Charles R. Pierce
Regulatory Affairs Director

Southern Nuclear
Operating Company, Inc.
40 Inverness Center Parkway
Post Office Box 1295
Birmingham, AL 35242

Tel 205.992.7872
Fax 205.992.7601

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AUG 1 1 2015

Docket Nos.: 50-321
50-366

NL-14-0649

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

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications
Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical
Rewrite – Update To TSTF-360".

In accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.90, Southern Nuclear Operating Company (SNC) is submitting a request for an amendment to Edwin I. Hatch Nuclear Plant, Units 1 and 2 (HNP) Technical Specifications (TSs) to incorporate the NRC-approved TSTF-500, Revision 2, "DC Electrical Rewrite - Update to TSTF-360."

Attachment 1 provides a description and assessment of the proposed changes including the requested confirmation of applicability and plant-specific verifications, technical analyses, regulatory analyses, and environmental considerations. Attachment 2 provides a summary of the required Final Safety Analysis Report (FSAR) descriptions. Attachment 3 provides markup pages of existing TSs and TS Bases to show the proposed change. Attachment 4 provides revised (clean) TS pages.

SNC requests that, once approval is granted, the amendment be implemented within 90 days.

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

If you have any questions, please contact Ken McElroy at (205) 992-7369.

A001
NRR

Mr. C.R. Pierce states he is Regulatory Affairs Director of Southern Nuclear Operating Company and is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

C. R. Pierce

C. R. Pierce
Regulatory Affairs Director

Sworn to and subscribed before me this 11 day of August, 2015.

Laura L. Crumpton
Notary Public

My commission expires: 10-8-2017

CRP/OCV

Attachments:
1. Description and Assessment of the Proposed Changes
2. List of Required Final Safety Analysis Report (FSAR) Descriptions
3. Markup Pages of Existing TSs and TS Bases
4. Clean TS Pages

Enclosures:
1. Letter From Battery Vendor, C&D Technologies, Verifying the Acceptability of Using Float Current Monitoring
2. Evaluation Supporting a Completion Time Longer than 2 Hours for Specification 3.8.4, Required Action 3.8.4.E

cc: Southern Nuclear Operating Company
Mr. S. E. Kuczynski, Chairman, President & CEO
Mr. D. G. Bost, Executive Vice President & Chief Nuclear Officer
Mr. D. R. Vineyard, Vice President – Hatch
Mr. M.D. Meier, Vice President – Regulatory Affairs
Mr. D. R. Madison, Vice President – Fleet Operations
Mr. B. J. Adams, Vice President – Engineering
Mr. G.L.Johnson, Regulatory Affairs Manager - Hatch
RTYPE: CHA02.004

U. S. Nuclear Regulatory Commission
Mr. V. M. McCree, Regional Administrator
Mr. R. E. Martin, NRR Senior Project Manager - Hatch
Mr. D.H. Hardage, Senior Resident Inspector – Hatch

State of Georgia
Mr. J. H. Turner, Environmental Director Protection Division

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update To TSTF-360".

Attachment 1

Description and Assessment of the Proposed Changes

1.0 DESCRIPTION

The Technical Specification (TS) requirements are revised from requirements on battery cells to requirements on the battery. This focuses the requirements on the assumed safety function of the battery. The proposed amendment would revise TS requirements related to direct current (DC) electrical systems in TS limiting condition for operation (LCO) 3.8.4, "DC Sources - Operating," LCO 3.8.5, "DC Sources - Shutdown," and LCO 3.8.6, "Battery Cell Parameters." A new "Battery Monitoring and Maintenance Program" is being proposed for Section 5.5 "Administrative Controls - Programs and Manuals."

Specifically, the proposed changes request new actions for an inoperable battery charger and alternate battery charger testing criteria for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown." The proposed changes also include the relocation of a number of Surveillance Requirements (SRs) in TS 3.8.4 that perform preventive maintenance on the safety-related batteries to a licensee-controlled program. It is proposed that LCO 3.8.6, "Battery Cell Parameters," be modified by relocating Table 3.8.6-1, "Battery Cell Parameter Requirements," to a licensee-controlled program, and that specific actions with associated Completion Times (CTs) for out-of-limits conditions for battery cell voltage, electrolyte level, and electrolyte temperature be added to TS 3.8.6. In addition, specific SRs are being proposed for verification of these parameters.

A new program is being proposed for Section 5.5 of the Administrative Controls for the maintenance and monitoring of station batteries. The items proposed to be relocated will be contained within this program, titled the "Battery Monitoring and Maintenance Program."

The proposed changes provide new Actions for an inoperable battery charger and alternate battery charger testing criteria. The longer CT for an inoperable battery charger will allow additional time for maintenance and testing. In addition, a number of SRs are relocated to licensee control including the monitoring of battery cell parameter requirements and performance of battery maintenance activities.

These changes are consistent with the U.S. Nuclear Regulatory Commission (NRC)-approved Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2. The availability of this TS improvement was announced in the *Federal Register* on September 1, 2011 (76 FR 54510).

2.0 ASSESSMENT

2.1 APPLICABILITY OF TSTF-500 AND MODEL SAFETY EVALUATION (SE)

Southern Nuclear Operating Company (SNC) has reviewed the model SE referenced in the *Federal Register* Notice of Availability published on September 1, 2011 (76 FR 54510). The review included the NRC staff's SE, as well as the supporting information provided in TSTF-500, Revision 2. As described herein, SNC has concluded that the technical bases for the proposed changes presented in TSTF-500, Revision 2, and the model SE prepared by the NRC staff are applicable to Edwin I. Hatch Nuclear Plant, Units 1 and 2 (HNP) and support incorporation of this amendment into the HNP TS.

The HNP Station Service DC system is very similar to the system described in TSTF-500, with respect to its ability to meet the duty cycle assumed in the accident analyses and with its operations in the float and equalize modes. However, HNP also has a DC system specifically intended to support the Safety Related Diesel Generators (DGs), which is not described in TSTF-500-A, Revision 2. (The DG DC system is listed in the LCO 3.8.4 statement of the TSTF-500 TS mark-up, but is not described in Section 4.1 of the TSTF Technical Analysis). Following is a brief description of both HNP systems.

HNP Station Service DC System

The 125/250 V DC Station Service system for each HNP unit is made up of two separate subsystems, consisting of DC switchgear R22-S016 (Subsystem I) and R22-S017 (Subsystem II). Each subsystem contains the following major components covered by TS Limiting Conditions for Operation (LCO) 3.8.4, 3.8.5, and 3.8.6:

- One 120 cell, 250 Volt (V), lead-acid type battery.
- Three 125 V, 400 amp battery chargers.

The battery is essentially two 60 cell, 125 V batteries connected in series. They are center tapped such that they allow for the supply of both 125 V loads and 250 V loads.

Two of the three chargers are normally in service, with one in standby. Two battery throwover switches per division are used to determine which two chargers are in service and which one is in standby.

A subsystem of the station service DC System is considered Operable when the 125/250 VDC battery and two of the three battery chargers are Operable.

HNP Safety Related DG DC System

The HNP DG DC system uniquely supports the Safety Related Emergency DGs.

There are a total of five emergency diesel generators at HNP. Two are dedicated to Unit 1, two are dedicated to Unit 2, and one is a “swing” diesel capable of supplying either Unit 1 or 2.

The DG DC system is made up of five subsystems, each supporting one Diesel Generator. Like the station service system, each DG subsystem is also covered by LCOs 3.8.4. 3.8.5, and 3.8.6, and contains the following major components:

- One 60 cell, 125 V lead-acid type battery.
- Two 125 V, 100 amp battery chargers.

One charger is normally in service and one is in standby. Like the station service chargers, each pair of diesel battery chargers has a throwover switch to align power to the selected loads.

The DC system for a DG is considered Operable when its battery and one of its two battery chargers are Operable.

The HNP TS for DC Sources is similar to the Specification used in TSTF-500 as the starting point for the revisions. HNP never implemented TSTF-360, consequently, the attached HNP specific mark-up follows the mark-up provided in Attachment B of TSTF-500 as closely as possible.

The primary difference between the HNP TS and the NUREG-1433 TS marked-up for TSTF-500 is HNP's separation of the Station Service and DG DC systems in the LCO Conditions, and the default Conditions if the DG DC systems' CTs are not met. The 12 hour CT for one DG DC electrical power subsystem inoperable (current TS 3.8.4 Condition B) is consistent with the CT for one required offsite circuit inoperable concurrent with one required DG inoperable (HNP TS 3.8.1 Condition E). Similarly, the default Condition's RAs for the CT of current TS 3.8.4 Condition B not being met are the same as the default Condition's RAs for the CT of TS 3.8.1 Condition E not being met (MODE 3 in 12 hours, MODE 4 in 36 hours). The default Condition for the NUREG-1433 TS marked-up for TSTF-500 require the associated DG to be declared inoperable if the CT for the one DG DC electrical power subsystem is not met. The HNP TS is therefore conservative and more limiting than the TSTF-500 for the case of an inoperable DG battery. Again, the TSTF would require declaring the associated diesel generator inoperable at the end of the 2 hour CT, which would provide at least another 72 hours of operation. On the other hand, at the end of the 12 hour DG DC system CT for HNP, an immediate shutdown would be required with Mode 3 required in 12 hours or less. These differences do not affect the applicability of the model SE for HNP.

The HNP Station Service batteries and the HNP DG batteries also have different required float currents for determining that their respective batteries are charged. This requires different Conditions for the Station Service battery chargers inoperable and the DG battery chargers inoperable, since different values of battery float current are required to be verified. This affects the HNP markups for TS 3.8.4, 3.8.5, and 3.8.6 (and the associated TS Bases). Having separate required float currents for the station service and DG batteries does not affect the applicability of the published model SE.

Also, the HNP LCO Condition for TS 3.8.4 discusses the opposite unit's DC systems that are needed to support safety systems common to both units; accordingly, there are corresponding Conditions for the opposite unit's DC DG electrical power subsystem. This Condition is unaffected by the proposed changes in TSTF-500, except to modify the required SRs appropriately based on re-numbering. This does not impact the applicability of the published model SE.

The HNP Actions for LCO 3.8.4 list a Condition for two or more DC electrical power subsystems inoperable that result in a loss of function, with a required immediate entry into LCO 3.0.3. This Condition is not explicitly stated in the TSTF-500 Actions for LCO 3.8.4; however, immediate entry into LCO 3.0.3 would be nonetheless required based on the LCO 3.0.3 Applicability. This does not impact the applicability of the published model SE.

The surveillance requirements (SR) in the HNP specification are similar to those in TSTF-500, but the HNP SRs also include requirements for the opposite unit's DC sources if they are required per the LCO. Current HNP SR 3.8.4.6 does not contain the Note stating that the surveillance shall not be performed in Modes 1, 2, or 3. This note is eliminated from the TS in TSTF-500; but since it does not exist in the current HNP TS, this change was not necessary. Also, current HNP SR 3.8.4.7 does not include the 60 month provision for the modified performance test, which TSTF-500 removes, consequently, this spec will not be modified, other than to be re-numbered. Otherwise, the changes to this SR are the same as the TSTF changes.

HNP has implemented the Surveillance Frequency Control Program (SFCP) per the provisions of TSTF- 425, and as approved by the NRC for Plant Hatch via Amendments No. 266 and 210 for the Hatch Unit 1 and Unit 2 Technical Specifications, respectively. Consequently, the surveillance frequencies in this submittal are listed as "... in accordance with the Surveillance Frequency Control Program", or words to that effect. In the current HNP TS, the surveillances which verify battery terminal voltage, charger function, battery capacity, electrolyte level and temperature, specific gravity (which, per procedure, includes a measurement of float current) and cell float voltage have frequencies controlled by the SFCP. Any revised frequencies are evaluated by NEI 04-10, "Risk Informed Method for Control of Surveillance Frequencies", Revision 1, as required by the Program.

Finally, the Model Safety evaluation states that the battery rooms are "environmentally controlled". The HNP battery rooms are environmentally controlled in the following sense:

1) The station service and diesel generator battery rooms have specific ventilation systems (exhaust fans) primarily designed to vent any hydrogen released in the room from the charging process,

2) The station service battery rooms are in the Control Building and are thus serviced by the Control Building Ventilation system. Similarly, the diesel battery rooms are located inside the diesel generator building which is serviced by the diesel generator ventilation system.

2.2 VERIFICATION AND REQUIRED FINAL SAFETY ANALYSIS REPORT CHANGES

As described in Section 4.7.1, "Verifications," in TSTF-500, SNC provides the following verifications.

1. Enclosure 1 contains a letter from the manufacturers of the batteries used at HNP verifying the acceptability of using float current monitoring instead of specific gravity monitoring as a reliable and accurate indication of the state-of-charge of the battery and that this will hold true over the life of the battery.

2. SNC verifies that the equipment that will be used to monitor float current under SR 3.8.6.1 will have the necessary accuracy and capability to measure electrical currents in the expected range. Additionally, SNC verifies that the minimum required procedural time to measure battery float current will be 30 seconds or as recommended by the float current measurement instrument manufacturer. This minimum float current measurement time is required to provide a more accurate battery float current reading.

3. SNC verifies that battery room temperature is routinely monitored such that a room temperature excursion could reasonably expect to be detected and corrected prior to the average battery electrolyte temperature dropping below the minimum electrolyte temperature.

4. Enclosure 2 contains the justification for an inoperable station service battery CT greater than 2 hours for TS 3.8.4, Required Action E.1 in accordance with the guidance in RG 1.177 and RG 1.174.

5. The cell resistance limits in existing SR 3.8.4.5 are relocated to the Battery Monitoring and Maintenance Program. The connection resistance limits are currently provided in Technical Requirements Manual Table T9.1-1 (One TRM for each unit). The resistance limits apply to the overall connection resistance and allow for an increase in connection resistance due to changes in connection tightness and contact surface corrosion. The OPERABILITY resistance limit is calculated for a battery that has reached end of life (80 % of capacity).

6. Monitoring of battery parameters (i.e., specific gravity, electrolyte level, cell temperature, float voltage, connection resistance, and physical condition) will be relocated to the licensee-controlled program, required and described in TS Section 5.5, "Programs and Manuals," and titled the "Battery Monitoring and Maintenance Program."

7. SNC verifies that plant procedures will require verification of the selection of the pilot cell or cells when performing SR 3.8.6.5.

<u>As described in Attachment 2, "List of Required Final Safety Analysis Report (FSAR) Descriptions," SNC will revise the FSAR to include the following, as part of the adoption of TSTF-500, Revision 2:</u>

1. How a 5 percent design margin for the batteries corresponds to a 20 amp float current value for the station service batteries and a 5 amp float current value for the DG batteries, indicating that the battery is 95 percent charged.

2. How long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer.

3. How the batteries are sized with correction margins that include temperature and aging and how these margins are maintained.

4. The minimum established design limit for battery terminal float voltage.

5. The minimum established design limit for electrolyte level.

6. The minimum established design limit for electrolyte temperature.

7. How each battery is designed with additional capacity above that required by the design duty cycles to allow for temperature variations and other factors.

8. Normal DC system operation i.e., powered from the battery chargers with the batteries floating on the system, and with a loss of normal power to the battery charger.

2.3 OPTIONAL CHANGES AND VARIATIONS

SNC is proposing the following variations from the TS changes described in the TSTF-500, Revision 2, or the applicable parts of the NRC staff's model SE referenced in the *Federal Register* on September 1, 2011 (76 FR 54510). Unless otherwise noted, these options were recognized as acceptable variations in TSTF-500 and the NRC staff's model SE.

SNC is proposing a CT longer than 2 hours for proposed Specification 3.8.4, Required Action E.1. A risk evaluation supporting the longer CT is included as Enclosure 2 . This evaluation is in accordance with the guidance provided in RG 1.177 and RG 1.174.

SNC is proposing to adopt TSTF-500 Specification 3.8.4, Condition B, as HNP Specification 3.8.4, Condition E. Proposed HNP Condition E is included because proposed Required Action E.1 (station service battery inoperable) and proposed Required Action F.1 (station service DC electrical power subsystem inoperable) should have different CTs. Proposed Condition E is one inoperable station service battery on one subsystem. The RG 1.177 analysis attached to this submittal justifies a 12 hour Completion Time for the battery in large part because the battery charger is still available to supply the DC bus during normal and emergency conditions. Condition F is the complete loss of one station service DC subsystem such that the ability to respond to an event is lost. Essentially, proposed Condition D represents the loss of a battery charger, proposed Condition E represents the loss of a battery, and proposed Condition F represents the loss of a battery charger <u>and</u> battery. Proposed Condition F is clearly a more serious condition, warranting the shorter (2 hour) Completion Time. No changes are being proposed to the DG battery inoperable Condition other than its number designation (in the current TS it is Condition B) and splitting the battery and battery chargers into two separate LCO Conditions.

SNC is proposing a variation with respect to pilot cell selection. Per the IEEE Std. 450-2002, the HNP station service and diesel generator batteries do not exhibit a temperature deviation across the battery of greater than 5 degrees Fahrenheit. Consequently, HNP will not take temperature into account when selecting the battery pilot cells.

SNC also proposes to add a statement to the SR 3.8.6.6 Bases that there are three different types of battery modified performance discharge tests suitable for satisfying the requirements of SR 3.8.6.6. These three type tests are identified and described as acceptable methods by IEEE-450-2002. The suggested wording for the SR Bases is included in Attachment 3 to this letter. This variation was not provided for in TSTF-500.

3.0 REGULATORY ANALYSIS

3.1 NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

SNC has evaluated the proposed changes to the TS using the criteria in Section 50.92 to Title 10 of the *Code of Federal Regulations* (10 CFR) and has determined that the proposed changes do not involve a significant hazards consideration.

Description of Amendment Request: The proposed amendment would revise TS requirements related to direct current (DC) electrical systems in TS Limiting Condition for Operation (LCO) 3.8.4, "DC Sources - Operating," LCO 3.8.5, "DC Sources - Shutdown," and LCO 3.8.6, "Battery Cell Parameters." A new "Battery Monitoring and Maintenance Program" is being proposed for Section 5.5 "Administrative Controls - Programs and Manuals."

Basis for proposed no significant hazards consideration determination: As required by 10 CFR 50.91(a), the SNC analysis of the issue of no significant hazards consideration is presented below:

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

   Response: No.

   The proposed changes restructure the Technical Specifications (TS) for the direct current (DC) electrical power system and are consistent with TSTF-500, Revision 2. The proposed changes modify TS Actions relating to battery and battery charger inoperability. The DC electrical power system, including associated battery chargers, is not an initiator of any accident sequence analyzed in the Final Safety Analysis Report (FSAR). Rather, the DC electrical power system supports equipment used to mitigate accidents. The proposed changes to restructure TS and change surveillances for batteries and chargers to incorporate the updates included in TSTF-500, Revision 2, will maintain the same level of equipment performance required for mitigating accidents assumed in the FSAR. Operation in accordance with the proposed TS would ensure that the DC electrical power system is capable of performing its specified safety function as described in the FSAR. Therefore, the mitigating functions supported by the DC electrical power system will continue to provide the protection assumed by the analysis.

   The relocation of preventive maintenance surveillances, and certain operating limits and actions, to a licensee-controlled Battery Monitoring and Maintenance Program will not challenge the ability of the DC electrical power system to perform its design function. Appropriate monitoring and maintenance that are consistent with industry standards will continue to be performed. In addition, the DC electrical power system is within the scope of 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," which will ensure the control of maintenance activities associated with the DC electrical power system.

   The integrity of fission product barriers, plant configuration, and operating procedures as described in the FSAR will not be affected by the proposed changes. Therefore, the consequences of previously analyzed accidents will not increase by implementing these changes. Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No

   The proposed changes involve restructuring the TS for the DC electrical power system. The DC electrical power system, including associated battery chargers, is not an initiator to any accident sequence analyzed in the FSAR. Rather, the DC electrical power system supports equipment used to mitigate accidents. The proposed changes to restructure the TS and change surveillances for batteries and chargers to incorporate the updates included in TSTF-500, Revision 2, will maintain the same level of equipment performance required for mitigating accidents assumed in the FSAR. Administrative and mechanical controls are in place to ensure the design and operation of the DC systems continues to meet the plant design basis described in the FSAR. Therefore, operation of the facility in accordance with this proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   Response: No.

   The margin of safety is established through equipment design, operating parameters, and the setpoints at which automatic actions are initiated. The equipment margins will be maintained in accordance with the plant-specific design bases as a result of the proposed changes. The proposed changes will not adversely affect operation of plant equipment. These changes will not result in a change to the setpoints at which protective actions are initiated. Sufficient DC capacity to support operation of mitigation equipment is ensured. The changes associated with the new Battery Monitoring and Maintenance Program will ensure that the station batteries are maintained in a highly reliable manner. The equipment fed by the DC electrical sources will continue to provide adequate power to safety-related loads in accordance with analysis assumptions.

   TS changes made in accordance with TSTF-500, Revision 2, maintain the same level of equipment performance stated in the FSAR and the current TSs. Therefore, the proposed changes do not involve a significant reduction of safety.

3.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

Southern Nuclear Operating Company has reviewed the NRC staff's model safety evaluation referenced in the Notice of Availability and concluded that the Regulatory Evaluation section is applicable to HNP, with the following qualifiers:

Reg Guide 1.75 – The construction permit for HNP-2 was issued in December 1972. The implementation date given in Section D of Reg Guide 1.75 is February 1974. For this reason, the recommendations of Reg Guide 1.75 are not required to be met on HNP-2. However, physical independence of the DC systems is maintained and discussed in the HNP -2 FSAR, Section 8.3.1.4.

Reg Guide 1.129 – The Battery Monitoring and Maintenance Program, proposed for Section 5 of the TS, indicates the adherence to Reg Guide 1.129 and IEEE (std) 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead –Acid Batteries for Stationary Application", with exceptions noted. This is consistent with TSTF-500.

The Traveler and model safety evaluation discuss the 10 CFR 50, Appendix A, General Design Criteria (GDC). HNP-2 is committed to these GDC. HNP-1, however, was not licensed to the 10 CFR 50, Appendix A GDC. The HNP-1 construction permit was received under the 70 general design criteria, as discussed in Section F.3 of the UFSAR. (Appendix F has since been designated as historical). However, the HNP Unit 1 Design Bases has been reviewed against the 10 CFR 50, Appendix A, GDC based on an understanding of its intent. Those evaluations are presented in Appendix F of the Unit 1 FSAR and a portion of them are presented below for those GDC quoted in the model safety evaluation.

<u>10 CFR Appendix A, Criterion 1, "Quality Standards".</u>

Design Evaluation

Those system and components of reactor facilities which are essential to the prevention of accidents which could affect the public health and safety or to mitigation of their consequences shall be identified and then designed, fabricated, and erected to quality standards that reflect the importance of the safety function to be performed. Where generally recognized codes or standards on design, materials, fabrication, and inspection are used, they shall be identified. Where adherence to such codes or standards does not suffice to assure a quality product in keeping with the safety function, they shall be supplemented or modeled as necessary. Quality assurance programs, test procedures, and inspection acceptance levels to be used shall be identified. A showing of sufficiency and applicability of codes, standards, quality assurance programs, test procedures, and inspection acceptance levels used is required.

The Southern Nuclear Operating Company (SNC) HNP Quality Assurance (QA) Program is discussed in Appendix D of the Unit 1 FSAR and in Chapter 17 of the Unit 2 FSAR, which are not designated as historical sections. The QA program for HNP is designed to assure the plant's safe and reliable operation and to satisfy the quality assurance requirements of Appendix B to 10 CFR Part 50. The items covered under the QA program are the safety related structures, systems and components. A more detailed description of the QA program is found in the Quality Assurance Topical Report (QATR) for the SNC Fleet.

10 CFR Appendix A, Criterion 17, "Electric Power Systems".

Design Evaluation

Both onsite and offsite electric power systems are capable of providing a reliable source of power to permit functioning of structures, systems, and components important to safety. Both of these sources have the capability to furnish required power for all postulated AOO and accident conditions. In the event that all offsite circuits are lost, the emergency buses will be connected to the onsite emergency diesel generators. Physically independent circuits are provided from the HNP-1 switchyard to the startup auxiliary transformers. These circuits are fed by at least two independent transmission lines, physically separated as they approach the switchyard so that the failure of one line will not cause failure of the other. From the switchyard to the onsite electrical distribution system, separation is also provided so that failure of one circuit will not cause failure of the other.

The Unit 1 features that indicate conformance to Criterion 1 are described in Section 8.3 of the Unit 1 FSAR. This FSAR section discusses the safety basis of the safety related electrical systems including system operation, separation between systems, and single failure criteria.

The features of the safety related DC system are discussed in Unit 1 FSAR section 8.5.

Neither section 8.3 nor 8.5 are designated as historical.

10 CFR Appendix A, Criterion 18, "Inspection and Testing of Electric Power Systems".

Design Evaluation

The primary circuit breakers are inspected, maintained, and tested on a routine basis. This can be accomplished without removing the generators, transformers, and transmission lines from service. Transmission line protective relaying is tested on a routine basis. This can be accomplished without removing the transmission line from service. Generator, unit auxiliary transformer, and startup auxiliary relaying are tested during refueling. Automatic transfers of 4160-V buses 1E, 1F, and 1G from startup transformers to emergency standby diesel generators are tested during the refueling of the unit to prove the operability of the system. The DC system is equipped with detectors to indicate when there is a ground existing in any portion of the system. A ground on one portion of the DC system will not cause any equipment to malfunction. The batteries are under continuous automatic charging and are inspected and checked on a routine basis while the unit is in service.

Additionally, inspection and testing is discussed in general for the Unit 1 safety related electrical systems in Section 8.3.7 of the Unit 1 FSAR and specifically for the safety related DC systems in Section 8.5.5. Again, neither of these sections are historical. Additionally, and with respect to the DC systems, inspection and testing is carried out via the various TS surveillance requirements of LCOs 3.8.4, 3.8.5, and 3.8.6. This will continue to be true following implementation of TSTF-500, again by the various TS surveillance requirements, but also by the new "Battery Monitoring and Maintenance Program" referenced from Section 5.0 in the TS.

4.0 ENVIRONMENTAL CONSIDERATION

The proposed TS revision would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed TS change 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 TS change.

5.0 REFERENCES

Unit 1 FSAR Section 8.5

Unit 2 FSAR Section 8.3.2

SNC Calculations:

MC-H-14-0009, "Station Service 1A – Sizing and Voltage Profile"

MC-H-14-0010, "Station Service 1B – Sizing and Voltage Profile"

MC-H-14-0013, "Station Service Battery 2B – Sizing"

MC-H-14-0014, "Emergency Diesel Batteries 1A, 1B, & 1C Sizing"

MC-H-14-0015, Emergency Diesel Batteries 2A & 2C Sizing"

MC-H-14-0016, "Station Service Battery 2A – Sizing"

PRA-BC-H-12-001, "Risk Evaluation for Extending Current LCO of 2 Hours to 12 Hours for Inoperable Station Service Batteries".

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update To TSTF-360," Using the Consolidated Line Item Improvement Process

Attachment 2

List of Required Final Safety Analysis Report (FSAR) Descriptions

ATTACHMENT 2

LIST OF REQUIRED FINAL SAFETY ANALYSIS REPORT (FSAR) DESCRIPTIONS

The following table identifies FSAR descriptions required by SNC as part of the adoption of TSTF-500, Revision 2.

REQUIRED FSAR DESCRIPTIONS

SNC will change or verify that the FSAR:	DUE DATE / EVENT
1. Describes how a 5 percent design margin for the batteries corresponds to a 20 amp and 5 amp float current value, for the station service and diesel generator batteries, respectively, indicating the batteries are 95 percent charged. 2. States that long term battery performance is supported by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 2.20 V per connected cell and that there are 60 connected cells in the battery, which corresponds to 132 V at the battery terminals. 3. Describes how the batteries are sized with correction margins that include temperature and aging and how these margins are maintained. 4. States the minimum established design limit for battery terminal float voltage. 5. States the minimum established design limit for electrolyte level. 6. States the minimum established design limit for electrolyte temperature. 7. Describes how each battery is designed with additional capacity above that required by the design duty cycles to allow for temperature variations and other factors. 8. Describes normal DC system operation (i.e., powered from the battery chargers) with the batteries floating on the system, and a loss of normal power to the battery charger describing how the DC load is automatically powered from the station batteries.	Upon implementation of the approved Technical Specification amendment (applies to all)

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update To TSTF-360".

Attachment 3

Markup Pages of Existing TSs and TS Bases

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. The Unit 1 Division 1 and Division 2 station service DC electrical power subsystems;

b. The Unit 1 and the swing DGs DC electrical power subsystems; and

c. The Unit 2 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System," and LCO 3.8.1, "AC Sources - Operating."

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Swing DG DC electrical power subsystem inoperable due to performance of SR 3.8.4.~~7~~ 3 or SR 3.8.~~4.8~~6.6. OR One or more required Unit 2 DG DC electrical power subsystems inoperable.	A.1 Restore DG DC electrical power subsystem to OPERABLE status.	7 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Unit 1 DG DC battery charger on one subsystem inoperable OR Required swing DG DC battery charger inoperable for reasons other than Condition A.	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage	2 hours
	AND	
	B.2 Verify battery float current is ≤ 5 amps	Once per 12 hours
	AND	
	B.3 Restore battery charger(s) to OPERABLE status	72 hours
~~B~~C. One Unit 1 DG DC electrical power subsystem inoperable for reasons other than Condition B. OR Swing DG DC electrical power subsystem inoperable for reasons other than Condition A or B.	~~B~~C.1 Restore DG DC electrical power subsystem to OPERABLE status.	12 hours

D. One or more required Unit 1 station service DC battery chargers on one subsystem inoperable	D.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage AND D.2 Verify battery float current is ≤ 20 amps AND D.3 Restore battery charger(s) to OPERABLE status	2 hours Once per 12 hours 72 hours
E. One Unit 1 station service DC battery on one subsystem inoperable	E.1 Restore required battery to OPERABLE status	12 hours

~~C~~E.	One Unit 1 station service DC electrical power subsystem inoperable for reasons other than Condition D or E.	~~C~~E.1	Restore station service DC electrical power subsystem to OPERABLE status.	2 hours
~~D~~G.	Required Action and Associated Completion Time of Condition A, B, ~~or~~ C, D, E, or F not met.	~~D~~G.1	Be in MODE 3.	12 hours
		AND		
		~~D~~G.2	Be in MODE 4.	36 hours
~~E~~H.	Two or more DC electrical power subsystems inoperable that result in a loss of function.	~~E~~H.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---
SR 3.8.4.1 through SR 3.8.4.~~8~~ 3 are applicable only to the Unit 1 DC sources. SR 3.8.4.~~9~~ 4 is applicable only to the Unit 2 DC sources.

SURVEILLANCE		FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ~~≥ 125 V on float charge~~greater than or equal to the minimum established float voltage.	In accordance with the Surveillance Frequency Control Program
~~SR 3.8.4.2~~	~~Verify no visible corrosion at battery terminals and connectors.~~ ~~OR~~ ~~Verify battery connection resistance is 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.~~	~~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 is within limits.~~	~~In accordance with the Surveillance Frequency Control Program~~

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.~~6~~2	Verify each required battery charger supplies ≥ 400 amps for station service subsystems, and ≥ 100 amps for DG subsystems at ~~≥ 129 V~~greater than or equal to the minimum established float voltage for ≥ 1 hour. OR 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.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.~~7~~3	-----------------------------NOTES----------------------------- 1. The modified performance discharge test in SR 3.8.4.~~4.8~~6.6 may be performed in lieu of ~~the service test in~~ SR 3.8.4.~~7~~3. 2. This Surveillance shall not be performed in MODE 1, 2, or 3, except for the swing DG battery. 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)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.4.8~~	~~NOTE~~ ~~This Surveillance shall not be performed in MODE 1, 2, or 3, except for the swing DG battery. However, credit may be taken for unplanned events that satisfy this SR.~~ ~~Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.~~	~~In accordance with the Surveillance Frequency Control Program~~ ~~AND~~ ~~12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating~~ ~~AND~~ ~~24 months when battery has reached 85% of expected life with capacity ≥ 100% of manufacturer's rating~~
SR 3.8.4.~~9~~4	For required Unit 2 DC sources, the SRs of Unit 2 Specification 3.8.4 are applicable.	In accordance with applicable SRs

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. The Unit 2 Division 1 and Division 2 station service DC electrical power subsystems;

b. The Unit 2 and the swing DGs DC electrical power subsystems; and

c. The Unit 1 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System"; LCO 3.7.4, "Main Control Room Environmental Control (MCREC) System"; LCO 3.7.5, "Control Room Air Conditioning (AC) System"; and LCO 3.8.1, "AC Sources - Operating."

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Swing DG DC electrical power subsystem inoperable due to performance of SR 3.8.4.~~7~~ 3 or SR 3.8.~~4.8~~6.6. OR One or more required Unit 1 DG DC electrical power subsystems inoperable.	A.1 Restore DG DC electrical power subsystem to OPERABLE status.	7 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Unit 2 DG DC battery charger on one subsystem inoperable OR Required swing DG DC battery charger inoperable for reasons other than Condition A.	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage AND B.2 Verify battery float current is ≤ 5 amps AND B.3 Restore battery charger(s) to OPERABLE status	2 hours Once per 12 hours 72 hours
~~B~~C. One Unit 2 DG DC electrical power subsystem inoperable for reasons other than Condition B. OR Swing DG DC electrical power subsystem inoperable for reasons other than Condition A or B.	~~B~~C.1 Restore DG DC electrical power subsystem to OPERABLE status.	12 hours

D. One or more required Unit 2 station service DC battery chargers on one subsystem inoperable	D.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage AND D.2 Verify battery float current is ≤ 20 amps AND D.3 Restore battery charger(s) to OPERABLE status	2 hours Once per 12 hours 72 hours
E. One Unit 2 station service DC battery on one subsystem inoperable	E.1 Restore required battery to OPERABLE status	12 hours

~~C~~E. One Unit 2 station service DC electrical power subsystem inoperable for reasons other than Condition D or E.	~~C~~E.1 Restore station service DC electrical power subsystem to OPERABLE status.	2 hours
~~D~~G. Required Action and Associated Completion Time of Condition A, B, ~~or~~ C, D, E, or F not met.	~~D~~G.1 Be in MODE 3.	12 hours
	AND	
	~~D~~G.2 Be in MODE 4.	36 hours
~~E~~H. Two or more DC electrical power subsystems inoperable that result in a loss of function.	~~E~~H.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

----------NOTE----------
SR 3.8.4.1 through SR 3.8.4.~~8~~3 are applicable only to the Unit 2 DC sources. SR 3.8.4.~~9~~4 is applicable only to the Unit 1 DC sources.

	SURVEILLANCE	FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ~~≥ 125 V on float charge~~greater than or equal to the minimum established float voltage.	In accordance with the Surveillance Frequency Control Program
~~SR 3.8.4.2~~	~~Verify no visible corrosion at battery terminals and connectors.~~ ~~OR~~ ~~Verify battery connection resistance is 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.~~	~~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 is within limits.~~	~~In accordance with the Surveillance Frequency Control Program~~

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.4.~~6~~2	Verify each required battery charger supplies ≥ 400 amps for station service subsystems, and ≥ 100 amps for DG subsystems at ~~≥ 129 V~~greater than or equal to the minimum established float voltage for ≥ 1 hour. OR 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.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.~~7~~3	---------------------------NOTES--------------------------- 1. The modified performance discharge test in SR 3.8.4~~.8~~6.6 may be performed in lieu of ~~the service test in~~ SR 3.8.4.~~7~~3. 2. This Surveillance shall not be performed in MODE 1, 2, or 3, except for the swing DG battery. 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)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
~~SR 3.8.4.8~~	~~NOTE~~ ~~This Surveillance shall not be performed in MODE 1, 2, or 3, except for the swing DG battery. However, credit may be taken for unplanned events that satisfy this SR.~~ ~~Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.~~	~~In accordance with the Surveillance Frequency Control Program~~ ~~AND~~ ~~12 months when battery shows degradation or has reached 85% of expected life with capacity < 100% of manufacturer's rating~~ ~~AND~~ ~~24 months when battery has reached 85% of expected life with capacity ≥ 100% of manufacturer's rating~~
SR 3.8.4.~~9~~4	For required Unit 1 DC sources, the SRs of Unit 1 Specification 3.8.4 are applicable.	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The following DC electrical power subsystems shall be OPERABLE:

a. The Unit 1 DC electrical power subsystems needed to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems - Shutdown"; and

b. The Unit 2 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System"; and LCO 3.8.2, "AC Sources - Shutdown."

APPLICABILITY: MODES 4 and 5,
During movement of irradiated fuel assemblies in the secondary containment.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required battery charger on one or more required DG DC subsystems inoperable. AND The redundant subsystem battery and required chargers OPERABLE.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	A.2 Verify battery float current ≤ 5 amps.	Once per 12 hours
	AND	
	A.3 Restore battery charger(s) to OPERABLE status.	72 hours
B. One or more required battery chargers on one required station service DC subsystems inoperable. AND The redundant subsystem	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	B.2 Verify battery float	Once per 12 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
battery and required chargers OPERABLE.	current ≤ 20 amps. AND B.3 Restore battery charger(s) to OPERABLE status.	 72 hours
~~A~~C. One or more required DG or station service DC electrical power subsystems inoperable for reasons other than Conditions A or B. OR Required Actions and associated Completion Times of Conditions A or B not met	~~A~~C.1 Declare affected required feature(s) inoperable. OR ~~A~~C.2.1 Suspend CORE ALTERATIONS. AND ~~A~~C.2.2 Suspend movement of irradiated fuel assemblies in the secondary containment. AND	Immediately Immediately Immediately

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A~~C. (continued)	~~A~~C.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.	Immediately
	AND	
	~~A~~C.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	------------------------------NOTE------------------------------ The following SRs are not required to be performed: SR 3.8.4.~~7~~ 2 and SR 3.8.4.3~~8~~. --	
	For required Unit 1 DC sources, the following SRs are applicable: SR 3.8.4.1 ~~SR 3.8.4.4~~ ~~SR 3.8.4.7~~ SR 3.8.4.2 ~~SR 3.8.4.5~~ ~~SR 3.8.4.8.~~ SR 3.8.4.3 ~~SR 3.8.4.6~~	In accordance with applicable SRs
SR 3.8.5.2	For required Unit 2 DC sources, SR 3.8.5.1 of Unit 2 Specification 3.8.5 is applicable.	In accordance with Unit 2 SR 3.8.5.1

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The following DC electrical power subsystems shall be OPERABLE:

a. The Unit 2 DC electrical power subsystems needed to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems - Shutdown"; and

b. The Unit 1 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System"; and LCO 3.7.4, "Main Control Room Environmental Control (MCREC) System"; LCO 3.7.5, "Control Room Air Conditioning (AC) System"; and LCO 3.8.2, "AC Sources - Shutdown."

APPLICABILITY: MODES 4 and 5,
During movement of irradiated fuel assemblies in the secondary containment.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required battery charger on one or more required DG DC subsystems inoperable. AND The redundant subsystem battery and required chargers OPERABLE.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND A.2 Verify battery float current ≤ 5 amps. AND A.3 Restore battery charger(s) to OPERABLE status.	2 hours Once per 12 hours 72 hours
B. One or more required battery chargers on one required station service DC subsystems inoperable. AND	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND	2 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
The redundant subsystem battery and required chargers OPERABLE.	B.2 Verify battery float current ≤ 20 amps.	Once per 12 hours
	AND	
	B.3 Restore battery charger(s) to OPERABLE status.	72 hours
~~A~~C. One or more required DG or station service DC electrical power subsystems inoperable for reasons other than Conditions A or B. OR Required Actions and associated Completion Times of Conditions A or B not met	~~A~~C.1 Declare affected required feature(s) inoperable.	Immediately
	OR	
	~~A~~C.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	~~A~~C.2.2 Suspend movement of irradiated fuel assemblies in the secondary containment.	Immediately
	AND	
		(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A~~C. (continued)	~~A~~C.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.	Immediately
	AND	
	~~A~~C.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.5.1	-----NOTE----- The following SRs are not required to be performed: SR 3.8.4.~~7~~2 and SR 3.8.4.3~~8~~. ---------- For required Unit 2 DC sources, the following SRs are applicable: SR 3.8.4.1 ~~SR 3.8.4.4~~ ~~SR 3.8.4.7~~ SR 3.8.4.2 ~~SR 3.8.4.5~~ ~~SR 3.8.4.8.~~ SR 3.8.4.3 ~~SR 3.8.4.6~~	In accordance with applicable SRs
SR 3.8.5.2	For required Unit 1 DC sources, SR 3.8.5.1 of Unit 1 Specification 3.8.5 is applicable.	In accordance with Unit 1 SR 3.8.5.1

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery ~~Cell~~ Parameters

LCO 3.8.6 Battery ~~cell~~ parameters for the station service and DG electrical power subsystem batteries shall be within ~~the~~ limits ~~of Table 3.8.6-1~~.

APPLICABILITY: When associated DC electrical power subsystem is required to be OPERABLE.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. One or more batteries with one or more battery cell parameters not within Category A or B limits.~~	~~A.1 Verify pilot cell's electrolyte level and float voltage meet Table 3.8.6-1 Category C limits.~~	~~1 hour~~
	~~AND~~	
	~~A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits.~~	~~24 hours~~ ~~AND~~ ~~Once per 7 days thereafter~~
	~~AND~~	
	~~A.3 Restore battery cell parameters to Category A and B limits of Table 3.8.6-1.~~	~~31 days~~

~~(continued)~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One DG or station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V.	A.1 Perform SR 3.8.4.1. AND A.2 Perform SR 3.8.6.1. AND A.3 Restore affected cell voltage > 2.07 V.	2 hours 2 hours 24 hours
B. One DG battery on one subsystem with float current > 5 amps.	B.1 Perform SR 3.8.4.1. AND B.2 Restore battery float current to ≤ 5 amps.	2 hours 12 hours
C. One station service battery on one subsystem with float current > 20 amps.	C.1 Perform SR 3.8.4.1. AND C.2 Restore battery float current to ≤ 20 amps.	2 hours 12 hours
-------------NOTE------------- Required Action D.2 shall be completed if electrolyte level was below the top of plates. ----------------------------------- D. One DG or station service battery on one subsystem with one or more cells electrolyte level less than minimum established design limits.	----------------NOTE---------------- Required Actions D.1 and D.2 are only applicable if electrolyte level was below the top of plates. --- D.1 Restore electrolyte level to above top of plates. AND D.2 Verify no evidence of leakage. AND D.3 Restore electrolyte level to greater than or equal	 8 hours 12 hours 31 days

	to minimum established design limits.	
E. One DG or station service battery on one subsystem with pilot cell electrolyte temperature less than minimum established design limits.	E.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits.	12 hours
F. One or more batteries in redundant subsystems with battery parameters not within limits.	F.1 Restore battery parameters for batteries in one subsystem to within limits.	2 hours
~~B~~G. Required Action and associated Completion Time of Condition A, B, C, D, E, or F not met. OR One DG battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 5 amps. OR One station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 20 amps. ~~One or more batteries with average electrolyte temperature of the representative cells not within limits.~~ ~~OR~~ ~~One or more batteries with one or more battery cell parameters not within Category C limits.~~	~~B~~G.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
~~SR 3.8.6.1~~	~~Verify battery cell parameters meet Table 3.8.6-1 Category A limits.~~	~~In accordance with the Surveillance Frequency Control Program~~
~~SR 3.8.6.2~~	~~Verify battery cell parameters meet Table 3.8.6-1 Category B limits.~~	~~In accordance with the Surveillance Frequency Control Program~~ ~~AND~~ ~~Once within 24 hours after battery overcharge > 150 V~~
~~SR 3.8.6.3~~	~~Verify average electrolyte temperature of representative cells is ≥ 65°F for each station service battery, and ≥ 40°F for each DG battery.~~	~~In accordance with the Surveillance Frequency Control Program~~
SR 3.8.6.1	----------------------------NOTE---------------------------- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. --- Verify each DG battery float current is ≤ 5 amps and each station service battery float current is ≤ 20 amps.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.2	Verify each DG and each station service battery pilot cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.3	Verify each DG and each station service battery connected cell electrolyte level is greater than or	In accordance with the Surveillance

	equal to minimum established design limits.	Frequency Control Program
SR 3.8.6.4	Verify each DG and each station service battery pilot cell temperature is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.5	Verify each DG and each station service battery connected cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.6	-----------------------------NOTE----------------------------- This Surveillance shall not normally be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. --- Verify DG and station service battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	In accordance with the Surveillance Frequency Control Program

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

~~PARAMETER~~	~~CATEGORY A: LIMITS FOR EACH DESIGNATED PILOT CELL~~	~~CATEGORY B: LIMITS FOR EACH CONNECTED CELL~~	~~CATEGORY C: LIMITS FOR EACH CONNECTED CELL~~
~~Electrolyte Level~~	~~> Minimum level indication mark, and ≤ 1/4 inch above maximum level indication mark[(a)]~~	~~> Minimum level indication mark, and ≤ 1/4 inch above maximum level indication mark[(a)]~~	~~Above top of plates, and not overflowing~~
~~Float Voltage~~	~~≥ 2.13 V~~	~~≥ 2.13 V~~	~~> 2.07 V~~
~~Specific Gravity[(b)(c)]~~	~~≥ 1.200~~	~~≥ 1.195~~ ~~AND~~ ~~Average of all connected cells > 1.205~~	~~Not more than 0.020 below average of all connected cells~~ ~~AND~~ ~~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 and level. Level correction is not required; however, when on float charge battery charging is < 1 amp for station service batteries and < 0.5 amp for DG batteries.~~

~~(c) A battery charging current of < 1 amp for station service batteries and < 0.5 amp for DG batteries when on float charge is acceptable for meeting specific gravity limits following a battery recharge, for a maximum of 7 days. When charging current is used to satisfy specific gravity requirements, specific gravity of each connected cell shall be measured prior to expiration of the 7 day allowance.~~

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery ~~Cell~~ Parameters

LCO 3.8.6 Battery cell parameters for the station service and DG electrical power subsystem batteries shall be within ~~the~~ limits ~~of Table 3.8.6-1~~.

APPLICABILITY: When associated DC electrical power subsystem is required to be OPERABLE.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A. One or more batteries with one or more battery cell parameters not within Category A or B limits.~~	~~A.1 Verify pilot cell's electrolyte level and float voltage meet Table 3.8.6-1 Category C limits.~~	~~1 hour~~
	~~AND~~	
	~~A.2 Verify battery cell parameters meet Table 3.8.6-1 Category C limits.~~	~~24 hours~~ ~~AND~~ ~~Once per 7 days thereafter~~
	~~AND~~	
	~~A.3 Restore battery cell parameters to Category A and B limits of Table 3.8.6-1.~~	~~31 days~~

~~(continued)~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One DG or station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V.	A.1 Perform SR 3.8.4.1. AND A.2 Perform SR 3.8.6.1. AND A.3 Restore affected cell voltage > 2.07 V.	2 hours 2 hours 24 hours
B. One DG battery on one subsystem with float current > 5 amps.	B.1 Perform SR 3.8.4.1. AND B.2 Restore battery float current to ≤ 5 amps.	2 hours 12 hours
C. One station service battery on one subsystem with float current > 20 amps.	C.1 Perform SR 3.8.4.1. AND C.2 Restore battery float current to ≤ 20 amps.	2 hours 12 hours
---NOTE--- Required Action D.2 shall be completed if electrolyte level was below the top of plates. --- D. One DG or station service battery on one subsystem with one or more cells electrolyte level less than minimum established design limits.	---NOTE--- Required Actions D.1 and D.2 are only applicable if electrolyte level was below the top of plates. --- D.1 Restore electrolyte level to above top of plates. AND D.2 Verify no evidence of leakage. AND D.3 Restore electrolyte level to greater than or equal	 8 hours 12 hours 31 days

	to minimum established design limits.	
E. One DG or station service battery on one subsystem with pilot cell electrolyte temperature less than minimum established design limits.	E.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits.	12 hours
F. One or more batteries in redundant subsystems with battery parameters not within limits.	F.1 Restore battery parameters for batteries in one subsystem to within limits.	2 hours
~~B~~G. Required Action and associated Completion Time of Condition A, B, C, D, E, or F not met. OR One DG battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 5 amps. OR One station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 20 amps. ~~One or more batteries with average electrolyte temperature of the representative cells not within limits.~~ ~~OR~~ ~~One or more batteries with one or more battery cell parameters not within Category C limits.~~	~~B~~G.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
~~SR 3.8.6.1~~	~~Verify battery cell parameters meet Table 3.8.6-1 Category A limits.~~	~~In accordance with the Surveillance Frequency Control Program~~
~~SR 3.8.6.2~~	~~Verify battery cell parameters meet Table 3.8.6-1 Category B limits.~~	~~In accordance with the Surveillance Frequency Control Program~~ ~~AND~~ ~~Once within 24 hours after battery overcharge > 150 V~~
~~SR 3.8.6.3~~	~~Verify average electrolyte temperature of representative cells is ≥ 65°F for each station service battery, and ≥ 40°F for each DG battery.~~	~~In accordance with the Surveillance Frequency Control Program~~
SR 3.8.6.1	------------------------------NOTE------------------------------ Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. --- Verify each DG battery float current is ≤ 5 amps and each station service battery float current is ≤ 20 amps.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.2	Verify each DG and each station service battery pilot cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.3	Verify each DG and each station service battery connected cell electrolyte level is greater than or	In accordance with the Surveillance

	equal to minimum established design limits.	Frequency Control Program
SR 3.8.6.4	Verify each DG and each station service battery pilot cell temperature is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.5	Verify each DG and each station service battery connected cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.6	-----------------------------NOTE---------------------------- This Surveillance shall not normally be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. --- Verify DG and station service battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	In accordance with the Surveillance Frequency Control Program

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

~~PARAMETER~~	~~CATEGORY A:~~ ~~LIMITS FOR EACH~~ ~~DESIGNATED PILOT CELL~~	~~CATEGORY B:~~ ~~LIMITS FOR EACH~~ ~~CONNECTED CELL~~	~~CATEGORY C:~~ ~~LIMITS~~ ~~FOR EACH~~ ~~CONNECTED CELL~~
~~Electrolyte Level~~	~~≥ Minimum level indication mark, and ≤ 1/4 inch above maximum level indication mark[(a)]~~	~~≥ Minimum level indication mark, and ≤ 1/4 inch above maximum level indication mark[(a)]~~	~~Above top of plates, and not overflowing~~
~~Float Voltage~~	~~≥ 2.13 V~~	~~≥ 2.13 V~~	~~≥ 2.07 V~~
~~Specific Gravity[(b)(c)]~~	~~≥ 1.200~~	~~≥ 1.195~~ ~~AND~~ ~~Average of all connected cells ≥ 1.205~~	~~Not more than 0.020 below average of all connected cells~~ ~~AND~~ ~~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 and level. Level correction is not required; however, when on float charge battery charging is ≤ 1 amp for station service batteries and ≤ 0.5 amp for DG batteries.~~

~~(c) A battery charging current of ≤ 1 amp for station service batteries and ≤ 0.5 amp for DG batteries when on float charge is acceptable for meeting specific gravity limits following a battery recharge, for a maximum of 7 days. When charging current is used to satisfy specific gravity requirements, specific gravity of each connected cell shall be measured prior to expiration of the 7 day allowance.~~

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0.

d. Measurement, at designated locations, of the CRE pressure relative to all external areas adjacent to the CRE boundary during the pressurization mode of operation by one subsystem of the MCREC System, operating at the flow rate required by the VFTP, at a Frequency of 24 months on a STAGGERED TEST BASIS. The results shall be trended and used as part of the 24 month assessment of the CRE boundary.

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.15 Battery Monitoring and Maintenance Program

This Program provides controls for battery restoration and maintenance. The program shall be in accordance with IEEE Standard (Std) 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," as endorsed by Regulatory Guide 1.129, Revision 2 (RG), with RG exceptions and program provisions as identified below:

a. The program allows the following RG 1.129, Revision 2 exceptions:

1. Battery temperature correction may be performed before or after conducting discharge tests.

2. RG 1.129, Regulatory Position 1, Subsection 2, "References," is not applicable to this program.

3. In lieu of RG 1.129, Regulatory Position 2, Subsection 5.2, "Inspections," the following shall be used: "Where reference is made to the pilot cell, pilot cell selection shall be based on the lowest voltage cell in the battery."

4 In Regulatory Guide 1.129, Regulatory Position 3, Subsection 5.4.1, "State of Charge Indicator," the following statements in paragraph (d) may be omitted: "When it has been recorded that the charging current

has stabilized at the charging voltage for three consecutive hourly measurements, the battery is near full charge. These measurements shall be made after the initially high charging current decreases sharply and the battery voltage rises to approach the charger output voltage."

5. In lieu of RG 1.129, Regulatory Position 7, Subsection 7.6, "Restoration", the following may be used: "Following the test, record the float voltage of each cell of the string."

b. The program shall include the following provisions:

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

2. Actions to determine whether the float voltage of the remaining battery cells is ≥ 2.13 V when the float voltage of a battery cell has been found to be < 2.13 V;

3. Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates;

4. Limits on average electrolyte temperature, battery connection resistance, and battery terminal voltage; and

5. A requirement to obtain specific gravity readings of all cells at each discharge test, consistent with manufacturer recommendations.

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0.

d. Measurement, at designated locations, of the CRE pressure relative to all external areas adjacent to the CRE boundary during the pressurization mode of operation by one subsystem of the MCREC System, operating at the flow rate required by the VFTP, at a Frequency of 24 months on a STAGGERED TEST BASIS. The results shall be trended and used as part of the 24 month assessment of the CRE boundary.

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.15 Battery Monitoring and Maintenance Program

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a. The program allows the following RG 1.129, Revision 2 exceptions:

1. Battery temperature correction may be performed before or after conducting discharge tests.

2. RG 1.129, Regulatory Position 1, Subsection 2, "References," is not applicable to this program.

3. In lieu of RG 1.129, Regulatory Position 2, Subsection 5.2, "Inspections," the following shall be used: "Where reference is made to the pilot cell, pilot cell selection shall be based on the lowest voltage cell in the battery."

4 In Regulatory Guide 1.129, Regulatory Position 3, Subsection 5.4.1, "State of Charge Indicator," the following statements in paragraph (d) may be omitted: "When it has been recorded that the charging current

has stabilized at the charging voltage for three consecutive hourly measurements, the battery is near full charge. These measurements shall be made after the initially high charging current decreases sharply and the battery voltage rises to approach the charger output voltage."

5. In lieu of RG 1.129, Regulatory Position 7, Subsection 7.6, "Restoration", the following may be used: "Following the test, record the float voltage of each cell of the string."

b. The program shall include the following provisions:

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

2. Actions to determine whether the float voltage of the remaining battery cells is ≥ 2.13 V when the float voltage of a battery cell has been found to be < 2.13 V;

3. Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates;

4. Limits on average electrolyte temperature, battery connection resistance, and battery terminal voltage; and

5. A requirement to obtain specific gravity readings of all cells at each discharge test, consistent with manufacturer recommendations.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources - Operating

BASES

BACKGROUND

The DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment. As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The DC electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The station service DC power sources provide both motive and control power to selected safety related and nonsafety related equipment. Each DC subsystem is energized by one 125/250 V station service battery (consisting of two 125 V batteries in series), and three 125 V battery chargers (two normally inservice chargers and one standby charger). Each battery is exclusively associated with a single 125/250 VDC bus. Each set of battery chargers exclusively associated with a 125/250 VDC subsystem cannot be interconnected with any other 125/250 VDC subsystem. The normal and backup chargers are supplied from the same AC load groups for which the associated DC subsystem supplies the control power. The loads between the redundant 125/250 VDC subsystem are not transferable except for the Automatic Depressurization System, the logic circuits and valves of which are normally fed from the Division 1 DC system.

The diesel generator (DG) DC power sources provide control and instrumentation power for their respective DG and their respective offsite circuit supply breakers. In addition, DG 1A power source provides circuit breaker control power for the respective Division I loads on 4160 VAC buses 1E and 1F, and DG 1C power source provides circuit breaker control power for the respective Division II loads on 4160 VAC buses 1F and 1G. Each DG DC subsystem is energized by one 125 V battery and two 125 V battery chargers (one normally inservice charger and one standby charger).

During normal operation, the DC loads are powered from the respective station service and DG battery chargers with the batteries floating on the system.

In case of loss of normal power to any battery charger, the DC loads are automatically powered from the associated battery. This will

(continued)

BASES

BACKGROUND (continued)

result in the discharging of the associated battery (and affect the battery cell parameters).

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 has adequate storage capacity to carry the required load continuously for approximately 2 hours (Ref. 4).~~

Each DC battery subsystem is separately housed in a ventilated room apart from its charger and distribution panels. 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.

Each battery has adequate storage capacity to meet the duty cycle(s) discussed in the FSAR, 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.

The batteries for DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life. The minimum design voltage limit is 105/210 V.

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 124 V for a 60 cell battery (i.e., cell voltage of 2.07 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 > 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 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 4).

Each battery charger of the DC electrical power subsystem has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining a fully charged battery. Each battery charger has sufficient excess capacity to restore the battery from the design

(continued)

minimum charge to its fully charged state within 24 hours while supplying normal steady state loads (Ref. 4).

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.

A description of the Unit 2 DC power sources is provided in the Bases for Unit 2 LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapters 5 and 6 (Ref. 5), and Chapter 14 (Ref. 6), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation. The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining DC sources OPERABLE during accident conditions in the event of:

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

a. An assumed loss of all offsite AC power sources or all onsite AC power sources; and

b. A postulated worst case single failure.

The DC sources satisfy Criterion 3 of the NRC Policy Statement (Ref. 13).

LCO

The Unit 1 DC electrical power subsystems -- with: 1) each station service DC subsystem consisting of one 125/250 V station service battery (two 125 V batteries in series), two battery chargers, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus; and 2) each DG DC subsystem consisting of one battery bank, one battery charger, and the corresponding control equipment and interconnecting cabling -- 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 anticipated operational occurrence (AOO) or a postulated DBA. In addition, some components required by Unit 1 require power from Unit 2 sources (e.g., Standby Gas Treatment (SGT) System and Low Pressure Coolant Injection (LPCI) valve load centers). Therefore, the Unit 2 DG DC and the swing DG DC electrical power subsystems needed to provide DC power to the required Unit 2 components are also required to be OPERABLE. Thus, loss of any DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4).

APPLICABILITY

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

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal 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 conditions in which DC Sources are required, are addressed in the Bases for LCO 3.8.5, "DC Sources - Shutdown."

(continued)

BASES (continued)

ACTIONS

A.1

If one or more of the required Unit 2 DG DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger(s), or inoperable battery charger and associated inoperable battery), or if the swing DG DC electrical power subsystem is inoperable due to performance of SR 3.8.4.3~~7~~ or SR 3.8.6.6~~4.8~~, and a loss of function has not occurred as described in Condition ~~E~~H, the remaining DC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. In the case of an inoperable required Unit 2 DG DC electrical power subsystem, continued power operation should not exceed 7 days, since a subsequent postulated worst case single failure could result in the loss of certain safety functions (e.g., SGT System and LPCI valve load centers). The 7 day Completion Time takes into account the capacity and capability of the remaining DC sources, and is based on the shortest restoration time allowed for the systems affected by the inoperable DC source in the respective system Specification.

In the case of an inoperable swing DG DC electrical power subsystem, since a subsequent postulated worst case single failure could result in the loss of minimum necessary DC electrical subsystems to mitigate a postulated worst case accident, continued power operation should also not exceed 7 days. The 7 day Completion Time is based upon the swing DG DC electrical power subsystem being inoperable due to performance of SR 3.8.4.3~~7~~ or SR 3.8.6.6~~4.8~~. Performance of these two SRs will result in inoperability of the DC battery. Since this battery is common to both units, more time is provided to restore the battery, if the battery is inoperable for performance of required Surveillances, to preclude the need to perform a dual unit shutdown to perform these Surveillances. The swing DG DC electrical power subsystem also does not provide power to the same type of equipment as the other DG DC sources (e.g., breaker control power for 4160 V loads is not provided by the swing DG battery). The Completion Time also takes into account the capacity and capability of the remaining DC sources.

B.1, B.2, and B.3

Condition B represents one Unit 1 DG DC subsystem with a required battery charger inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained), or the swing DG DC subsystem with a required battery charger inoperable for reasons other than Condition A. 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 B.1 requires that the battery terminal voltage be restored to greater

(continued)

than or equal to the minimum established float voltage within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action B.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 capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2).

Required Action B.2 requires that the battery float current be verified as less than or equal to 5 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it is now fully capable of supplying the maximum expected load requirement. The 5 amp value is based on returning the battery to 95% charge and assumes a 5% design margin for the battery. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 5 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Action B.3 limits the restoration time for the inoperable

(continued)

battery charger to 72 hours. 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 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

~~B~~C.1

If a Unit 1 DG DC electrical power subsystem is inoperable for reasons other than Condition B, or if the swing DG DC electrical power subsystem is inoperable ~~(~~for reasons other than Condition A or B~~)~~, (e.g. inoperable battery or inoperable battery charger and associated inoperable battery)~~,~~, the remaining DC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent postulated worst case single failure could result in the loss of minimum necessary DC electrical subsystems to mitigate a postulated worst

(continued)

BASES

ACTIONS

~~B~~C.1 (continued)

case accident, continued power operation should not exceed 12 hours. The 12 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining the DG DC electrical power subsystem OPERABLE. (The DG DC electrical power subsystem affects both the DG and the offsite circuit, as well as the breaker closure power for various 4160 VAC loads, but does not affect 125/250 VDC station service loads.)

D.1, D.2, and D.3

Condition D represents one Unit 1 station service DC subsystem with one or more required battery chargers 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 D.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 charged condition (Required Action D.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.

(continued)

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

Required Action D.2 requires that the battery float current be verified as less than or equal to 20 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it is now fully capable of supplying the maximum expected load requirement. The 20 amp value is based on returning the battery to 95% charge and assumes a 5% design margin for the battery. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 20 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Action D.3 limits the restoration time for the inoperable battery charger to 72 hours. 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 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

E.1

Condition E represents one Unit 1 station service DC subsystem with one battery inoperable. With one battery inoperable, the station service DC bus is being supplied by the OPERABLE battery chargers. Any event that results in a loss of the AC bus supporting the battery chargers will also result in loss of DC to that subsystem. The energization transients of any DC loads that are beyond the capability of the battery chargers and normally require the assistance of the battery will not be able to be brought online. The 12 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than or equal to 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

~~C~~F.1

Condition ~~C~~ F represents one Unit 1 station service ~~division~~ subsystem with a loss of ability to completely respond to an event,

(continued)

and a potential loss of ability to remain energized during normal operation. It is therefore imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected ~~division~~subsystem. The 2 hour limit is consistent with the allowed time for an inoperable DC Distribution System ~~division~~subsystem.

If one of the required Unit 1 station service DC electrical power subsystems is inoperable for reasons other Conditions D or E (e.g., ~~inoperable battery, inoperable battery charger(s), or~~ inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystem~~s~~ has~~ve~~ the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent postulated worst case single failure could result in the loss of minimum necessary DC electrical subsystems to mitigate a postulated worst case accident, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 7) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

~~D~~G.1 and ~~D~~G.2

If the DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 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

(continued)

BASES

ACTIONS

~~D~~G.1 and ~~D~~G.2 (continued)

to bring the unit to MODE 4 is consistent with the time required in Regulatory Guide 1.93 (Ref. 7).

~~E~~H.1

Condition ~~E~~ H corresponds to a level of degradation in the DC electrical power subsystems that causes a required safety function to be lost. When more than one DC source is lost, and this results in the loss of a required function, the plant is 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 shutdown.

SURVEILLANCE REQUIREMENTS

The SRs are modified by a Note to indicate that SR 3.8.4.1 through SR 3.8.4.~~8~~ 3 apply only to the Unit 1 DC sources, and that SR 3.8.4.~~9~~ 4 applies only to the Unit 2 DC sources.

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~~ battery chargers, which support 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 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 (2.20 Vpc times the number of connected cells). For example, if 60 cells are connected, the voltage at the battery terminals would be 132 V, 2.20 Vpc times 60 cells. With only 58 connected cells, the terminal voltage would be 127.6 V.
This voltage maintains the battery plates in a condition that supports maintaining the grid life. ~~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 voltage requirement for battery terminal voltage is based on the open circuit~~

(continued)

~~voltage of a lead-calcium cell of nominal 1.215 specific gravity. Without regard to other battery parameters, this voltage is indicative of a battery that is capable of performing its required safety function.~~ The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

~~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,~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.4.2 (continued)~~

~~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 are established to maintain connection resistance as low as reasonably possible to minimize the overall voltage drop across the battery and the possibility of battery damage due to heating of connections.~~

~~The resistance values for each battery connection are located in the Technical Requirements Manual (Ref. 9).~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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 provides 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.~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.4.4 and SR 3.8.4.5 (continued)~~

~~The connection resistance limits are established to maintain connection resistance as low as reasonably possible to minimize the overall voltage drop across the battery and the possibility of battery damage due to heating of connections. The resistance values for each battery connection are located in the Technical Requirements Manual (Ref. 9).~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

SR 3.8.4.~~6~~2

This SR verifies ~~Battery charger capability requirements are based on~~ the design capacity of the battery chargers ~~(Ref. 4)~~. According to Regulatory Guide 1.32 (Ref. 10), each battery charger supply is ~~required~~ recommended 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 occurrences. The minimum required amperes and duration ensures that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying ≥ 400 amps for station service subsystems and ≥ 100 amps for DG subsystems at the minimum established float voltage for 1 hour. 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 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 ≤ 20 amps for the station service battery and ≤ 5 amps for the DG batteries.

(continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.~~7~~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 as specified in Reference 4.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.~~7~~ 3 (continued)

~~The modified performance discharge test is a simulated duty cycle consisting of just two rates: the 1 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 1 minute discharge represent 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 for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.~~

~~A modified performance discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service discharge test.~~

The reason for Note 2 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. The swing DG DC battery is exempted from this restriction, since it is required by both units' LCO 3.8.4 and cannot be performed in the manner required by the Note without resulting in a dual unit shutdown.

~~SR 3.8.4.8~~

~~A battery performance discharge test is a constant current capacity test to detect any change in the capacity determined by the acceptance test. Initial conditions consistent with IEEE-450 need to be met prior to the performing of a battery performance discharge test. The test results reflect the overall effects of usage and age.~~

~~A battery modified performance discharge test is described in the Bases for SR 3.8.4.7. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.8; however, only the modified performance discharge test~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.4.8 (continued)~~

~~may be used to satisfy SR 3.8.4.8, while satisfying the requirements of SR 3.8.4.7 at the same time. The acceptance criteria for this Surveillance is consistent with IEEE-450 (Ref. 8) and IEEE-485 (Ref. 12). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. Although there may be ample capacity, the battery rate of deterioration is rapidly increasing.~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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. The swing DG DC battery is exempted from this restriction, since it is required by both units' LCO 3.8.4 and cannot be performed in the manner required by the Note without resulting in a dual unit shutdown.~~

SR 3.8.4.~~9~~ 4

With the exception of this Surveillance, all other Surveillances of this Specification (SR 3.8.4.1 through SR 3.8.4.~~8~~3) are applied only to the Unit 1 DC sources. This Surveillance is provided to direct that the appropriate Surveillances for the required Unit 2 DC sources are governed by the Unit 2 Technical Specifications. Performance of the applicable Unit 2 Surveillances will satisfy both any Unit 2 requirements, as well as satisfying this Unit 1 SR.

The Frequency required by the applicable Unit 2 SR also governs performance of that SR for both Units.

(continued)

BASES (continued)

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6.
3. IEEE Standard 308-1971.
4. FSAR, Section 8.5.
5. FSAR, Chapters 5 and 6.
6. Unit 2 FSAR, Chapter 154.
7. Regulatory Guide 1.93, December 1974.
8. IEEE Standard 450-2002~~1987~~.
9. Technical Requirements Manual, Section 9.0.
10. Regulatory Guide 1.32, February 1977.
11. Not used.
12. IEEE Standard 485-1983.
13. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.
14. Not used.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources - Operating

BASES

BACKGROUND

The DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment. As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The DC electrical power system also conforms to the recommendations of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The station service DC power sources provide both motive and control power to selected safety related and nonsafety related equipment. Each DC subsystem is energized by one 125/250 V station service battery (consisting of two 125 V batteries in series), and three 125 V battery chargers (two normally inservice chargers and one standby charger). Each battery is exclusively associated with a single 125/250 VDC bus. Each set of battery chargers exclusively associated with a 125/250 VDC subsystem cannot be interconnected with any other 125/250 VDC subsystem. The normal and backup chargers are supplied from the same AC load groups for which the associated DC subsystem supplies the control power. The loads between the redundant 125/250 VDC subsystem are not transferable except for the Automatic Depressurization System, the logic circuits and valves of which are normally fed from the Division 1 DC system.

The diesel generator (DG) DC power sources provide control and instrumentation power for their respective DG and their respective offsite circuit supply breakers. In addition, DG 2A power source provides circuit breaker control power for the respective Division I loads on 4160 VAC buses 2E and 2F, and DG 2C power source provides circuit breaker control power for the respective Division II loads on 4160 VAC buses 2F and 2G. Each DG DC subsystem is energized by one 125 V battery and two 125 V battery chargers (one normally inservice charger and one standby charger).

During normal operation, the DC loads are powered from the respective station service and DG battery chargers with the batteries floating on the system.

In case of loss of normal power to any battery charger, the DC loads are automatically powered from the associated battery. This will

(continued)

BACKGROUND (continued)

result in the discharging of the associated battery (and affect the battery cell parameters).

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 has adequate storage capacity to carry the required load continuously for approximately 2 hours (Ref. 4).~~

Each DC battery subsystem is separately housed in a ventilated room apart from its charger and distribution panels. 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.

Each battery has adequate storage capacity to meet the duty cycle(s) discussed in the FSAR, 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.

The batteries for DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life. The minimum design voltage limit is 105/210 V.

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 124 V for a 60 cell battery (i.e., cell voltage of 2.07 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 > 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 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 4).

Each battery charger of the DC electrical power subsystem has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining a fully charged battery. Each battery charger has sufficient excess capacity to restore the battery from the design

(continued)

minimum charge to its fully charged state within 24 hours while supplying normal steady state loads (Ref. 4).

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.

A description of the Unit 1 DC power sources is provided in the Bases for Unit 1 LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. 5), and Chapter 15 (Ref. 6), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation. The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining DC sources OPERABLE during accident conditions in the event of:

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

a. An assumed loss of all offsite AC power sources or all onsite AC power sources; and

b. A postulated worst case single failure.

The DC sources satisfy Criterion 3 of the NRC Policy Statement (Ref. 13).

LCO

The Unit 2 DC electrical power subsystems -- with: 1) each station service DC subsystem consisting of one 125/250 V station service battery (two 125 V batteries in series), two battery chargers, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus; and 2) each DG DC subsystem consisting of one battery bank, one battery charger, and the corresponding control equipment and interconnecting cabling -- 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 anticipated operational occurrence (AOO) or a postulated DBA. In addition, some components required by Unit 2 require power from Unit 1 sources (e.g., Standby Gas Treatment (SGT) System, Low Pressure Coolant Injection (LPCI) valve load centers, Main Control Room Environmental Control (MCREC) System, and Control Room Air Condition (AC) System). Therefore, the Unit 1 DG DC and the swing DG DC electrical power subsystems needed to provide DC power to the required Unit 1 components are also required to be OPERABLE. Thus, loss of any DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4).

APPLICABILITY

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

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal 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 conditions in which DC Sources are required, are addressed in the Bases for LCO 3.8.5, "DC Sources - Shutdown."

(continued)

BASES (continued)

ACTIONS

A.1

If one or more of the required Unit 1 DG DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger(s), or inoperable battery charger and associated inoperable battery), or if the swing DG DC electrical power subsystem is inoperable due to performance of SR 3.8.4.3~~7~~ or SR 3.8.6.6~~4.8~~, and a loss of function has not occurred as described in Condition ~~E~~H, the *remaining DC electrical power subsystems have the capacity to* support a safe shutdown and to mitigate an accident condition. In the case of an inoperable required Unit 1 DG DC electrical power subsystem, continued power operation should not exceed 7 days since a subsequent postulated worst case single failure could result in the loss of certain safety functions (e.g., SGT System and LPCI valve load centers). The 7 day Completion Time takes into account the capacity and capability of the remaining DC sources, and is based on the shortest restoration time allowed for the systems affected by the inoperable DC source in the respective system Specification.

In the case of an inoperable swing DG DC electrical power subsystem, since a subsequent postulated worst case single failure could result in the loss of minimum necessary DC electrical subsystems to mitigate a postulated worst case accident, continued power operation should also not exceed 7 days. The 7 day Completion Time is based upon the swing DG DC electrical power subsystem being inoperable due to performance of SR 3.8.4.3~~7~~ or SR 3.8.6.6~~4.8~~. Performance of these two SRs will result in inoperability of the DC battery. Since this battery is common to both units, more time is provided to restore the battery, if the battery is inoperable for performance of required Surveillances, to preclude the need to perform a dual unit shutdown to perform these Surveillances. The swing DG DC electrical power subsystem also does not provide power to the same type of equipment as the other DG DC sources (e.g., breaker control power for 4160 V loads is not provided by the swing DG battery). The Completion Time also takes into account the capacity and capability of the remaining DC sources.

B.1, B.2, and B.3

Condition B represents one Unit 2 DG DC subsystem with a required battery charger inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained), or the swing DG DC subsystem with a required battery charger inoperable for reasons other than Condition A. 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 B.1 requires that the battery terminal voltage be restored to greater

(continued)

than or equal to the minimum established float voltage within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or providing an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage. Restoring the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action B.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 capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2).

Required Action B.2 requires that the battery float current be verified as less than or equal to 5 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it is now fully capable of supplying the maximum expected load requirement. The 5 amp value is based on returning the battery to 95% charge and assumes a 5% design margin for the battery. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 5 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Action B.3 limits the restoration time for the inoperable

(continued)

battery charger to 72 hours. 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 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

~~B~~C.1

If a Unit 2 DG DC electrical power subsystem is inoperable for reasons other than Condition B, or if the swing DG DC electric power subsystem is inoperable for reasons other than Condition A or B, (e.g. inoperable battery or inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent postulated worst case single failure could result in the loss of minimum necessary DC electrical subsystems to mitigate a postulated worst

(continued)

BASES

ACTIONS

BC.1 (continued)

case accident, continued power operation should not exceed 12 hours. The 12 hour Completion Time provides a period of time to correct the problem commensurate with the importance of maintaining the DG DC electrical power subsystem OPERABLE. (The DG DC electrical power subsystem affects both the DG and the offsite circuit, as well as the breaker closure power for various 4160 V AC loads, but does not affect 125/250 V DC station service loads.)

D.1, D.2, and D.3

Condition D represents one Unit 2 station service DC subsystem with one or more required battery chargers 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 D.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 charged condition (Required Action D.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.

(continued)

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

Required Action D.2 requires that the battery float current be verified as less than or equal to 20 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it is now fully capable of supplying the maximum expected load requirement. The 20 amp value is based on returning the battery to 95% charge and assumes a 5% design margin for the battery. If at the expiration of the initial 12 hour period the battery float current is not less than or equal to 20 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

Required Action D.3 limits the restoration time for the inoperable battery charger to 72 hours. 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 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery to OPERABLE status.

E.1

Condition E represents one Unit 2 station service DC subsystem with one battery inoperable. With one battery inoperable, the station service DC bus is being supplied by the OPERABLE battery chargers. Any event that results in a loss of the AC bus supporting the battery chargers will also result in loss of DC to that subsystem. The energization transients of any DC loads that are beyond the capability of the battery chargers and normally require the assistance of the battery will not be able to be brought online. The 12 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than or equal to 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

~~C~~F.1

Condition ~~C~~ F represents one Unit 2 station service ~~division~~ subsystem with a loss of ability to completely respond to an event,

(continued)

and a potential loss of ability to remain energized during normal operation. It is therefore imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected ~~division~~subsystem. The 2 hour limit is consistent with the allowed time for an inoperable DC Distribution System ~~division~~subsystem.

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

~~D~~G.1 and ~~D~~G.2

If the DC electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 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

(continued)

BASES

ACTIONS

~~D~~G.1 and ~~D~~G.2 (continued)

to bring the unit to MODE 4 is consistent with the time required in Regulatory Guide 1.93 (Ref. 7).

~~E~~H.1

Condition ~~E~~ H corresponds to a level of degradation in the DC electrical power subsystems that causes a required safety function to be lost. When more than one DC source is lost, and this results in the loss of a required function, the plant is 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 shutdown.

SURVEILLANCE REQUIREMENTS

The SRs are modified by a NOTE to indicate that SR 3.8.4.1 through SR 3.8.4.~~8~~ 3 apply only to the Unit 2 DC sources, and that SR 3.8.4.~~9~~ 4 applies only to the Unit 1 DC sources.

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~~ battery chargers, which support 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 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 (2.20 Vpc times the number of connected cells). For example, if 60 cells are connected, the voltage at the battery terminals would be 132 V, 2.20 Vpc times 60 cells. With only 58 connected cells, the terminal voltage would be 127.6 V.
This voltage maintains the battery plates in a condition that supports maintaining the grid life. ~~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 voltage requirement for battery terminal voltage is based on the open circuit~~

(continued)

~~voltage of a lead-calcium cell of nominal 1.215 specific gravity. Without regard to other battery parameters, this voltage is indicative of a battery that is capable of performing its required safety function.~~ The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

~~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,~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.4.2 (continued)~~

~~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 are established to maintain connection resistance as low as reasonably possible to minimize the overall voltage drop across the battery and the possibility of battery damage due to heating of connections.~~

~~The resistance values for each battery connection are located in the Technical Requirements Manual (Ref. 9).~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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 provides 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.~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.4.4 and SR 3.8.4.5 (continued)~~

~~The connection resistance limits are established to maintain connection resistance as low as reasonably possible to minimize the overall voltage drop across the battery and the possibility of battery damage due to heating of connections. The resistance values for each battery connection are located in the Technical Requirements Manual (Ref. 9).~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

SR 3.8.4.~~6~~2

This SR verifies ~~Battery charger capability requirements are based on~~ the design capacity of the battery chargers ~~(Ref. 4)~~. According to Regulatory Guide 1.32 (Ref. 10), each battery charger supply is ~~required~~ recommended 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 occurrences. The minimum required amperes and duration ensures that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying ≥ 400 amps for the station service subsystems and ≥ 100 amps for the DG subsystems at the minimum established float voltage for 1 hour. 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 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 ≤ 20 amps for the station service battery and ≤ 5 amps for the DG batteries.

(continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.~~7~~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 as specified in Reference 4.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.~~7~~ 3 (continued)

~~The modified performance discharge test is a simulated duty cycle consisting of just two rates: the 1 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 1 minute discharge represent 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 for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.~~

~~A modified performance discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service discharge test.~~

The reason for Note 2 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. The swing DG DC battery is exempted from this restriction, since it is required by both units' LCO 3.8.4 and cannot be performed in the manner required by the Note without resulting in a dual unit shutdown.

~~SR 3.8.4.8~~

~~A battery performance discharge test is a constant current capacity test to detect any change in the capacity determined by the acceptance test. Initial conditions consistent with IEEE-450 need to be met prior to the performing of a battery performance discharge test. The test results reflect the overall effects of usage and age.~~

~~A battery modified performance discharge test is described in the Bases for SR 3.8.4.7. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.8; however, only the modified performance discharge test~~

(continued)

BASES

SURVEILLANCE REQUIREMENTS

~~SR 3.8.4.8 (continued)~~

~~may be used to satisfy SR 3.8.4.8, while satisfying the requirements of SR 3.8.4.7 at the same time.~~

~~The acceptance criteria for this Surveillance is consistent with IEEE-450 (Ref. 8) and IEEE-485 (Ref. 12). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. Although there may be ample capacity, the battery rate of deterioration is rapidly increasing.~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~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. The swing DG DC battery is exempted from this restriction, since it is required by both units' LCO 3.8.4 and cannot be performed in the manner required by the Note without resulting in a dual unit shutdown.~~

SR 3.8.4.~~9~~ 4

With the exception of this Surveillance, all other Surveillances of this Specification (SR 3.8.4.1 through SR 3.8.4.~~8~~3) are applied only to the Unit 2 DC sources. This Surveillance is provided to direct that the appropriate Surveillances for the required Unit 1 DC sources are governed by the Unit 1 Technical Specifications. Performance of the applicable Unit 1 Surveillances will satisfy both any Unit 1 requirements, as well as satisfying this Unit 2 SR.

The Frequency required by the applicable Unit 1 SR also governs performance of that SR for both Units.

(continued)

BASES (continued)

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6.
3. IEEE Standard 308-1971.
4. FSAR, Paragraphs 8.3.2.1.1 and 8.3.2.1.2.
5. FSAR, Chapter 6.
6. FSAR, Chapter 15.
7. Regulatory Guide 1.93, December 1974.
8. IEEE Standard 450-2002~~1987~~.
9. Technical Requirements Manual, Section 9.0.
10. Regulatory Guide 1.32, February 1977.
11. Not used
12. IEEE Standard 485-1983.
13. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources - Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapters 5 and 6 (Ref. 1), and Unit 2 FSAR Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

The DC sources satisfy Criterion 3 of the NRC Policy Statement (Ref. 3).

LCO

The necessary Unit 1 DC electrical power subsystems -- with:
1) each station service DC subsystem consisting of one 125/250 V station service battery (consisting of two 125 V batteries in series), two battery chargers, and the corresponding control equipment and interconnecting cabling; and
2) each DG DC subsystem consisting of one battery bank, one battery charger, and

(continued)

BASES

LCO (continued)

the corresponding control equipment and interconnecting cabling -- are required to be OPERABLE to support required DC distribution subsystems required OPERABLE by LCO 3.8.8, "Distribution Systems - Shutdown." In addition, some components that may be required by Unit 1 require power from Unit 2 sources (e.g., Standby Gas Treatment (SGT) System and LPCI valve load centers). Therefore, the Unit 2 DG DC and the swing DG DC electrical power subsystems needed to provide DC power to the required Unit 2 components are also required to be OPERABLE. This requirement ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

ACTIONS

A.1, ~~A.2.1, A.2.2, A.2.3, and A.2.4~~A.2, A.3, B.1, B.2, B.3

Conditions A and B represent one or more (Condition A), or one (Condition B), required subsystem with one or more required battery chargers 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

(continued)

qualified charger to OPERABLE status in a reasonable time period. Required Action A.1/B.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 charged condition (Required Action A.2/B.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 capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action A.2/B.2).

Required Action A.2/B.2 requires that the battery float current be verified as less than or equal to 20 amps for the station service battery or 5 amps for the DG battery. 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 20 amps for the station service battery or 5 amps for the DG battery this indicates there may be additional battery problems and the battery must be declared inoperable.

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Required Action A.3/B.3 limits the restoration time for the inoperable battery charger to 72 hours. 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 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

C.1, C.2.1, C.2.2, C.2.3, and C.2.4

If more than one DC distribution subsystem is required according to LCO 3.8.8, the DC subsystems remaining OPERABLE with one or more DC power sources inoperable may be capable of supporting sufficient required features to allow continuation of CORE

(continued)

BASES

ACTIONS

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

ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By allowance of the option to declare required features inoperable with associated DC power sources inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

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

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.~~8~~3. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

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

SR 3.8.5.2

This Surveillance is provided to direct that the appropriate Surveillances for the required Unit 2 DC sources are governed by the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.5.2 (continued)

Unit 2 Technical Specifications. Performance of the applicable Unit 2 Surveillances will satisfy both any Unit 2 requirements, as well as satisfying this Unit 1 Surveillance Requirement. The Frequency required by the applicable Unit 2 SR also governs performance of that SR for both Units.

REFERENCES

1. FSAR, Chapters 5 and 6.
2. Unit 2 FSAR, Chapter 154.
3. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources - Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter 6 (Ref. 1) and Chapter 15 (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

The DC sources satisfy Criterion 3 of the NRC Policy Statement (Ref. 3).

LCO

The necessary Unit 2 DC electrical power subsystems -- with:
1) each station service DC subsystem consisting of one 125/250 V station service battery (consisting of two
125 V batteries in series), two battery chargers, and the corresponding control equipment and interconnecting cabling; and
2) each DG DC subsystem consisting of one battery bank, one battery charger, and

(continued)

BASES

LCO (continued)

the corresponding control equipment and interconnecting cabling -- are required to be OPERABLE to support required DC distribution subsystems required OPERABLE by LCO 3.8.8, "Distribution Systems - Shutdown." In addition, some components that may be required by Unit 2 require power from Unit 1 sources (e.g., Standby Gas Treatment (SGT) System and LPCI valve load centers). Therefore, the Unit 1 DG DC and the swing DG DC electrical power subsystems needed to provide DC power to the required Unit 1 components are also required to be OPERABLE. This requirement ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

ACTIONS

A.1, ~~A.2.1, A.2.2, A.2.3, and A.2.4~~A.2, A.3, B.1, B.2, B.3

Conditions A and B represent one or more (Condition A) or one (Condition B) required subsystem with one or more required battery chargers 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.

(continued)

Required Action A.1/B.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 charged condition (Required Action A.2/B.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 capacity margins will be reduced. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action A.2/B.2).

Required Action A.2/B.2 requires that the battery float current be verified as less than or equal to 20 amps for the station service battery or 5 amps for the DG battery. 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 20 amps for the station service battery or 5 amps for the DG battery this indicates there may be additional battery problems and the battery must be declared inoperable.

(continued)

Required Action A.3/B.3 limits the restoration time for the inoperable battery charger to 72 hours. 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 72 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

C.1, C.2.1, C.2.2, C.2.3, and C.2.4

If more than one DC distribution subsystem is required according to LCO 3.8.8, the DC subsystems remaining OPERABLE with one or more DC power sources inoperable may be capable of supporting sufficient required features to allow continuation of CORE

(continued)

BASES

ACTIONS

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

ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By allowance of the option to declare required features inoperable with associated DC power sources inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

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

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.~~8~~3. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

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

SR 3.8.5.2

This Surveillance is provided to direct that the appropriate Surveillances for the required Unit 1 DC sources are governed by the

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.5.2 (continued)

Unit 1 Technical Specifications. Performance of the applicable Unit 1 Surveillances will satisfy both any Unit 1 requirements, as well as satisfying this Unit 2 Surveillance Requirement. The Frequency required by the applicable Unit 1 SR also governs performance of that SR for both Units.

REFERENCES

1. FSAR, Chapter 6.

2. FSAR, Chapter 15.

3. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery ~~Cell~~ Parameters

BASES

BACKGROUND

This LCO delineates the limits on battery float current as well as electrolyte temperature, level, and float voltage~~, and specific gravity~~ for the DC electrical power subsystems batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown." In addition to the limitations of this Specification, the licensee controlled program also implements a program specified in Specification 5.5.15 for monitoring various battery parameters.

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 124 V for 60 cell battery (i.e., cell voltage of 2.07 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 > 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 2.20 to 2.25 Vpc. This provides adequate over-potential which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapters 5 and 6 (Ref. ~~1~~3), and Unit 2 FSAR Chapter 154 (Ref. ~~2~~4), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power subsystems provide normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one ~~division~~ subsystem of DC sources OPERABLE during accident conditions, in the event of:

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

(continued)

b. A postulated worst case single failure.

Since battery ~~cell~~ parameters support the operation of the DC electrical power subsystems, they satisfy Criterion 3 of the NRC Policy Statement (Ref. 4~~6~~).

LCO

Battery ~~cell~~ parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. ~~Cell~~ Battery parameter limits are established to allow continued DC electrical system function even with ~~Category A and B~~ limits not met. Additional preventative maintenance, testing, and monitoring performed in accordance with the licensee controlled program is conducted as specified in Specification 5.5.15.

(continued)

BASES (continued)

APPLICABILITY

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

ACTIONS

A Note has been added providing that, for this LCO, separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable battery. Complying with the Required Actions for battery ~~cell~~ parameters allows for restoration and continued operation, and subsequent out of limit battery ~~cell~~ parameters may be governed by separate Condition entry and application of associated Required Actions.

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

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

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.6.1 acceptance criteria does not result in this Required Action not met. However, if one of the SRs is failed the appropriate Condition(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed then there is no assurance that there is still sufficient battery capacity to perform the intended function and the battery must be declared inoperable immediately.

B.1, B.2, C.1, and C.2

One or more batteries in one subsystem with float current > 20 amps for station service batteries or > 5 amps for DG batteries indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours verification of the required battery charger

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OPERABILITY is made by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. Condition A addresses charger inoperability. If the charger is operating in the current limit mode after 2 hours that is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2/C.2). The battery must therefore be declared inoperable.

If the float voltage is found to be satisfactory but there are one or more battery cells with float voltage less than or equal to 2.07 V, the associated "OR" statement in Condition G is applicable and the battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than or equal to 2.07 V there is good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action B.2/C.2) from any discharge that might have occurred due to a temporary loss of the battery charger.

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

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

D.1, D.2, and D.3

With one or more batteries in one subsystem with one or more cells

(continued)

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

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions D.1 and D.2 address this potential (as well as provisions in Specification 5.5.15, Battery Monitoring and Maintenance Program). They are modified by a Note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours level is required to be restored to above the top of the plates. The Required Action D.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.15.b item to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from IEEE Standard 450 (Ref. 1). They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the batteries may have to be declared inoperable and the affected cells replaced.

E.1

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

F.1

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

~~With parameters of one or more cells in one or more batteries not within limits (i.e., Category A limits not met or Category B limits not~~

(continued)

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

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

~~Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The~~

(continued)

~~BASES~~

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

~~verification is repeated at 7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the normal Frequency of pilot cell surveillances.~~

~~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~~G.1

When any battery parameter is outside the allowances of the Required Actions for Condition A, B, C, D, E, or F,~~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~~battery must be declared inoperable. Additionally, discovering one or more batteries in one subsystem with one or more battery cells float voltage less than or equal to 2.07 V and float current greater than 20 amps for the station service batteries or greater than 5 amps for the DG batteries indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately.~~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 the appropriate limit (65°F for station service and 40°F for DG batteries), also are cause for immediately declaring the associated DC electrical power subsystem inoperable.~~

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The equipment used to monitor float current must have the necessary accuracy and capability to measure electrical currents in the expected range. The float current

(continued)

requirements are based on the float current indicative of a charged battery. The Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTIONs B or D are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained (Ref. 7).

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 132 V at the battery terminals, or 2.20 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.5.15. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are greater than 2.07 V. The Surveillance Frequency for cell voltage verification for pilot cell and for each connected cell is controlled under the Surveillance Frequency Control Program.

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The minimum design electrolyte level is the minimum level indication mark on the battery cell jar. The Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e.,65 F for the station service batteries and 40°F for the diesel generator batteries). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is controlled under the Surveillance Frequency Control Program.

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SR 3.8.6.6

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

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.6.6; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.3.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

It may consist of just two rates; for instance, the one minute rate 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 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 for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

IEEE-450 (Ref. 1) describes three types of modified performance discharge tests. The discharge test described in the preceding paragraph is the Type 1 test. The Type 2 and Type 3 tests, however, are also suitable to satisfy this surveillance.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 1) and IEEE-485 (Ref. 5). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

The Frequency for this test is in accordance with the Surveillance

(continued)

Frequency Control Program. 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. 1), 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.

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.

~~This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 3), which recommends regular battery inspections including voltage, specific gravity, and electrolyte level of pilot cells. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~SR 3.8.6.2~~

~~The 92 day inspection of specific gravity, cell voltage, and level is consistent with IEEE-450 (Ref. 3). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. In addition, within 24 hours of a battery overcharge > 150 V, the battery must be demonstrated to meet Category B limits. This inspection~~

(continued)

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.8.6.2 (continued)~~

~~is also consistent with IEEE-450 (Ref. 3), which recommends special inspections following a severe overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such overcharge.~~

~~SR 3.8.6.3~~

~~This Surveillance verification that the average temperature of representative cells is within limits is consistent with a recommendation of IEEE-450 (Ref. 3) that states that the temperature of electrolyte in representative cells should be determined in accordance with the Surveillance Frequency Control Program.~~

~~Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on IEEE-450 or the manufacturer's recommendations when provided.~~

~~Table 3.8.6-1~~

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

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

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

~~The Category A limit specified for float voltage is ≥ 2.13 V per cell.~~

(continued)

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~

~~Table 3.8.6-1 (continued)~~

~~This value is based on the recommendation of IEEE-450 (Ref. 3), which states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells.~~

~~The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer's fully charged nominal specific gravity) or a battery charging current that had stabilized at a low value. This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 3), the specific gravity readings are based on a temperature of 77°F (25°C).~~

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

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

~~The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer's fully charged, nominal specific gravity) with the average of all connected cells 1.205 (0.010 below the manufacturer's fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell do not mask overall degradation of the battery.~~

~~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 limit, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.~~

~~The Category C limits specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability.~~

(continued)

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~

~~Table 3.8.6-1 (continued)~~

~~The Category C limit 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 Allowable Value of 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.~~

~~The footnotes to Table 3.8.6-1 that apply to specific gravity are applicable to Category A, B, and C specific gravity. Footnote (b) of Table 3.8.6-1 requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current, while on float charge, is < 1 amp for station service batteries and < 0.5 amp for DG batteries. This current provides, in general, an indication of overall battery condition.~~

~~Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized 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.~~

REFERENCES

1. IEEE-450-2002.

2. FSAR, Chapter 8

~~1~~3. FSAR, Chapters 5 and 6.

~~2~~4. Unit 2 FSAR, Chapter 154.

~~3~~5. ~~IEEE Standard 450-1987~~ IEEE Standard 485, 1983.

46. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.

7. Modification (and respective Base) Calculations MC-H-14-0009, 0010, and 0014; (SENH-92-137, SENH-92-136, SENH-97-014)

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery ~~Cell~~ Parameters

BASES

BACKGROUND

This LCO delineates the limits on battery float current as well as electrolyte temperature, level, and float voltage~~, and specific gravity~~ for the DC electrical power subsystems batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources - Shutdown." In addition to the limitations of this Specification, the licensee controlled program also implements a program specified in Specification 5.5.15 for monitoring various battery parameters.

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 124 V for 60 cell battery (i.e., cell voltage of 2.07 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 > 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 2.20 to 2.25 Vpc. This provides adequate over-potential which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.20 Vpc corresponds to a total float voltage output of 132 V for a 60 cell battery as discussed in the FSAR, Chapter 8 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 6 (Ref. ~~1~~3), and Chapter 15 (Ref. ~~2~~4), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power subsystems provide normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one ~~division~~ subsystem of DC sources OPERABLE during accident conditions, in the event of:

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

(continued)

b. A postulated worst case single failure.

Since battery ~~cell~~ parameters support the operation of the DC electrical power subsystems, they satisfy Criterion 3 of the NRC Policy Statement (Ref. ~~4~~6).

LCO

Battery ~~cell~~ parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. ~~Cell~~ Battery parameter limits are established to allow continued DC electrical system function even with ~~Category A and B~~ limits not met. Additional preventative maintenance, testing, and monitoring performed in accordance with the licensee controlled program is conducted as specified in Specification 5.5.15.

(continued)

BASES (continued)

APPLICABILITY

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

ACTIONS

A Note has been added providing that, for this LCO, separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable battery. Complying with the Required Actions for battery ~~cell~~ parameters allows for restoration and continued operation, and subsequent out of limit battery ~~cell~~ parameters may be governed by separate Condition entry and application of associated Required Actions.

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

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

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.6.1 acceptance criteria does not result in this Required Action not met. However, if one of the SRs is failed the appropriate Condition(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed then there is no assurance that there is still sufficient battery capacity to perform the intended function and the battery must be declared inoperable immediately.

B.1, B.2, C.1, and C.2

One or more batteries in one subsystem with float current > 20 amps for station service batteries or > 5 amps for DG batteries indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 2 hours verification of the required battery charger

(continued)

OPERABILITY is made by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. Condition A addresses charger inoperability. If the charger is operating in the current limit mode after 2 hours that is an indication that the battery has been substantially discharged and likely cannot perform its required design functions. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 12 hours (Required Action B.2/C.2). The battery must therefore be declared inoperable.

If the float voltage is found to be satisfactory but there are one or more battery cells with float voltage less than or equal to 2.07 V, the associated "OR" statement in Condition G is applicable and the battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than or equal to 2.07 V there is good assurance that, within 12 hours, the battery will be restored to its fully charged condition (Required Action B.2/C.2) from any discharge that might have occurred due to a temporary loss of the battery charger.

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

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

D.1, D.2, and D.3

With one or more batteries in one subsystem with one or more cells

(continued)

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

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions D.1 and D.2 address this potential (as well as provisions in Specification 5.5.15, Battery Monitoring and Maintenance Program). They are modified by a Note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours level is required to be restored to above the top of the plates. The Required Action D.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.15.b item to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from IEEE Standard 450 (Ref. 1). They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the batteries may have to be declared inoperable and the affected cells replaced.

E.1

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

F.1

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

~~With parameters of one or more cells in one or more batteries not within limits (i.e., Category A limits not met or Category B limits not~~

(continued)

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

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

~~Verification that the Category C limits are met (Required Action A.2) provides assurance that during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The~~

(continued)

~~BASES~~

~~ACTIONS~~

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

~~verification is repeated at 7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the normal Frequency of pilot cell surveillances.~~

~~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~~G.1

When any battery parameter is outside the allowances of the Required Actions for Condition A, B, C, D, E, or F~~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~~battery must be declared inoperable. Additionally, discovering one or more batteries in one subsystem with one or more battery cells float voltage less than or equal to 2.07 V and float current greater than 20 amps for the station service batteries or greater than 5 amps for the DG batteries indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately.~~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 the appropriate limit (65°F for station service and 40°F for DG batteries), also are cause for immediately declaring the associated DC electrical power subsystem inoperable.~~

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a charged state. The equipment used to monitor float current must have the necessary accuracy and capability to measure electrical currents in the expected range. The float current

(continued)

requirements are based on the float current indicative of a charged battery. The Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTIONs B or D are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained (Ref. 7).

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 132 V at the battery terminals, or 2.20 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.5.15. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are greater than 2.07 V. The Surveillance Frequency for cell voltage verification for pilot cell and for each connected cell is controlled under the Surveillance Frequency Control Program.

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The minimum design electrolyte level is the minimum level indication mark on the battery cell jar. The Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 65 F for the station service batteries and 40°F for the diesel generator batteries). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is controlled under the Surveillance Frequency Control Program.

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SR 3.8.6.6

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

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.6.6; however, only the modified performance discharge test may be used to satisfy the battery service test requirements of SR 3.8.4.3.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

It may consist of just two rates; for instance, the one minute rate 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 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 for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

IEEE-450 (Ref. 1) describes three types of modified performance discharge tests. The discharge test described in the preceding paragraph is the Type 1 test. The Type 2 and Type 3 tests, however, are also suitable to satisfy this surveillance.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 1) and IEEE-485 (Ref. 5). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements. Furthermore, the battery is sized to meet the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

The Frequency for this test is in accordance with the Surveillance

(continued)

Frequency Control Program. 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. 1), 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.

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.
~~This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 3), which recommends regular battery inspections including voltage, specific gravity, and electrolyte level of pilot cells. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~SR 3.8.6.2~~

~~The 92 day inspection of specific gravity, cell voltage, and level is consistent with IEEE-450 (Ref. 3). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. In addition, within 24 hours of a battery overcharge > 150 V, the battery must be demonstrated to meet Category B limits. This inspection~~

(continued)

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.8.6.2 (continued)~~

~~is also consistent with IEEE-450 (Ref. 3), which recommends special inspections following a severe overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such overcharge.~~

~~SR 3.8.6.3~~

~~This Surveillance verification that the average temperature of representative cells is within limits is consistent with a recommendation of IEEE-450 (Ref. 3) that states that the temperature of electrolyte in representative cells should be determined in accordance with the Surveillance Frequency Control Program.~~

~~Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on IEEE-450 or the manufacturer's recommendations when provided.~~

~~Table 3.8.6-1~~

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

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

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

~~The Category A limit specified for float voltage is ≥ 2.13 V per cell.~~

(continued)

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~

~~Table 3.8.6-1 (continued)~~

~~This value is based on the recommendation of IEEE-450 (Ref. 3), which states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells.~~

~~The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturer's fully charged nominal specific gravity) or a battery charging current that had stabilized at a low value. This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 3), the specific gravity readings are based on a temperature of 77°F (25°C).~~

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

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

~~The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer's fully charged, nominal specific gravity) with the average of all connected cells 1.205 (0.010 below the manufacturer's fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell do not mask overall degradation of the battery.~~

~~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 limit, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.~~

~~The Category C limits specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability.~~

(continued)

~~BASES~~

~~SURVEILLANCE REQUIREMENTS~~

~~Table 3.8.6-1 (continued)~~

~~The Category C limit 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 Allowable Value of 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.~~

~~The footnotes to Table 3.8.6-1 that apply to specific gravity are applicable to Category A, B, and C specific gravity. Footnote (b) of Table 3.8.6-1 requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current, while on float charge, is < 1 amp for station service batteries and < 0.5 amp for DG batteries. This current provides, in general, an indication of overall battery condition.~~

~~Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized 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.~~

REFERENCES

1. IEEE-450-2002.

2. FSAR, Chapter 8

~~1~~3. FSAR, Chapters 6.

~~2~~4. FSAR, Chapter 15.

~~3~~5. ~~IEEE Standard 450-1987~~ IEEE Standard 485, 1983.

~~4~~6. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.

7. Modification (and respective Base) Calculations MC-H-14-0009, 0010, and 0014; (SENH-92-137, SENH-92-136, SENH-97-014)

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications
Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical
Rewrite – Update To TSTF-360".

Attachment 4

Clean Technical Specifications Pages

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. The Unit 1 Division 1 and Division 2 station service DC electrical power subsystems;

b. The Unit 1 and the swing DGs DC electrical power subsystems; and

c. The Unit 2 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System," and LCO 3.8.1, "AC Sources - Operating."

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Swing DG DC electrical power subsystem inoperable due to performance of SR 3.8.4.3 or SR 3.8.6.6. OR One or more required Unit 2 DG DC electrical power subsystems inoperable.	A.1 Restore DG DC electrical power subsystem to OPERABLE status.	7 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Unit 1 DG DC battery charger on one subsystem inoperable. OR Required swing DG DC battery charger inoperable for reasons other than Condition A.	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND B.2. Verify battery float current is ≤ 5 amps.	Once per 12 hours
	AND B.3 Restore battery charger(s) to OPERABLE status.	72 hours
C. One Unit 1 DG DC electrical power subsystem inoperable for reasons other than Condition B. OR Swing DG DC electrical power subsystem inoperable for reasons other than Condition A or B.	C.1 Restore DG DC electrical power subsystem to OPERABLE status.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. One or more required Unit 1 station service DC battery chargers on one subsystem inoperable.	D.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND		
	D.2.	Verify battery float current is ≤ 20 amps.	Once per 12 hours
	AND		
	D.3	Restore battery charger(s) to OPERABLE status.	72 hours
E. One Unit 1 station service DC battery on one subsystem inoperable.	C.1	Restore required battery to OPERABLE status.	12 hours
F. One Unit 1 station service DC electrical power subsystem inoperable for reasons other than Condition D or E.	F.1	Restore station service DC electrical power subsystem to OPERABLE status.	2 hours
G. Required Action and Associated Completion Time of Condition A, B, C, D, E, or F not met.	G.1	Be in MODE 3.	12 hours
	AND		
	G.2	Be in MODE 4.	36 hours
H. Two or more DC electrical power subsystems inoperable that result in a loss of function.	H.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

-----NOTE-----
SR 3.8.4.1 through SR 3.8.4.3 are applicable only to the Unit 1 DC sources. SR 3.8.4.4 is applicable only to the Unit 2 DC sources.

	SURVEILLANCE	FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.2	Verify each required battery charger supplies ≥ 400 amps for station service subsystems, and ≥ 100 amps for DG subsystems at greater than or equal to the minimum established float voltage for ≥ 1 hour. <u>OR</u> 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.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	-----NOTES----- 1. The modified performance discharge test in SR 3.8.6.6 may be performed in lieu of SR 3.8.4.3. 2. This Surveillance shall not be performed in MODE 1, 2, or 3, except for the swing DG battery. 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)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.4	For required Unit 2 DC sources, the SRs of Unit 2 Specification 3.8.4 are applicable.	In accordance with applicable SRs

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. The Unit 2 Division 1 and Division 2 station service DC electrical power subsystems;

b. The Unit 2 and the swing DGs DC electrical power subsystems; and

c. The Unit 1 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System"; LCO 3.7.4, "Main Control Room Environmental Control (MCREC) System"; LCO 3.7.5, "Control Room Air Conditioning (AC) System"; and LCO 3.8.1, "AC Sources - Operating."

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Swing DG DC electrical power subsystem inoperable due to performance of SR 3.8.4.3 or SR 3.8.6.6. OR One or more required Unit 1 DG DC electrical power subsystems inoperable.	A.1 Restore DG DC electrical power subsystem to OPERABLE status.	7 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Unit 2 DG DC battery charger on one subsystem inoperable. OR Required swing DG DC battery charger inoperable for reasons other than Condition A.	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	B.2 Verify battery float current is ≤ 5 amps.	Once per 12 hours
	AND	
	B.3 Restore battery charger(s) to OPERABLE status.	72 hours
C. One Unit 2 DG DC electrical power subsystem inoperable for reasons other than Condition B. OR Swing DG DC electrical power subsystem inoperable for reasons other than Condition A or B.	C.1 Restore DG DC electrical power subsystem to OPERABLE status.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One or more required Unit 2 station service DC battery chargers on one subsystem inoperable.	D.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	D.2 Verify battery float current is ≤ 20 amps.	Once per 12 hours
	AND	
	D.3 Restore battery charger(s) to OPERABLE status.	72 hours
E. One Unit 2 station service DC battery on one subsystem inoperable.	E.1 Restore required battery to OPERABLE status.	12 hours
F. One Unit 2 station service DC electrical power subsystem inoperable for reasons other than Condition D or E.	F.1 Restore station service DC electrical power subsystem to OPERABLE status.	2 hours
G. Required Action and Associated Completion Time of Condition A, B, C, D, E, or F not met.	G.1 Be in MODE 3.	12 hours
	AND	
	G.2 Be in MODE 4.	36 hours
H. Two or more DC electrical power subsystems inoperable that result in a loss of function.	H.1 Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---
SR 3.8.4.1 through SR 3.8.4.3 are applicable only to the Unit 2 DC sources. SR 3.8.4.4 is applicable only to the Unit 1 DC sources.

	SURVEILLANCE	FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is greater than or equal to the minimum established float voltage.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.2	Verify each required battery charger supplies ≥ 400 amps for station service subsystems, and ≥ 100 amps for DG subsystems at greater than or equal to the minimum established float voltage for ≥ 1 hour. <u>OR</u> 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.	In accordance with the Surveillance Frequency Control Program
SR 3.8.4.3	---------------------------NOTES--------------------------- 1. The modified performance discharge test in SR 3.8.6.6 may be performed in lieu of the service test in SR 3.8.4.3. 2. This Surveillance shall not be performed in MODE 1, 2, or 3, except for the swing DG battery. 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)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.4	For required Unit 1 DC sources, the SRs of Unit 1 Specification 3.8.4 are applicable.	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The following DC electrical power subsystems shall be OPERABLE:

a. The Unit 1 DC electrical power subsystems needed to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems - Shutdown"; and

b. The Unit 2 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System"; and LCO 3.8.2, "AC Sources - Shutdown."

APPLICABILITY: MODES 4 and 5,
During movement of irradiated fuel assemblies in the secondary containment.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required battery charger on one or more required DG DC subsystems inoperable. AND The redundant subsystem battery and required chargers OPERABLE.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	A.2. Verify battery float current ≤ 5 amps.	Once per 12 hours
	AND	
	A.3 Restore battery charger(s) to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more required battery chargers on one required station service DC subsystem inoperable. AND The redundant subsystem battery and required chargers OPERABLE.	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND	
	B.2 Verify battery float current ≤ 20 amps.	Once per 12 hours
	AND	
	B.3 Restore battery charger(s) to OPERABLE status.	72 hours
C. One or more required DG or station service DC electrical power subsystems inoperable for reasons other than Conditions A or B. OR Required Actions and associated Completion Times of Conditions A or B not met.	C.1 Declare affected required feature(s) inoperable.	Immediately
	OR	
	C.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	C.2.2 Suspend movement of irradiated fuel assemblies in the secondary containment.	Immediately
	AND	
	C.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.	Immediately

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	AND C.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	-------------------------------NOTE---------------------------- The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3. --- For required Unit 1 DC sources, the following SRs are applicable: SR 3.8.4.1 SR 3.8.4.2 SR 3.8.4.3	In accordance with applicable SRs
SR 3.8.5.2	For required Unit 2 DC sources, SR 3.8.5.1 of Unit 2 Specification 3.8.5 is applicable.	In accordance with Unit 2 SR 3.8.5.1

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The following DC electrical power subsystems shall be OPERABLE:

a. The Unit 2 DC electrical power subsystems needed to support the DC electrical power distribution subsystem(s) required by LCO 3.8.8, "Distribution Systems - Shutdown"; and

b. The Unit 1 DG DC electrical power subsystems needed to support the equipment required to be OPERABLE by LCO 3.6.4.3, "Standby Gas Treatment (SGT) System"; and LCO 3.7.4, "Main Control Room Environmental Control (MCREC) System"; LCO 3.7.5, "Control Room Air Conditioning (AC) System"; and LCO 3.8.2, "AC Sources - Shutdown."

APPLICABILITY: MODES 4 and 5,
During movement of irradiated fuel assemblies in the secondary containment.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required battery charger on one or more required DG DC subsystems inoperable. AND The redundant subsystem battery and required chargers OPERABLE.	A.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND		
	A.2	Verify battery float current is ≤ 5 amps.	Once per 12 hours
	AND		
	A.3	Restore battery charger(s) to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more required battery chargers on one required station service DC subsystem inoperable. AND The required subsystem battery and required chargers OPERABLE.	B.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND B.2 Verify battery float current ≤ 20 amps. AND B.3 Restore battery charger(s) to OPERABLE status.	2 hours Once per 12 hours 72 hours
C. One or more required DG or station service DC electrical power subsystems inoperable for reasons other than Conditions A or B. OR Required Actions and associated Completion Times of Conditions A or B not met.	C.1 Declare affected required feature(s) inoperable. OR C.2.1 Suspend CORE ALTERATIONS. AND C.2.2 Suspend movement of irradiated fuel assemblies in the secondary containment. AND	Immediately Immediately Immediately

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	C.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.	Immediately
	AND	
	C.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.5.1	-----NOTE----- The following SRs are not required to be performed: SR 3.8.4.2 and SR 3.8.4.3. ----- For required Unit 2 DC sources, the following SRs are applicable: SR 3.8.4.1 SR 3.8.4.2 SR 3.8.4.3	In accordance with applicable SRs
SR 3.8.5.2	For required Unit 1 DC sources, SR 3.8.5.1 of Unit 1 Specification 3.8.5 is applicable.	In accordance with Unit 1 SR 3.8.5.1

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery Parameters

LCO 3.8.6 Battery parameters for the station service and DG electrical power subsystem batteries shall be within limits.

APPLICABILITY: When associated DC electrical power subsystem is required to be OPERABLE.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One DG or station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V.	A.1 Perform SR 3.8.4.1.	2 hours
	AND	
	A.2 Perform SR 3.8.6.1.	2 hours
	AND	
	A.3 Restore affected cell voltage > 2.07 V.	24 hours
B. One DG battery on one subsystem with float current > 5 amps.	B.1 Perform SR 3.8.4.1.	2 hours
	AND	
	B.2 Restore battery float current to ≤ 5 amps.	12 hours
C. One station service battery on one subsystem with float current > 20 amps.	C.1 Perform SR 3.8.4.1.	2 hours
	AND	
	C.2 Restore battery float current to ≤ 20 amps.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
------------------NOTE------------------ Required Action D.2 shall be completed if electrolyte level was below the top of plates. -- D. One DG or station service battery on one subsystem with one or more cells electrolyte level less than minimum established design limits.	------------------NOTE------------------ Required Actions D.1 and D.2 are only applicable if electrolyte level was below the top of plates. -- D.1 Restore electrolyte level to above top of plates. <u>AND</u> D.2 Verify no evidence of leakage. <u>AND</u> D.3 Restore electrolyte level to greater than or equal to minimum established design limits.	 8 hours 12 hours 31 days
E. One DG or station service battery on one subsystem with pilot cell electrolyte temperature less than minimum established design limits.	E.1 Restore battery pilot cell temperature to greater than or equal to minimum established design limits.	12 hours
F. One or more batteries in redundant subsystems with battery parameters not within limits.	F.1 Restore battery parameters for batteries in one subsystem to within limits.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. Required Action and associated Completion Time of Condition A, B, C, D, E, or F not met. OR One DG battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 5 amps. OR One station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 20 amps.	G.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	-----NOTE----- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. ---------- Verify each DG battery float current is ≤ 5 amps and each station service battery float current is ≤ 20 amps.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.2	Verify each DG and each station service battery pilot cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.6.3	Verify each DG and each station service battery connected cell electrolyte level is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.4	Verify each DG and each station service battery pilot cell temperature is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.5	Verify each DG and each station service battery connected cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.6	------------------------------NOTE-------------------------- This Surveillance shall not normally be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. --	
	Verify DG and station service battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	In accordance with the Surveillance Frequency Control Program

3.8 ELECTRICAL POWER SYSTEMS

3.8.6 Battery Parameters

LCO 3.8.6 Battery parameters for the station service and DG electrical power subsystem batteries shall be within limits.

APPLICABILITY: When associated DC electrical power subsystem is required to be OPERABLE.

ACTIONS

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

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One DG or station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V.	A.1	Perform SR 3.8.4.1.	2 hours
	AND		
	A.2	Perform SR 3.8.6.1.	2 hours
	AND		
	A.3	Restore affected cell voltage > 2.07 V.	24 hours
B. One DG battery on one subsystem with float current > 5 amps.	B.1	Perform SR 3.8.4.1.	2 hours
	AND		
	B.2	Restore battery float current to ≤ 5 amps.	12 hours
C. One station service battery on one subsystem with float current > 20 amps.	C.1	Perform SR 3.8.4.1.	2 hours
	AND		
	C.2	Restore battery float current to ≤ 20 amps.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
------------------NOTE------------------ Required Action D.2 shall be completed if electrolyte level was below the top of plates. --	------------------NOTE------------------ Required Actions D.1 and D.2 are only applicable if electrolyte level was below the top of plates. --		
D. One DG or station service battery on one subsystem with one or more cells electrolyte level less than minimum established design limits.	D.1	Restore electrolyte level to above top of plates.	8 hours
	<u>AND</u>		
	D.2	Verify no evidence of leakage.	12 hours
	<u>AND</u>		
	D.3	Restore electrolyte level to greater than or equal to minimum established design limits.	31 days
E. One DG or station service battery on one subsystem with pilot cell electrolyte temperature less than minimum established design limits.	E.1	Restore battery pilot cell temperature to greater than or equal to minimum established design limits.	12 hours
F. One or more batteries in redundant subsystems with battery parameters not within limits.	F.1	Restore battery parameters for batteries in one subsystem to within limits.	2 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. Required Action and associated Completion Time of Condition A, B, C, D, E, or F not met. <u>OR</u> One DG battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 5 amps. <u>OR</u> One station service battery on one subsystem with one or more battery cells float voltage ≤ 2.07 V and float current > 20 amps.	G.1 Declare associated battery inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.6.1	-------------------------NOTE------------------------- Not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. -- Verify each DG battery float current is ≤ 5 amps and each station service battery float current is ≤ 20 amps.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.2	Verify each DG and each station service battery pilot cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.6.3	Verify each DG and each station service battery connected cell electrolyte level is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.4	Verify each DG and each station service battery pilot cell temperature is greater than or equal to minimum established design limits.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6 5	Verify each DG and each station service battery connected cell float voltage is > 2.07 V.	In accordance with the Surveillance Frequency Control Program
SR 3.8.6.6	-------------------------NOTE---------------------------- This Surveillance shall not normally be performed in MODE 1, 2, or 3. However, credit may be taken for unplanned events that satisfy this SR. --- Verify DG and station service battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test or a modified performance discharge test.	In accordance with the Surveillance Frequency Control Program

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0.

d. Measurement, at designated locations, of the CRE pressure relative to all external areas adjacent to the CRE boundary during the pressurization mode of operation by one subsystem of the MCREC System, operating at the flow rate required by the VFTP, at a Frequency of 24 months on a STAGGERED TEST BASIS. The results shall be trended and used as part of the 24 month assessment of the CRE boundary.

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.15 Battery Monitoring and Maintenance Program

This program provides controls for battery restoration and maintenance. The program shall be in accordance with IEEE Standard (STD) 450-2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," as endorsed by Regulatory Guide 1.129, Revision 2 (RG), with RG exceptions and program provisions as identified below:

a. The program allows the following RG 1.129, Revision 2 exceptions:

1) Battery temperature correction may be performed before or after conducting discharge tests.

2) RG 1.129, Regulatory Position 1, Subsection 2, "References," is not applicable to this program.

3) In lieu of RG 1.129, Regulatory Position 2, Subsection 5.2, "Inspections," the following shall be used: "Where reference is made to the pilot cell, pilot cell selection shall be based on the lowest voltage cell in the battery."

5.5 Programs and Manuals

5.5.15 Battery Monitoring and Maintenance Program (continued)

4) In Regulatory Guide 1.129, Regulatory Position 3, Subsection 5.4.1, "State of Charge Indicator," the following statements in paragraph (d) may be omitted: "When it has been recorded that the charging current has stabilized at the charging voltage for three consecutive hourly measurements, the battery is near full charge. These measurements shall be made after the initially high charging current decreases sharply and the battery voltage rises to approach the charger output voltage."

5) In lieu of RG 1.129, Regulatory Position 7, Subsection 7.6, "Restoration", the following may be used: "Following the test, record the float voltage of each cell of the string."

b. The program shall include the following provisions:

1) Actions to restore battery cells with float voltage < 2.13 V;

2) Actions to determine whether the float voltage of the remaining battery cells is ≥ 2.13 V when the float voltage of a battery cell has been found to be < 2.13 V;

3) Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates;

4) Limits on average electrolyte temperature, battery connection resistance, and battery terminal voltage; and

5) A requirement to obtain specific gravity readings of all cells at each discharge test, consistent with manufacturer recommendations.

5.5 Programs and Manuals

5.5.14 Control Room Envelope Habitability Program (continued)

Frequencies specified in Sections C.1 and C.2 of Regulatory Guide 1.197, Revision 0.

d. Measurement, at designated locations, of the CRE pressure relative to all external areas adjacent to the CRE boundary during the pressurization mode of operation by one subsystem of the MCREC System, operating at the flow rate required by the VFTP, at a Frequency of 24 months on a STAGGERED TEST BASIS. The results shall be trended and used as part of the 24 month assessment of the CRE boundary.

e. The quantitative limits on unfiltered air inleakage into the CRE. These limits shall be stated in a manner to allow direct comparison to the unfiltered air inleakage measured by the testing described in paragraph c. The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

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a. The program allows the following RG 1.129, Revision 2 exceptions:

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5.5 Programs and Manuals

5.5.15 Battery Monitoring and Maintenance Program (continued)

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2) Actions to determine whether the float voltage of the remaining battery cells is ≥ 2.13 V when the float voltage of a battery cell has been found to be < 2.13 V;

3) Actions to equalize and test battery cells that had been discovered with electrolyte level below the top of the plates;

4) Limits on average electrolyte temperature, battery connection resistance, and battery terminal voltage; and

5) A requirement to obtain specific gravity readings of all cells at each discharge test, consistent with manufacturer recommendations.

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications
Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical
Rewrite – Update To TSTF-360".

Enclosure 1

Letter From Battery Vendor, C&D Technologies,
Verifying the Acceptability of Using Float Current Monitoring

C&D TECHNOLOGIES, INC.
Power Solutions

1400 Union Meeting Road
Blue Bell, PA 19422
Phone: (215) 775-1314
Fax: (215) 619-7887

Sent via Email to: X2FLOYD@southernco.com

April 25, 2012

Mr. Kyle Floyd
Southern Nuclear Operating Company

Subject: Hatch Nuclear Plant – Using Float Current for State of Charge

Dear Kyle:

In regards to the C&D battery models KCR, LCR and LCY in safety related (Class 1-E) applications at Plant Hatch, it is acceptable to use float current monitoring instead of specific gravity monitoring as a reliable and accurate indication of the state of charge of the battery. This relationship remains valid for the life of these batteries.

I hope that this information meets your needs. If you require any additional information, please contact me.

Regards,

Larry A. Carson

Larry A. Carson
Nuclear Product Manager
C&D Technologies, Inc.

Edwin I. Hatch Nuclear Plant – Units 1 and 2
License Amendment Request for Adoption of Technical Specifications Task Force (TSTF) Traveler TSTF-500, Revision 2, "DC Electrical Rewrite – Update To TSTF-360".

Enclosure 2

Evaluation Supporting a CT Longer Than 2 Hours for Specification 3.8.4, Required Action 3.8.4.E

Description of Probabilistic Risk Analysis

Evaluation of Risk Impact

The overall risk evaluation for this proposed completion time extension for each inoperable Plant Hatch Station Service Battery is based on the following three-tier approach described in Regulatory Guide 1.177:

- **Tier 1: PRA Capability and Insights**
- **Tier 2: Avoidance of Risk-Significant Plant Configurations, and**
- **Tier 3: Risk-Informed Configuration Risk Management**

1. Tier 1: PRA Capability and Insights

The quantified risk impact associated with this proposed Station Service Battery completion time extension was evaluated using the Plant Hatch Unit 1 Revision 4 PRA Average Risk Model. Results from this model are directly applied to Unit 2 because of the high degree of similarity between Hatch Plant units.

Evaluations for risk associated with this proposed amendment were performed using the following:

- Internal Events (including Internal Flooding) using the Plant Hatch Average Risk Model
- Internal Fires
- Seismic Events
- Low Power/Shutdown Risk discussed qualitatively
- Other External Events

The guidance documented in Regulatory Guide 1.177 was used to evaluate the risk impact of the requested 12 hour completion time for each Plant Hatch Station Service Battery.

Definitions

ΔCDF = CDF(TSTF-500 Case) – CDF(Base)

ΔCDF

This value shows the difference or change in average quantified Core Damage Frequency based on new values for Station Service Battery maintenance unavailability as opposed to the presently used values. This value is designed to show the average risk difference in increasing the completion time for each Station Service Battery from its present value of approximately 1 hour to 12 hours.

CDF(TSTF-500 Case)

This value is the quantified average Core Damage Frequency considering the new Station Service Battery maintenance unavailabilities. The new Station Service Battery maintenance term considers the potential for battery work being done while the units are "at Power."

CDF(Base)

This value is the average Core Damage Frequency quantified using the present Station Service Battery maintenance unavailabilites.

ΔLERF = LERF(TSTF-500 Case) – LERF(Base)

ΔLERF

This value shows the difference or change in average quantified Large Early Release Frequency based on new values for Station Service Battery maintenance unavailability as opposed to the presently used values. This value is designed to show the average risk difference in increasing the completion time for each Station Service Battery from its present value of approximately 1 hour to 12 hours.

LERF(TSTF-500 Case)

This value is the quantified average Large Early Release Frequency considering the new Station Service Battery maintenance unavailabilities. The new Station Service Battery maintenance term considers the potential for battery work being done while the units are "at Power."

LERF(Base)

This value is the average Large Early Release Frequency quantified using the present Station Service Battery maintenance unavailabilites.

Internal Events and Internal Flooding Considerations

To determine the risk associated with the extended CT for the Station Service Battery, the Hatch PRA "At Power" model was used. In order to perform a risk evaluation, the unavailability hours for each station service battery were increased to 12 hours. The following results were obtained.

	U1			U2		
	Base Case	TSTF-500 Case	**Delta**	Base Case	TSTF-500 Case	**Delta**
CDF	7.9796E-06	7.9091E-06	7.05E-08	7.3351E-06	7.4022E-06	6.71E-08
LERF	1.1358E-06	1.1428E-06	7.00E-09	1.0348E-06	1.0418E-06	7.00E-09

Fire Risk Contribution

Plant Hatch does not have a Fire PRA model that can be used for risk-informed applications. A draft Unit 1 model is available but the large number of open peer review comments prevents direct use of model results.

To determine order of magnitude bounding conditions, the Unit 1 pre-generated cutsets available from the Fire PRA peer review were used to evaluate relative risk increases due to changes in the battery failure rates. The results showed that the change in fire risk is about half of the internal events risk. It is believed that resolution of the open items will result in a fire risk approximately two to three times the internal events risk.

Based on the above insights, and because the delta CDF from internal events PRA is very small, it is conservatively assumed that fire risk contribution is three times as much as the internal events (including internal flooding) risk. Therefore, the bounding delta CDF due to internal fires would be 2.12E-07 for Unit 1 and 2.01E-07 for Unit 2.

The delta CDF for fire is 2.12E-7 for Unit 1 and 2.01E-07 for Unit 2.

The delta LERF for fire is 2.10E-8 for Unit 1 and Unit 2.

Seismic Risk Contribution

Currently, HNP does not have a Seismic PRA model. To estimate the Seismic risk contribution, the following methodology was used:

NUREG-1488 gives the seismic initiating event frequencies for each nuclear plant in the US. NUREG/CR-4840 provides fragility curves for various components and a methodology to combine the seismic hazard probabilities with the seismic fragility probabilities to get conditional probabilities of component failures given different seismic accelerations.

Frequencies of Seismically-Induced LOOP Events for SPAR Models, a paper which estimates values for seismic LOOPs (accession number ML062540239 in ADAMS), indicates a value of 4.2E-5/yr is appropriate for Hatch. This value is mentioned in Table 1 Frequencies of Seismically-Induced LOOP Events of RASP Handbook (Volume 2, Version 1.01, ML080300179). The value 4.2E-05 is derived by multiplying 6.13E-04 (seismic initiating event frequency) with 6.83E-02 (Conditional probability of LOSP due to seismic event). In a simplistic approach, a CCDP (due to LOSP) is multiplied to obtain delta CDF or delta LERF. However, a detailed conservative evaluation was performed in which ground acceleration is divided into three bins with each bin having different seismic initiating event frequency and conditional probability of LOSP due to seismic event.

The internal evens (including internal flooding) PRA model was used to determine seismic risk contribution. Because seismic LOSPs are not considered to be recoverable in the short or medium term, the model was quantified by setting these events to True.

The delta CDF was obtained by using the following formula for each bin. The total CDF due to seismic was obtained by adding individual delta CDF obtained from each bin. Similar process was used to calculate delta LERF.

Delta CDF = seismic initiating event frequency * conditional probability of LOSP due to seismic event * delta CCDP from the internal events *

Estimation of Seismic Risk Contribution for Unit 1 delta CDF is 1.68E-12

Estimation of Seismic Risk Contribution for Unit 1 delta LERF is 1.61E-13

Estimation of Seismic Risk Contribution for Unit 2 delta CDF is 1.68E-12

Estimation of Seismic Risk Contribution for Unit 2 delta LERF is 2.57E-14

Other External Events Risk Contribution

The risk contribution from a tornado is treated as a tornado induced LOSP. The switchyard structures and incoming transmission lines are constructed to NESC wind and ice loading requirements as described in FSAR chapter 8. The wind design for Hatch is 130 MPH, which is equivalent to an F3 or greater tornado. NUREG/CR-4461 provides an updated method of calculating the probability of a tornado with winds exceeding this amount striking the switchyard (approximately 1 sq km in size). Using this method results in a tornado induced LOSP probability of 3.35E-06. The delta CDF was obtained by using the following formula.

Delta CDF = (Delta LOSP/Normal LOSP) * F3 or greater Tornado Frequency

Estimation of Risk Contribution for Unit 1 delta CDF is 1.41E-13

Estimation of Risk Contribution for Unit 1 delta LERF is 1.35E-14

Estimation of Risk Contribution for Unit 2 delta CDF is 1.41E-13

Estimation of Risk Contribution for Unit 2 delta LERF is 2.15E-15

Low Power/Shutdown Risk

The AOT increase request for the Station Service Batteries is not applicable to operation Mode 4 (cold shutdown) and Mode 5 (refuel). Therefore, these operational conditions will not be evaluated.

The Internal Events review, although it considers Mode 1 or the "at Power" case, bounds Mode 2 (Startup/Hot Standby) and Mode 3 (Hot Shutdown). In these cases, the reactor can be cold (just above 212° F) or in excess of 500 psig; each case, however, considers the shutdown reactor. Shutdown reactor water systems such as condensate are abundant. Their redundancy, required to keep an operating reactor at 100% , makes this so. Consideration of the low pressure cases shows that there are several motor driven pumps capable of supplying the vessel with water. For the high pressure cases, there is an extra reactor feed pump, HPCI, RCIC, or the condensate booster pumps—the service of which depends on the particular reactor pressure. The transition from the high pressure to low pressure sources is by normal means and is the same that is modeled in the PRA for Mode 1. The overall difference is that there is a longer time frame allowed for the depressurization because power or decay heat is not as demanding as in the "at Power" model. Level control is an important consideration for shutdown as well as for the operating reactor. The shutdown cases tend to be less severe, however, because decay heat (or even the potential for approximately 5% reactor power in Mode 2) does not demand the full function of the systems under consideration as in the "at Power" case.

LOCAs, which tend to pose the most restrictive level control problems, are normally evaluated for a pressurized system which means that most of the time the consideration is for the "at Power" condition. The time a shutdown reactor is pressurized is short compared to the time at power. LOCA is possible during a depressurized condition, but it would tend to be caused by valve misalignment or operator error more so than actual pipe rupture. This type of event typically has more evaluation time and a longer time frame for recovery than at-power LOCAs, and the problem is corrected prior to catastrophic core damage. The overall LOCA initiating event frequencies are reasonably small (E-04 to E-05) for the range of LOCAs considered and are not a significant contribution during the shutdown or full power case.

The LERF condition is not as significant in Modes 2 and 3 because of the low reactor power. In order to have LERF, there needs to be core damage as well as a release of the damaged core to primary containment and ultimately to the environment. The availability of sources to cover the core in the low power condition has previously been discussed. The next phase of the LERF condition should water sources fail, however, is release of this damaged product to primary containment or out via a failed isolation pathway. If the material does not get into primary containment, the capability to penetrate the containment via some failure mode such as overpressure is such that the time frame involved would no longer make it an Early Release. This does not take into account the availability of sources for containment cooling or pressure control.

In consideration of failed containment isolation, it is possible that the main steam isolation valves may be closed already due to the operational variations involved in startup and hot shutdown; therefore, in these states their probability of failure to close would be less. HPCI and RCIC steam line isolations could be treated in a similar fashion as the MSIV's; however as the steam line low pressure alarms cleared, they would be opened. Their failure to close would provide a high energy pathway. If, however, all sources of core coverage failed and a HPCI or RCIC steam line failed to isolate, the actual release rate would decrease rapidly because the motive force (i.e. the steam pressure attributed to low power or decay heat) would not last. This plus the holdup time involved with the reactor building would severely retard the LERF capabilities of such scenarios.

In the shutdown or startup conditions, not only are more physical attributes available to prevent core damage, the number of initiating event contributions are less. One such example is the case with the Anticipated Transient Without Scram (ATWS). Losses of condenser vacuum and feedwater or MSIV closure are not as severe or they would be at power. These accidents have their most significant contributions when these Balance of Plant (BOP) systems are required to keep the unit operating. Failure of these systems limits the use of the condenser as a heat sink and the use of high pressure feedwater injection. During the shutdown or startup condition, failure of these systems or functions would tend to be more of an inconvenience to operation than a threat to core damage. Reactor scram is not considered for the Mode 3 case but is for Mode 2, but even this would be a very low power event. The main events to consider would be LOSP or Loss of Electrical Bus cases. These events tend to take away the redundancy associated with extra systems during the non "at Power" case.

In general, Modes 2 and 3 are not normally sustained. Mode 2 is the startup case. Transition through this mode can certainly be more than a few hours, but it is not designed as a convenient holding point to perform various activities without going to cold shutdown. It is an allowance for the physical restrictions of control rod manipulation during startup (and certain Refuel Mode cases) and maintenance on Station Service Batteries would be an administrative hindrance. Use of Mode 2 is controlled by Technical Specifications and procedures.

Mode 3 is a unique end state that accounts for any requirements to end full power operation. It is convenient to perform certain required maintenance in this condition in order to save time restoring the unit to full power operation from cold shutdown (Mode 4). It is possible to enter this condition by necessity during the time that a Station Service Battery is undergoing maintenance on an extended completion time. The transition into Mode 3 for those unique times when a Battery is already in maintenance while in Mode 1 are still low risk as discussed previously.

Summary of results from each contribution

Risk	Unit 1		Unit 2	
	Delta CDF	**Delta LERF**	**Delta CDF**	**Delta LERF**
Internal Events PRA	7.05E-08	7.00E-09	6.71E-08	7.00E-09
Fire	2.12E-07	2.10E-08	2.01E-07	2.10E-08
Seismic	1.68E-12	1.61E-13	1.68E-12	2.57E-14
Other External Events	1.41E-13	1.35E-14	1.41E-13	2.15E-15
Shutdown	Bounded by Internal Events PRA			
Total	**2.83E-07**	**2.80E-08**	**2.68E-07**	**2.80E-08**

Regulatory Guide 1.177 acceptance guidelines specify that a permanent TS CT change may be classified as having a small quantitative impact on plant risk if it has a delta CDF of less than 1.0E-06 and a delta LERF of less than 1.0E-07. The delta CDF and delta LERF for all cases are within the acceptable criteria. Therefore, the acceptance guidelines for Regulatory Guide 1.177 are satisfied.

2. Tier 2: Avoidance of Risk-Significant Plant Configurations

Avoidance of Risk Significant Plant Configurations is accomplished by the Plant Hatch Maintenance Scheduling and Risk Assessment process. Maintenance on components, planned and emergent, is assessed on a probabilistic perspective as well as a deterministic one. No restrictions are proposed concerning the use of the 12 hour AOT on the station service battery. However, maintenance is assessed at Plant Hatch using a computerized On-Line Risk Monitor. Color coded risk categories are employed to recognize and gage the plant risk for a particular plant configuration. The increasing risk, from GREEN to RED, requires correspondingly increasing higher management levels of approval, as listed in the next section. Hatch Risk Assessment procedures also contain provisions for Risk Management Actions to alleviate potentially risk significant plant configurations, should this be necessary.

3. Tier 3: Risk-Informed Configuration Risk Management

The following discussion focuses on a description of the 10 CFR 50.65(a)(4) program which will be used to support the requested AOT.

Hatch presently manages risk with a procedurally controlled program that governs the scheduling of maintenance activities. This program involves review from a probabilistic and/or deterministic standpoint of all, planned and unplanned, maintenance activities and is effective for all modes of operation.

Maintenance is normally assessed from a probabilistic standpoint using a computerized On-Line Risk Monitor. Each plant uses the EPRI sponsored software called Equipment Out of Service (EOOS) to quantify results. In cases where a quantitative solution is not possible because the functions or systems under consideration are not modeled, a qualitative assessment is used. Under certain risk significant conditions, both quantitative and qualitative assessments are required.

Risk frequencies are related to a color code that responds to a certain managerial level for approval. The following chart shows a typical color code concept.

Risk Action Level	On-Line Maintenance	Forced Outage	Refueling Outage
Green (None)	Shift Supervisor	Shift Supervisor	Shift Supervisor
Yellow (Low Risk)	Superintendent of Shift or Unit Superintendent	Superintendent of Shift or Unit Superintendent	Outage Director
Orange (Medium Risk)	Manager-Operations or Assistant General Manager-Plant Operations	Manager-Operations or Assistant General Manager-Plant Operations	Outage and Maintenance Manager or Assistant General Manager-Plant Operations
Red (High Risk)	General Manager-Nuclear Plant	General Manager-Nuclear Plant	General Manager-Nuclear Plant

Maintenance rule functions are evaluated to the component level by EOOS. The Hatch plant uses a configuration risk management procedure to evaluate and manage the risk of maintenance. Guidance from the procedure and NUMARC 93-01 is used to set risk threshold colors. If planned maintenance, unplanned maintenance, or a combination of both produces a non-green color, a documented evaluation of the situation is necessary and risk management actions are required. Red color situations are typically not approved as planned maintenance. If unplanned events place the plant in this situation, all maintenance activities focus on exiting the situation as soon as possible. All attempts are made to address all maintenance rule functions from either a direct quantification standpoint or one that is less direct. Certain functions are not specifically part of the EOOS/PRA quantitative model, but are modeled for equipment out of service purposes on the EOOS Operator's Screen status panel. Depending on the color codes generated when portions or all of one or more of these specific functions are removed from service, selected Initiating Event frequencies are temporarily increased to account for the degraded condition. This is conservative, yet it allows for evaluating these situations against modeled components that likewise may be removed from service.

Additionally, selected Initiating Event frequencies are increased with the aid of EOOS software based on selected external conditions.

Battery maintenance falls under the previously mentioned process at the present time.

Conclusion

The proposed extension of the Station Service Battery completion time is consistent with NRC policy and will continue to provide adequate protection of public health. Therefore, the proposed changes are acceptable.

3.1 Technical Adequacy of the PRA

PRA Maintenance and Update

The SNC PRA Configuration Control process is controlled by Risk-Informed Engineering procedures and ensures that the applicable PRA model remains an accurate reflection of the as-built and as-operated units. The SNC PRA Configuration Control process also delineates the responsibilities and guidelines for updating the full power internal events PRA models at all operating SNC nuclear generation sites. The overall SNC PRA Configuration Control process defines the expectations for implementing regularly scheduled and interim PRA model updates, for tracking issues identified as potentially affecting the PRA models (e.g., due to changes in the plant, errors or limitations identified in the model, industry operational experience), and for controlling the model and associated computer files. To ensure that the current PRA model remains an accurate reflection of the as-built, as-operated plant, the HNP PRA model has been updated according to the requirements defined in the SNC Configuration Control Process:

> Modifications to the physical plant shall be reviewed to determine the scope and necessity of a revision to the baseline model on an ongoing basis.

- Pertinent modifications to plant procedures and Technical Specifications shall be reviewed, at a minimum, annually for changes which are of statistical significance to the results of the BL-PRA and those changes documented. Reliability data, failure data, initiating events frequency data, human reliability data, and other such PRA inputs shall be reviewed approximately every two fuel cycles.

- BL-PRAs may be updated to reflect germane changes in methodology, phenomenology, and regulation as judged to be prudent by the PRA Models and Tools Supervisor, Risk-Informed Engineering Subject Matter Experts, or as required by regulation.

- A Peer Review, either full or focused scope, shall be performed per the requirements of the current ASME-ANS PRA standard for such changes that meet one of the following criteria for a "PRA upgrade" (from the Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications):
    - New methodology
    - Change in scope that impacts the significant accident sequences or the significant accident progression sequences
    - Change in capability that impacts the significant accident sequences or the significant accident progression sequences

- If model updates require changes that are considered a "PRA upgrade", a Peer Review shall be performed prior to using the upgraded BL-PRA in support of any Risk Informed Application. The scope of the peer review may be limited/focused to the specific areas of the PRA that have been upgraded. Alternatively, the potential impact of not performing the peer review will be addressed as part of the Application.

- Any of the above changes deemed to be "Quantitatively Significant" (criteria listed in the PRA Configuration Control procedures) require the affected model to be updated as soon as possible. Other changes are to be made at a schedule determined by the Risk Informed Engineering Manager.

In addition to these activities, SNC Risk-Informed Engineering procedures provide the guidance for particular risk management and PRA quality and maintenance activities. This guidance includes:

- Documentation of the PRA model, PRA products, and bases document.

- The approach for controlling electronic storage of Risk Management (RM) products including PRA update information, PRA models, and PRA applications.

- Guidelines for updating the full power, internal events PRA models for SNC nuclear generation sites.

- Guidance for use of quantitative and qualitative risk models in support of the Configuration Risk Management Program for risk evaluations for maintenance tasks (corrective maintenance, preventive maintenance, minor maintenance, surveillance tests and modifications) on systems, structures, and components (SSCs) within the scope of the Maintenance Rule (10 CFR 50.65 (a)(4)).

In accordance with this guidance, regularly scheduled PRA model updates nominally occur on an approximate three year cycle; however, longer intervals may be justified if it can be shown that the PRA continues to adequately represent the as-built, as-operated plant. Table 1 shows the brief history of the major HNP PRA model updates.

Table 1: History of the Major Hatch PRA Model Updates				
Model	**Document No.**	**Scope**	**Updated Items**	**CDF and LERF (/yr)**
IPE	Generic Letter 88-20 Response, Individual Plant Examination Submittal Plant Hatch Units 1 and 2 December 11, 1992	At-power, internal and external, CDF and Level 2 PRA.	The original	CDF: 2.1E-5 LERF: 4.7E-06
Rev. 0	SNC-H1-98-002-005 Notebooks prepared by PLG	At-power, internal, CDF and LERF.	Conversion from RISKMAN Event Tree model to a CAFTA Fault Tree model	CDF: 1.22E-5 LERF: 2.2E-6 The CDF reduction was due to updating initiating event frequencies, splitting Loss of Feedwater into two events (one based on loss of condensate system-one not). The LERF reduction was due to the use of a more simplified LERF model.
Rev. 1	PSA-H-00-024 Rev. 1a May 2001	At-power, internal, CDF and LERF.	CAFTA model changes from Rev. 0	CDF: 1.24E-5; LERF: 2.20E-6 The change in CDF was due to a correction in the Mutually Exclusive file that had incorrectly removed a valid cutset.

Table 1: History of the Major Hatch PRA Model Updates

Model	Document No.	Scope	Updated Items	CDF and LERF (/yr)
Rev. 2	PRA-BC-H-05-003 Jan. 2006 CDF only PRA-BC-H-06-002 April 2006 LERF/LEVEL II only	At-power, internal, CDF and LERF.	The first HNP PRA Peer Review was performed on Revision 1 of the HNP model in April 2001. The Revision 2 model has the findings from that Peer Review incorporated in it. This model had a complete updated HRA, Data, and Common Cause input. In addition, the LERF model was completely redone to address all of the Peer Review findings regarding it.	CDF: 8.3E-6 LERF: 6.08E-7 The most significant change that reduced CDF and contributed to LERF reduction was the inclusion of five hours of battery power for RCIC operation during a station blackout. In addition, the data update provided more industry correct power recovery factors. LERF was affected primarily by using declaration times to general emergency comparison to emergency planning evacuation data for the plant surrounding area.
Rev. 3	PRA-BC-H-08-002 Jan 2009 CDF only	At-power, internal, CDF and LERF.	Selected depressurization events were recalculated to a lower probability of failure. Loss of battery A no longer caused a turbine trip. These items were modified in the model and provided the bulk of the change in CDF. They caused a slight decrease in LERF frequency.	CDF = 6.76E-6 LERF = 5.8E-7 The modification to the model with regards to the Loss of A station service battery in conjunction with lower depress probabilities provided the lower overall values.

Table 1: History of the Major Hatch PRA Model Updates

Model	Document No.	Scope	Updated Items	CDF and LERF (/yr)
Rev. 4	PRA-BC-H-10-008 June 2010	At-power, internal, CDF and LERF.	This model has been peer reviewed to R.G. 1.200 Revision 2 clarifications, the ASME/ANS PRA Standard and NEI 05-04. Peer review comments have been incorporated and the model meets Cat II of the ASME standard.	CDF = 7.78E-6 LERF = 1.16E-6 The CDF model addressed many comments from the peer review. There were several new special initiating event trees added for electrical systems. The data and HRA was completely redone. The upgrade of the line break outside containment event values provided most of the change in core damage frequency between Revision 3 and Revision 4. The remainder of the change was distributed among the extra initiators being considered. LERF was affected most by the new values for the breaks outside containment. These were initially estimated, however, for Revision 4, line lengths were calculated and a more rigorous methodology was used.

Consistency with Applicable ASME PRA Standard Requirements

Previous Peer Review and Self Assessment for Hatch PRA Model

In addition to independent internal review during each HNP PRA model development and update, the HNP PRA model has been peer reviewed twice.

- The first peer review was conducted by the BWR Owners Group in April 2001. The review team used Revision A-3 NEI draft "Probabilistic Risk Assessment (PRA) Peer Review Process Guidance", dated June 2, 2000 as the basis for review. This review was observed by a team from the NRC.
- In 2006, a gap analysis was performed against the available versions of the ASME PRA Standard and Regulatory Guide 1.200, Revision 0 (2003 trial version).

RG 1.200 PRA Peer Review for Hatch PRA Model against ASME PRA Standard Requirements

The decision was made to perform a complete peer review for all elements of the internal events model including Internal Flooding against R.G. 1.200 Revision 2 clarifications, the ASME/ANS PRA Standard, and NEI 05-04. This was completed in November 2009.

A summary of the review is described in the following information.

1. The ASMEIANS PRA Standard contains a total of 326 numbered supporting requirements (SRs) in nine technical elements and one configuration control element. There were five not applicable requirements for the HNP review: AS-B4, IFEV-A8, LE-05, LE-06, and MU-01.

2. Among 321 applicable SRs, 95% of SRs met Capability Category II or higher as follows:

Capability Category (CC)	No. of SRs	% of Total Applicable SRs
CC I/II/III (or SR Met)	225	70%
CC I	5	1%
CC II	27	8%
CC III	18	6%
CC I/II	10	3%
CC II/III	26	8%
SR Not Met	10	3%
SR Not Applicable	5	1%
Total	326	100%

3. 10 SRs were judged to be not met. IE-A6 was not met because the additional initiating events identified from the FME analysis were not included in the model under review. IE-B2 was not met because the IE notebook did not discuss the system for grouping initiating events. IE-B3 was not met because IE-B2 was not met. AS-B3 was not met because the Accident Sequence notebook did not provide a discussion of the phenomenological conditions for each accident sequence. SC-B5 was not met because a comparison of the thermal hydraulic calculations with those of other plants was not performed. SC-C1 was not met because, although the success criteria were very detailed, it was difficult to compare criteria to a specific initiating event. IFSN-A10 was not met because credit was not given to operator isolation of a certain flood scenario. This could cause a potential for flooding in other areas. IFQU-A5 is not met because IFSN-A10 is not met. IFQU-A6 cites an over conservatism by failing operator actions outside the main control room in flooding areas. MU-A1 is not met because the SNC process used does not provide a more organized method of documentation.

   In addition to the not met SRs, there were five SRs that were met as Cat I. IE-A9 was met as Cat I because plant specific experience for initiating event precursors was not provided. LE-C3 was met as Cat I only because there was no address as to the possibility of equipment repair. HNP did not credit repair during LERF conditions. LE-C10 was met as Cat I because there was no documentation regarding continued equipment operations or personnel actions in a LERF environment. HNP did not credit such actions. LE-C12 was met as Cat I because there is no documentation showing that the PRA can credit post containment failure operation of equipment or personnel actions. HNP does not credit such items. LE-C13 was met as Cat I because there was not an engineering basis for the decontamination factor used for scrubbing.

Resolution of Findings from RG 1.200 PRA Peer Review

Table 2 shows details of the 10 "SR Not Met" findings and resolutions after the peer review. In addition, the five Cat I SRs are also addressed.

Table 2 Resolution of the Hatch PRA Peer Review F&Os associated 10 "SR not Met" SRs

F&O #	Review Element	Level	Resolution	The Status of Resolution by the SNC
IE-A6-1-2	IE-A6 (SR not met CC-II)	Reviewed IE Notebook. Section 6, 3.16, Appendix A. The FMEA that was performed identified numerous IEs resulting from failure of individual or multiple electrical panels, however, these IEs were not included in the analysis. The notebook indicates that these new IEs would be considered in a future revision of the PRA.	Include the additional IEs in the analysis. It would appear panel failures would be very unlikely except for specific types of events, especially spatially related events.	The IEs identified in the notebook have been added to the model as well as the common cause failure considerations. Two of the buses were not modeled as IEs because they serve only to feed two that were added as IEs. The two buses not modeled as IEs are modeled as support for systems, one of the supported systems is in itself modeled as a special initiator. The special initiator modeling for the Hatch PRA not only considers what causes a transient/scram but also what would require a shutdown per Technical Specifications.

IE-B2-1-7	IE-B2 (SR CC-I/II/III Not met)	Reviewed the IE Notebook and found that the grouping process for the IEs was not provided as required by the SR. Selection and screening, modeling and quantification process are included, however.	Describe the process for systematically grouping the IEs to ensure: (a) Events can be considered similar in terms of plant response, success criteria, timing, and the effect on the operability and performance of operators and relevant mitigating systems: or (b) Events can be subsumed into a group and bounded by the worst case impacts within the new group.	The IE notebook has been revised to include a full discussion of IE grouping. This comment has been addressed.
IE-B3-1-7	IE-B3 (SR Not met CC II)	Reviewed the IE Notebook and found that the grouping process for the IEs was not provided as required by the SR. Selection and screening, modeling and quantification process are included, however.	Describe the process for systematically grouping IEs to ensure: (a) Events can be considered similar in terms of plant response, success criteria, timing, and the effect on the operability and performance of operators and relevant mitigating systems; or (b) Events can be subsumed into a group and bounded by the worst case impacts within the new group.	This comment has been added to the IE notebook. There are no subsumed events in the Hatch PRA model.

AS-B3-1-9	AS-B3 (SR Not met CCI/II/III)	Reviewed the AS Notebook. Generally the discussion of the accident sequence modeling is adequate. However some enhancements would be beneficial: 1) Discussion of environmental conditions associated with sequences. 2) Interface between accident sequences and plant damage states.	Include additional detail for each accident sequence. Particularly, there was no mention of the generation of harsh environments affecting temperature, pressure, debris, water levels or humidity that could impact the success of the system.	The detail required by this finding has been added to the accident sequence notebook. The sequence descriptions have a discussion of Environmental Conditions. The Hatch PRA does not typically rely on equipment or operator actions in an area where a severe environment is encountered.
SC-B5-3-1	SC-B5 (SR Not met CCI/II/III)	No evidence could be found in the PRA documentation that a check for reasonableness, as required by SR SC-B5, was performed. Section 4.2 of the SC Notebook states that a comparison of the success criteria modeled for other BWRs will be performed in a future PRA update.	Check the reasonableness and acceptability of the results of the thermal/hydraulic and any other analysis used to support the success criteria. Document in the SC Notebook how this reasonableness was performed.	A comparison table for the Hatch PRA was developed for Success Criteria based on input from other BWR facilities (i.e. Pilgrim, Cooper, LaSalle, and Nine Mile Point).

SC-C1-5-4	SC-C3 (SR Not met CCI/II/III)	The success criteria hierarchy is documented in the PRA SC NOTEBOOK and supplemented in the PRA AS NOTEBOOK and individual system notebooks. However, it is difficult to see which systems are credited for a specific initiating event not to mention which initiators impact a specific system.	The success criteria should be captured in tabular form in the SC document. Having this information in one place will alleviate confusion when performing PRA applications and upgrades. Additionally, it will facilitate peer reviews. Provide a summary of success criteria for available mitigating systems and human actions for each initiating group.	A success criteria summary table has been added to the SC notebook. This table in addition to the extreme detail already provided makes the Success Criteria notebook extremely informative.
IFSN-A10-4-5	IFSN-A10 (SR Not met CCI/II/II)	In the development process of the flooding scenarios there is no credit taken for the manual isolation of floods. This approach was assumed to be conservative however, the propagation of flood water would be expanded if no operator action was taken therefore, affecting more areas and SSC's than initially projected.	Operator actions should be developed and added to the scenario development and the PRA model to reflect how the plant would be operated in the event of this scenario. It may be beneficial to consider use of mitigation event trees to assure that all mitigation issues are considered.	The PRA model used in the peer review contained over 100 flood initiators. No screening was done based on operator action input. This finding was addressed by screening the initiators to 24 and applying HRA for these scenarios to mitigate the results.
IFQU-A5-4-5	IFQU-A5 (SR Not met CCI/II/III)	In the development process of the flooding scenarios there is no credit taken for the manual isolation of floods. This approach was assumed to be conservative however, the propagation of flood water would be expanded if no operator action was taken therefore, affecting more areas and SSC's than initially projected.	Operator actions should be developed and added to the scenario development and the PRA model to reflect how the plant would be operated in the event of this scenario. It may be beneficial to consider use of mitigation event trees to assure that all mitigation issues are considered.	The PRA model used in the peer review contained over 100 flood initiators. No screening was done based on operator action input. This finding was addressed by screening the initiators to 24 and applying HRA for these scenarios to mitigate the results.

IFQU-A6-2-7	IFQU-A6 (SR Not met CCI/II/II)	A very conservative approach was taken with respect to the impact of flooding on operator actions. By reviewing the model it was determined that all operator actions are failed (set to 1.0) if the action takes place outside the control room and the associated system is impacted by the flood.	Consider more realistic operator actions for floods when action has to be taken outside the main control room.	This item has been addressed for IFQU-A5-4-5.
MU-C1-5-8	MU-C1 (SR Not met Cat I/II/III)	The identified changes in PRA input are prioritized and then put into the plant's corrective action program. The current process involves a handwritten entry into a diary and a duplicate entry into the plant's corrective action program. This process is cumbersome, inefficient, and prone to human errors.	Recommend developing a database for use by PRA. Such a database should have prioritization clearly delineated. This would allow a dynamic assessment of the cumulative impact of pending changes. Additionally, this will allow the more significant changes to be incorporated before less significant ones	This comment refers to the model update process. These procedures are under revision. At present model change requirements tend to be governed by the use of the corrective action program.

Table 2 Resolution of the Hatch PRA Peer Review F&Os associated with the 5 Cat I met only SRs				
F&O #	**Review Element**	**Level**	**Resolution**	**The Status of the Resolution by SNC**
LE-C3-7-2	LE-C3 (SR Cat I met)	No documentation of review of significant accident progression sequences resulting in LERF could be found.	Review significant progression sequences to support evaluations required in applicable SR Capability Category.	Statements have been added to L2 NB Section 7 of notebooks, as well as Appendix K, to note that significant accident sequences resulting in LERF were reviewed and credit for continued operation or repair (beyond LOOP recovery) was not judged to be credible. Cat I/II/III is considered met for this SR.
LE-C10-7-2	LE-C10 (SR Cat I met)	No documentation of review of significant accident progression sequences resulting in LERF could be found.	Review significant progression sequences to support evaluations required in applicable SR Capability Category.	Statements have been added to L2 NB Section 7 of notebooks as well as Appendix K to note that significant accident sequences resulting in LERF were reviewed and credit for continued operation or repair (beyond LOOP recovery) was not judged to be credible. Cat II is considered met for this SR.
LE-C12-7-2	LE-C12 (SR Cat I met)	No documentation of review of significant accident progression sequences resulting in LERF could be found.	Review significant progression sequences to support evaluations required in applicable SR Capability Category.	Statements have been added to L2 NB Section 7 of notebooks as well as Appendix K to note that significant accident sequences resulting in LERF were reviewed and credit for continued operation or repair (beyond LOOP recovery) was not judged to be credible. Cat II is considered met for this SR.

LE-C13-7-4	LE-C13 (SR Cat I met)	Class V sequences are assumed to lead directly to LERF without evaluation of scrubbing of releases.	Perform a containment bypass analysis as described in SR LE-C13.	Text enhanced in Appendix D of notebooks (Footnote 6 added to Table HA5) and similarly in Section 7.7. The analysis regarding scrubbing is approached with engineering judgment. Only scrubbing for low pressure sequences is considered and then the value is low. This basis is acceptable and the use of scrubbing is considered in the uncertainty analysis. Cat II/III is considered met for this SR.
IE-A9-1-4	IE-A9 (SR Cat I met)	Reviewed IE Notebook, Section 3.1.9, and Appendix D. Although interviews with plant operations personnel is a source of plant operating experience, the approach taken (interview one person) cannot be considered a reasonably complete review of plant specific operating experience. The SR requires a review of plant specific operating experience and there are a variety of OE sources that could have been considered but were not (e.g., LERs, SOERs).	Include other sources of OE in the search for IE precursors.	Several sources are available to determine plant specific initiating events. When preparing the IE notebook, SNC reviewed the following sources. For each source, appropriate section has also been identified. 1. Plant Specific Events: [Table 3-4; Appendix C (LERs)] 2. Plant Systems: [Appendix B - FMEA] 3. LOCA inside Containment [3.2.3] 4. LOCA outside Containment [3.2.3] 5. Multiple Failures [3.1.6] 6. Interview [3.1.9; Appendix E] As a result of these reviews, additional special initiating events were identified and have been modeled.

Conclusion Regarding PRA Capability

The HNP PRA maintenance and update processes and technical capability evaluations described above provide a robust basis for concluding that this full scope PRA is suitable for use in support of this risk assessment for the proposed extension of the Station Service Battery completion time.

3.2 Scope of the Probabilistic Risk Assessment or Technical Specifications Change Evaluations

(covered above)

Engineering Considerations

The following section addresses the traditional engineering considerations referred to in Section 2.2 of Regulatory Guide 1.177.

Increasing the completion time for the station service batteries from 2 to 12 hours will not affect the defense-in-depth capabilities of the Plant Hatch electrical power AC and DC power supply systems.

Currently, the Hatch Technical Specifications does not separate having one station service battery out of service alone, with having a station service battery out of service simultaneously with a station service battery charger. In either case, the CT is currently 2 hours. Obviously, having a station service battery and battery charger out of service is a much more serious situation than having only the battery out, with the battery charger in service. We are proposing a 12 hour CT for one station service battery out of service. A 12 hour CT is still a relatively short period of time. With the station service battery out of service, but the chargers in service, the chargers are supplying the steady state loads. Should an accident occur, the charger will be able to handle many of the accident loads on that division, though not all. However, defense-in-depth is primarily provided by the fact that the other Division is Operable. At Hatch Units 1 and 2, one Division of DC is capable of safely shutting down the unit in an accident situation, and meeting the FSAR and TS Bases acceptance criteria. Therefore, the Operable division provides the defense-in-depth, as well as the battery chargers in the Inoperable division. If, while in the ACTION statement for an inoperable station service battery, a component (battery or battery charger) in the other division becomes inoperable, then the Tech Specs will require immediate entry into LCO 3.0.3.

The increase of the Technical Specifications CT for the station service battery does not in any way affect the design basis for the DC system or the acceptance criteria for the design basis events. The CT is being extended, nothing else is changing. Whether the CT is 2 hours or 12 hours, the design capabilities of the system are the same. The acceptability of increasing the CT from 2 to 12 hours is addressed by assessing the changes in the CDF and LERF values which, as presented in this document, fall within the RG 1.177 values. The safety margins assumed for LOCA analyses in the FSAR Chapters 14 and 15 analyses are not reduced by increasing the station service battery CT.

The proposed change in CT does not involve any physical changes to the system; consequently, the independence between the two DC divisions is not compromised, and new type failures are not introduced. Furthermore, consideration of maintaining the integrity of the fission product barriers, and the mitigating accident functions such as core cooling and containment will be maintained by the scheduling and risk assessment programs at Plant Hatch. In other words, this program ensures that risk significant plant configurations do not occur during use of the 12 hour CT for the batteries; helping to maintain overall plant defense-in-depth.

Monitoring Program

The change to the Technical Specifications (TS) Completion Time for the Station Service batteries from 2 to 12 hours does not affect how those batteries will be operated. Furthermore, none of the maintenance and surveillance criteria for maintaining the battery is affected by the Probabilistic evaluation to increase the TS CT. In other words, the increase in the CT for the station service battery does not affect the criteria for maintaining cell voltage or battery terminal voltage. It does not affect temperature or level criteria, and it does not affect the return-to-service float charge criteria for determining when the battery is fully charged. In short, the probabilistic analysis only affects the Technical Specifications Completion Time, consequently, it does not change the Licensing Basis with respect to how the battery is maintained and surveilled. Consequently, no adverse safety degradation is expected to occur as a result of the increase in the Completion Time. Accordingly, the performance monitoring on the station service DC system as discussed in Reg Guide 1.174, Element 3, will be done by the routine 10 CFR 50.65 Maintenance Rule Monitoring of which the Station Service and Diesel Generator DC systems are already a part.