only a charger is supplying bus voltage, the associated Distribution System shall be considered inoperable, as it cannot supply the peak power required for some event scenarios.

In case of loss of power to any battery charger, the DC loads are automatically powered from the battery until the redundant charger or swing charger is placed in service by operator action.

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."

Each battery (with a minimum of 5*9*~~8~~ cells for the 125 VDC batteries and 115 cells for the 250 VDC battery) has adequate storage capacity to carry the control and essential instrumentation power continuously for approximately 4 hours and the emergency motor loads for their required length of time.

Each DC 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 the other subsystems to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E subsystems such as batteries, battery chargers, or distribution panels except for the swing 125 VDC battery charger which is mechanically interlocked to prevent being simultaneously connected to both distribution buses with double isolation circuit breakers.

The batteries for DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at the end of a nominal 20 year service cycle. The expected life of the batteries may exceed 20 years and will be adjusted based on engineering evaluations of each battery's capacity trend data as the batteries age. The minimum design voltage limits are 105V and 210V for the 125 VDC and 250 VDC subsystems, respectively.

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

is consistent with the time suggested in Regulatory Guide 1.93 (Ref. 6).

C.1

With the 250 VDC electrical power subsystem inoperable, the HPCI System and associated PCIVs may be incapable of performing their intended function and must be immediately declared inoperable. The associated PCIVs referred to are: the RHR-SDC Isolation Valve (MO-1909), the RWCU Inlet Outboard Isolation Valve (MO-2701), the HPCI Steam Supply Isolation Valve (MO-2239), the HCPI Feedwater Injection Isolation Valve (MO-2312), and Main Steam Drain Line Isolation Valve (MO-4424).

D.1

Condition D corresponds to a level of degradation in the DC Electrical Power System that either causes a required safety function to be lost (e.g. when Division I and Division II of the 125 VDC electrical power subsystem are inoperable) or that results in a level of degradation that is severe enough to warrant an immediate shutdown (e.g. when one Division of the 125 VDC electrical power subsystem is inoperable concurrent with the 250 VDC electrical power subsystem being inoperable). When this situation exists, the plant may be in a condition outside the accident analysis. Therefore, no additional time is justified for continued operation. LCO 3.0.3 must be entered immediately to commence a controlled plant shutdown.

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 continuous charge required to overcome the internal losses of a battery (or battery cell) and maintain the battery (or a battery cell) in a fully charged state. The voltage requirements are based on

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1 (continued)

the nominal design voltage of the battery and are consistent with the *manufacturers minimum float voltage recommendations* ~~initial voltages assumed in the battery margin calculations~~ (Ref. 4). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency is consistent with manufacturer recommendations and with the intent of IEEE-450 (Ref. 7).

SR 3.8.4.2

Visual inspection to detect corrosion of the battery cells and connections, or measurement of the resistance of each inter-cell, inter-rack, inter-tier, and terminal connection, provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.

The connection resistance limits established for this SR must be no more than 20% above the resistance as measured during installation or not above the ceiling value established by the manufacturer. The resulting limits are 5.0 E-5 ohms for inter-cell connections and 1.4 E-4 ohms for inter-rack connections, inter-tier connections and terminal connections. The Frequency for these inspections, which can detect conditions that can cause power losses due to resistance heating, is controlled under the Surveillance Frequency Control Program. This Frequency is considered acceptable based on operating experience related to detecting corrosion trends.

SR 3.8.4.3

Visual inspection of the battery cells, cell plates, and battery racks provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.

The presence of physical damage or deterioration does not necessarily represent a failure of this SR, provided an evaluation determines that the physical damage or deterioration does not affect the OPERABILITY of the battery (its ability to perform its design function).

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency for this SR is consistent with the intent of IEEE-450 (Ref. 7), which recommends detailed visual

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.3 (continued)

inspection of cell condition and rack integrity on a yearly basis.

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of inter-cell, inter-rack, inter-tier, and terminal connections provide an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anti-corrosion material is used to help ensure good electrical connections and to reduce terminal deterioration. The visual inspection for corrosion is not intended to require removal of and inspection under each terminal connection.

The removal of visible corrosion is a preventive maintenance SR. The presence of visible corrosion does not necessarily represent a failure of this SR, provided visible corrosion is removed during performance of this Surveillance. The connection resistance limits for this SR must be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by the manufacturer. The resulting limits are 5.0 E-5 ohms for inter-cell connections and 1.4 E-4 ohms for inter-rack connections, inter-tier connections and terminal connections.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency of these SRs is consistent with the intent of IEEE-450 (Ref. 7), which recommends detailed visual inspection of cell condition and inspection of cell to cell and terminal connection resistance on a yearly basis.

SR 3.8.4.6

Battery charger capability requirements are based on the design capacity of the chargers (Ref. 3). According to the recommendations of Regulatory Guide 1.32 (Ref. 8), the battery charger supply is required to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurences. The minimum required amperes ensures that these requirements can be satisfied. *The minimum required voltage ensures that the requirements are satisfied at the minimum float voltage that the battery chargers are normally set for.*

(continued)

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SURVEILLANCE REQUIREMENTS

SR 3.8.4.6 (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency is acceptable, given the unit 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.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance on a required battery charger would remove a required DC electrical power subsystem from service, perturb the electrical distribution system, and challenge safety systems. This Note does not preclude performance of this SR on the "spare" battery charger (i.e., a charger not in-service or "required"). This Note also acknowledges that credit may be taken for unplanned events that satisfy the Surveillance.

SR 3.8.4.7

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 as specified in Reference 4. The voltage of each cell shall be determined after the discharge. Following discharge, battery cell parameters must be restored in accordance with LCO 3.8.6. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency is consistent with the maximum length of an operating cycle.

This SR is modified by two Notes. Note 1 allows the performance of a performance discharge test in lieu of a service test.

The modified performance discharge test is a simulated duty cycle consisting of just two rates; the one minute rate published for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a rated one minute discharge 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 3.8.4.8 (continued)

this test is normally controlled under the Surveillance Frequency Control Program.. However, 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. 7), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is 10% below the manufacturer's rating. All these Frequencies are consistent with the recommendations in IEEE-450 (Ref. 7).

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required DC electrical power subsystem from service, perturb the Electrical Distribution System, and challenge safety systems. Credit may be taken for unplanned events that satisfy the Surveillance. Following discharge, battery cell parameters must be restored in accordance with LCO 3.8.6.

REFERENCES

1. UFSAR, Section 3.1.2.2.8.
2. UFSAR, Section 1.8.6.
3. IEEE Standard 308, 1971.
4. Calculations: *CAL-E08-007 and CAL-E08-008* ~~CAL-E92-09, CAL-E92-08 and CAL-E92-07~~, latest approved revisions.
5. UFSAR, Chapter 15.
6. Regulatory Guide 1.93.
7. IEEE Standard 450, 1980.
8. Regulatory Guide 1.32, February 1977.
9. IEEE Standard 485, 1983.
10. UFSAR, Section 8.3.2