Advanced Passive 1000 (AP1000)
Generic Technical Specification Traveler (GTST)

Title: Changes related to Section 3.8.2, DC Sources - Shutdown

I. Technical Specifications Task Force (TSTF) Travelers, Approved Since Revision 2 of STS NUREG-1431, and Used to Develop this GTST

TSTF Number and Title:

TSTF-425, Rev. 3, Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b
TSTF-471-A, Rev. 1, Eliminate use of term CORE ALTERATIONS in ACTIONS and Notes
TSTF-500, Rev. 2, DC Electrical Rewrite - Update to TSTF-360

STS NUREGs Affected:

TSTF-425, Rev. 3: NUREG-1430, -1431, -1432, -1433, and -1434
TSTF-471-A, Rev. 1: NUREG-1430, -1431, and -1432
TSTF-500, Rev. 2: NUREG-1430, -1431, -1432, -1433, and -1434

NRC Approval Date:

TSTF-425, Rev. 3: 18-Mar-2009
TSTF-471-A, Rev. 1: 07-Dec-2006
TSTF-500, Rev.2: 09-Sept-2011

TSTF Classification:

TSTF-425, Rev. 3: Technical Change
TSTF-471-A, Rev. 1: Technical Change
TSTF-500, Rev. 2: Technical Change

II. Reference Combined License (RCOL) Standard Departures (Std. Dep.), RCOL COL Items, and RCOL Plant-Specific Technical Specifications (PTS) Changes Used to Develop this GTST

RCOL Std. Dep. Number and Title:

None

RCOL COL Item Number and Title:

None

RCOL PTS Change Number and Title:

VEGP LAR DOC L03:	TS are revised to eliminate the use of the defined term “CORE ALTERATION” and incorporate changes reflected in TSTF-471-A.
VEGP LAR DOC L22:	TS 3.8.2, “DC Sources - Shutdown” is revised to add a new Action A to address inoperable battery charger(s), resulting in renumbering of the subsequent Conditions and Actions.

III. Comments on Relations Among TSTFs, RCOL Std. Dep., RCOL COL Items, and RCOL PTS Changes

This section discusses the considered changes that are: (1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

TSTF-500, Rev.2 is an update of TSTF-360-A and portions of TSTF-500, Rev. 2 are the same as TSTF-360-A which was implemented in Rev. 2 of NUREG-1431 and in the AP1000 GTS. Section VI of this GTST presents a summary discussion of the changes in TSTF-500, Rev.2, along with detailed discussions of the specific changes that are applicable for inclusion in Subsection 3.8.2 of the AP1000 STS. Since the values for battery parameters and Completion Times were finalized in AP1000 DCD Rev.19 or approved in VEGP Units 3 and 4 plant-specific TS in Amendment 13, brackets and reviewer's notes are not used for AP1000 STS.

TSTF-425 is deferred for future consideration.

TSTF-51-A, requiring addition of "recently" before "irradiated fuel assemblies" is deferred for future consideration.

VEGP LAR DOC L03 is consistent with TSTF-471-A. No additional change was needed for LAR 03.

VEGP LAR DOC L22 is consistent with TSTF-500, Rev. 2. The addition of Condition A is consistent with the changes approved in TSTF-500, Rev. 2.

IV. Additional Changes Proposed as Part of this GTST (modifications proposed by NRC staff and/or clear editorial changes or deviations identified by preparer of GTST)

APOG Recommended Changes to Improve the Bases

Throughout the Bases, references to Sections and Chapters of the FSAR do not include the "FSAR" clarifier. Since these Section and Chapter references are to an external document, it is appropriate to include the "FSAR" modifier. (DOC A003)

TSTF-500 changes included in the GTST were reviewed and the changes that were not approved as part of the VEGP Unit 3 and 4 Plant-Specific TS in Amendment 13 were removed.

In the "Actions" section of the Bases, under heading "B.1, B.2.1, B.2.2, B.2.3, and B.2.4" first paragraph, revise first sentence, as indicated:

> With one or more of the required (per LCO 3.8.6, "Distribution Systems - Shutdown") Class 1E DC power subsystems inoperable, the remaining subsystems may be capable of supporting sufficient systems to allow continuation of ~~CORE ALTERATIONS,~~ **irradiated** fuel ~~movement, and/or~~ **movement and** operations with a potential for draining the reactor vessel.

Please note that the above sentence includes clarifying edits by NRC staff.

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.8.2, DC Sources – Shutdown

Changes to the Generic Technical Specifications and Bases:

Addition of Condition A for “one or more required battery chargers in one division inoperable” and renumbering of the remaining Conditions (TSTF-500, Rev.2; DOC L22)

In the renumbered Condition B, Required Action B.2.1, Suspend CORE ALTERATIONS, and the associated Completion Time are deleted (TSTF-471-A, Rev. 1; DOC L03)

Changes in the ACTIONS Section of the Bases were made addressing the above changes in the Specifications. (TSTF-471-A, Rev. 1, TSTF-500, Rev. 2, DOC L22, DOC L03)

The first sentence, under the heading “B.1, B.2.1, B.2.2, B.2.3, and B.2.4,” in the “Actions” section of the Bases, was revised for clarity. (APOG comment, NRC staff changes)

The acronym “FSAR” is added to modify “Section” and “Chapter” in references to the FSAR throughout the Bases. (DOC A003)

VI. Traveler Information

Description of TSTF changes:

TSTF-471

TSTF-471 proposes elimination of the defined term CORE ALTERATIONS and all uses of the term for the Specifications and Bases. For AP1000 TS 3.8.2, this implies deletion of Required Action A.2.1, Suspend CORE ALTERATIONS, and removing corresponding discussions in the Bases.

TSTF-500

TSTF-500 updates and replaces TSTF-360-A, Revision 1, "DC Electrical Rewrite." The update reflects the current NRC position on the proposed changes and approval of recent plant-specific amendments to adopt TSTF-360-A.

TSTF-500 proposed new action requirements for an inoperable battery charger and new alternate test criteria for the battery chargers in STS 3.8.4, "DC Sources - Operating," and STS 3.8.5, "DC Sources - Shutdown." This traveler also proposed the relocation of safety related battery preventive maintenance-related Surveillance Requirements (SRs) from STS 3.8.4 to a licensee controlled program. TSTF-500 also proposed changes to STS 3.8.6, "Battery Parameters," by relocating Table 3.8.6-1, "Battery Cell Parameter Requirements," to a licensee-controlled program; adding action requirements specific to out-of-limits conditions for battery cell voltage, electrolyte level, and electrolyte temperature; and specific SRs for verification that these parameters are within limits. (The LCO numbers in this paragraph relate to NUREG-1431 and not AP1000 STS).

For clarification and description of the changes based on TSTF-500, the following information is presented below:

A. Summary of applicable changes for AP1000 STS based on TSTF-500,
B. Description of changes to AP1000 GTS 3.8.2, "DC Sources - Shutdown" Actions, and
C. Description of changes to AP1000 GTS 3.8.2, "DC Sources - Shutdown" Surveillance,

A. Summary of Applicable Changes for AP1000 STS based on TSTF-500

TSTF-360, "DC Electrical Rewrite," was approved by the NRC in December 2000 and incorporated in Revision 2 of STS NUREGs 1430 to 1434. TSTF-500 proposed additional changes to be applied to Revision 3.1 of the STS NUREGs. The differences between TSTF-360-A and TSTF-500 constitute the additional changes.

Since the AP1000 GTS are based on Revision 2 version of the STS NUREG 1431, the NRC staff concludes that the changes in TSTF-500 are applicable to the AP1000 GTS. Based on the review of the changes, the approved AP1000 DCD Rev. 19, and the approved VEGP Units 3 and 4 Plant-Specific TS in Amendment 13, the following summary describes the changes applicable to AP1000 STS.

1. TSTF-360-A was based on IEEE-450-1995, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications." The NRC has not reviewed or endorsed IEEE-450-1995. Therefore, the

changes proposed in TSTF-500 are based on IEEE-450-2002. The NRC has endorsed IEEE-450-2002 in Regulatory Guide 1.129, Revision 2.

2. The Battery Monitoring and Maintenance Program is revised to reference IEEE-450-2002 and Regulatory Guide 1.129, Revision 2 (with exceptions), to require actions to equalize and test battery cells when the electrolyte level drops below the top of plates instead of when the electrolyte level drops below the minimum established design limit, to require actions to verify the voltages of remaining cells are > [2.07] V when one or cells have been found with voltages < [2.13] V. The Battery Monitoring and Maintenance Program is also revised to state the license controlled program will contain limits on average electrolyte temperature, battery connection resistance, and battery terminal voltage; and a requirement to obtain specific gravity readings of all cells at each discharge test, consistent with manufacturer recommendations.

AP1000 GTS does not use brackets and Reviewer's Notes. The values used for battery parameters and Completion Times were finalized in AP1000 DCD Rev. 19 or were approved in VEGP Units 3 and 4 plant-specific TS in Amendment 13. All brackets and Reviewer's notes were also removed from AP1000 STS.

B. Description of changes to AP1000 GTS 3.8.2, “DC Sources - Shutdown” Actions

In AP1000 Specification TS 3.8.2, TSTF-500 proposes addition of a Condition which is an exception to the existing Condition. This new Condition applies when one or more battery chargers in one division are inoperable and the redundant division battery and battery chargers are Operable. A longer Completion Time is provided for restoration of the battery charger to the Operable status. This change was incorporated in NUREG-1431, Rev. 2 on which the AP1000 GTS is based. This additional Condition was not included in the AP1000 GTS. AP1000 GTS opted for the conservative actions for inoperability in the DC electrical power subsystems during MODEs 5 and 6. However, based on TSTF-500, an option can be provided for inoperability of one or more battery chargers in one division consistent with the Conditions in Section 3.8.1. This new Condition provides flexibility in operation during shutdown providing longer Completion Time for inoperability of battery chargers in one division. VEGP LAR DOC L22 proposes including this Condition consistent with TSTF-500 (see discussion below) and it was approved as part of VEGP Units 3 and 4 Plant-Specific TS in Amendment 13.

The new Condition A is defined as follows:

Condition A: “one or more battery chargers in one division inoperable”

Required Action includes three Actions, A.1, A.2 and A.3

A.1: “Restore battery terminal voltage to greater than or equal to the minimum established float voltage” with a completion time of 6 hours

A.2: “Verify battery float current ≤ 2 amps” with a completion time of “Once per 24 hours.”

A.3: “Restore battery chargers to OPERABLE status” with a completion time of 72 days.

The existing Condition A (new Condition B) is revised to address the situation in which the Required Actions and associated Completion Times of new Condition A are not met.

C. Description of changes to AP1000 GTS 3.8.2, “DC Sources - Shutdown” Surveillances

Changes to AP1000 Specification TS 3.8.2, “DC Sources - Surveillance” related to the relocation or elimination of Surveillances in TS 3.8.1, i.e. making Surveillance in TS 3.8.2 consistent with Surveillances in TS 3.8.1. Surveillance in TS 3.8.2 is consistent with Surveillance in TS 3.8.1 and no additional change is needed.

Rationale for TSTF changes:

TSTF-471

The rationale for removing CORE ALTERATIONS from Specifications and Bases is as follows:

CORE ALTERATIONS only occur when the reactor vessel head is removed, i.e. it only applies in MODE 6. There are only two accidents considered during MODE 6 for PWRs: a fuel handling accident and a boron dilution accident. According to the Standard Review Plan, a fuel handling accident is initiated by the dropping of an irradiated fuel assembly, either in the containment or in the fuel building. There are no mitigation actions, except some plants credit ventilation systems to reduce the dose consequences. Suspension of CORE ALTERATIONS, except for suspension of movement of irradiated fuel, will not prevent or impair the mitigation of a fuel handling accident.

The second analyzed event is a boron dilution accident. A boron dilution accident is initiated by a dilution source which results in the boron concentration dropping below that required to maintain the SHUTDOWN MARGIN. As described in the Bases of Specification 3.9.1, “Boron Concentration,” (which applies in MODE 6), “The refueling boron concentration limit is specified in the COLR. Unit procedures ensure the specified boron concentration in order to maintain an overall core reactivity of $k_{eff} \leq 0.95$ during fuel handling, with control element assemblies (CEAs) and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by unit procedures.” The accident is mitigated by stopping the dilution. Suspension of CORE ALTERATIONS has no effect on the mitigation of a boron dilution accident. Movement of control rods or fuel do not affect the initial conditions of a boron dilution accident as it is assumed that the control rods and fuel are in the most adverse conditions with a large safety margin ($k_{eff} \leq 0.95$). To address the possibility of a misloaded fuel assembly in GTS 3.9.3 (NUREG-1431 STS 3.9.2), Required Action A.1 is revised to require immediately suspending positive reactivity additions if one (or more) required nuclear instrumentation source range neutron flux range monitor is inoperable. This precludes movement of fuel assemblies which could add reactivity to the core.

In summary, with the exception of suspending movement of irradiated fuel assemblies, there are no DBAs or transients that are initiated by, or mitigation affected by, suspension of CORE ALTERATIONS. Therefore, if Required Actions that require suspension of CORE ALTERATIONS also require suspension of movement of [recently] irradiated fuel, suspension of CORE ALTERATIONS provides no safety benefit.

In TS 3.8.5 of NUREG-1431, when a one or more required DC electrical power subsystem is inoperable, the Required Actions require:

- Suspension of CORE ALTERATIONS
- Suspension of movement of irradiated fuel assemblies, and
- Suspension of operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

As discussed above, because the Required Actions require the suspension of movement of irradiated fuel assemblies, the initiating conditions for a fuel handling accident are prohibited. Because the Required Actions require the suspension of positive reactivity additions that could result in a loss of SDM, the initial conditions for a boron dilution accident are prevented. Therefore, the action to suspend CORE ALTERATIONS provides no safety benefit and is not needed.

There are several benefits to eliminating the ACTIONS which reference CORE ALTERATIONS.

The term CORE ALTERATIONS unnecessarily complicates plant operation. Plants go to great lengths to ensure that no prohibited CORE ALTERATIONS take place, such as pausing the lift of the reactor vessel head and having individuals lay on the floor or use video cameras to look under the head to ensure that no control rod drive mechanisms are still latched to avoid accidentally lifting a control rod and violating a Required Action which prohibits CORE ALTERATIONS. These actions have no safety benefit as the boron concentration limit ensures adequate SDM even with the worst configuration of control rods. These actions result in increased personnel dose and provide no safety benefit.

There are a large number of reportable events regarding CORE ALTERATIONS. A review of Licensee Event Reports over approximately ten years revealed 12 LERs related to failure to suspend CORE ALTERATIONS. As described above, these actions have no effect on plant safety and distract the plant and the NRC from more safety significant issues.

TSTF-500

This section presents the rationale provided in TSTF-500 for changes that are retained in DC Sources - Shutdown TS. Brackets and Completion Times, as they appear in TSTF-500, are retained here.

TS 3.8.5 in STS NUREG-1431contains a Condition for one or more DC electrical subsystems inoperable. The proposed change adds an additional Condition, which is an exception to the existing Condition. The existing Condition is renamed Condition B and modified to state “One or more DC electrical power subsystems inoperable for reasons other than Condition A.”

An additional condition joined by an OR is added to new Condition B which states, “Required Actions and associated Completion Time of Condition A not met.” The Required Actions of new Condition B, which require declaring affected required features inoperable or suspending core alterations and movement of irradiated fuel assemblies in the [secondary] containment, are not changed.

TS 3.8.5 requires DC electrical power sources to be Operable to support specific equipment and capabilities in MODE 5 and 6 and during movement of irradiated fuel assemblies. Depending on the plant design, this may require both DC electrical trains to be Operable. The new Condition A is bracketed and is included only when the plant-specific implementation of TS 3.8.5 may require both trains of the DC electrical power system to be Operable. If the plant-specific implementation of LCO 3.8.5 required only one train of the DC electrical power system to be Operable, then Condition A is omitted and Condition B is renumbered as Condition A.

The new Condition A applies when one [or two] battery charger[s] in one train are inoperable and the redundant train battery and charger[s] are Operable. There are three Required Actions. The first Required Action states that the battery terminal voltage must be restored to greater than or equal to the minimum established float voltage within 2 hours. The second Required Action states that the battery float current must be verified to be ≤ [2] amps once per [12] hours. As stated in a Reviewer's Note in the Bases, a plant that cannot meet the 12 hour Completion

Time due to an inherent battery charging characteristic can propose an alternate time equal to 2 hours plus the time experienced to accomplish the exponential charging current portion of the battery charge profile following the service test (SR 3.8.4.3). The third Required Action states that the battery charger[s] must be restored to Operable status. The third Completion Time is [72] hours.

As stated in a Reviewer's Note in the Bases, a licensee wishing to adopt a Completion Time longer than 72 hours must demonstrate that the Completion Time is appropriate for the plant in accordance with the guidance in RG 1.177 and RG 1.174. Alternatively, the 7 day Completion Time can be justified by an acceptable method, such as a regulatory commitment that an alternate means to charge the batteries will be available that is capable of being supplied power from a power source that is independent of the offsite power supply. Otherwise, the 72 hour Completion Time must be adopted.

As described in the discussion of the changes to TS 3.8.4, above, given that the DC bus remains energized, the battery discharge is terminated based on restoration of the battery terminal voltage (New Required Action A.1), and the battery is fully recharged based upon battery float current (New Required Action A.2), there is reasonable basis for extending the restoration time for an inoperable battery charger beyond the existing [2] hour Completion Time to [72] hours (New Required Action A.3).

Description of changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:

VEGP LAR DOC L03:

TS are revised to eliminate the use of the defined term “CORE ALTERATION” and incorporates changes reflected in Technical Specification Task Force (TSTF) 471-A.

The proposed change affects the following specifications:

- Current TS 1.1, “Definitions”: The definition of “CORE ALTERATION” in TS 1.1 is deleted.
- Current TS 3.8.2, “DC Sources - Shutdown”: Required Action A.2.1 is deleted, resulting in the renumbering of the subsequent Required Actions.
- Current TS 3.8.4, “Inverters - Shutdown”: Required Action A.2.1 is deleted, resulting in the renumbering of the subsequent Required Actions.
- Current TS 3.8.6, “Distributions Systems - Shutdown”: Required Action A.2.1 is deleted, resulting in the renumbering of the subsequent Required Actions.
- Current TS 3.9.1, “Boron Concentration”: Required Action A.1 is deleted, resulting in the renumbering of the subsequent Required Actions.
- Current TS 3.9.2, “Unborated Water Source Flow Paths”: Required Action A.1 is deleted, resulting in the renumbering of the subsequent Required Actions.
- Current TS 3.9.3, “Nuclear Instrumentation”: Required Action A.1 is modified to replace “CORE ALTERATIONS” with “positive reactivity additions.”

VEGP LAR DOC L22:

Current TS 3.8.2, “DC Sources - Shutdown,” is revised to add a new Action A to address inoperable battery charger(s), resulting in the renumbering of the subsequent Conditions and Required Actions.

The new Action A consists of the following:

- Condition A: One or more required battery chargers in one division inoperable
- Required Action A.1: Restore battery terminal voltage to greater than or equal to the minimum established float voltage with Completion Time of 6 hours;
- Required Action A.2: Verify battery float current ≤ 2 amps with Completion Time of once per 24 hours; and
- Required Action A.3: Restore battery charger(s) to Operable status with Completion Time of 72 hours.

Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:

The technical rationale for VEGP LAR DOC L03 is the same as that discussed in TSTF-471-A. For the discussion in support of the change by VEGP, please refer to:

VEGP Units 3 and 4 Technical Specification License Amendment Request Enclosure 1, Basis for Proposed Change, Item DOC L03

The technical rationale for VEGP LAR DOC L22 is the same as that discussed in TSTF-500. For the discussion in support of the change by VEGP, please refer to:

VEGP Units 3 and 4, Technical Specification License Amendment Request Enclosure 1, Basis for Proposed Change, Item DOC L22.

VEGP LAR DOC L22 initially proposed a Completion Time of 7 days for Required Action A.3. But, in response to NRC RAI No. 1, Question 16-15, VEGP changed the Required Action A.3 Completion Time to 72 hours. Consistent with TSTF-500, 72 hours Completion Time is acceptable, and a Completion Time of 7 days requires additional justification.

Description of additional changes proposed by NRC staff/preparer of GTST:

The acronym “FSAR” is added to modify “Section” and “Chapter” in references to the FSAR throughout the Bases. (DOC A003)

In the “Actions” section of the Bases, under heading “B.1, B.2.1, B.2.2, B.2.3, and B.2.4” first paragraph, first sentence, was revised as follows:

> With one or more of the required (per LCO 3.8.6, “Distribution Systems - Shutdown”) Class 1E DC power subsystems inoperable, the remaining subsystems may be capable of supporting sufficient systems to allow continuation of ~~CORE ALTERATIONS,~~ **irradiated** fuel ~~movement, and/or~~ **movement and** operations with a potential for draining the reactor vessel.

Rationale for additional changes proposed by NRC staff/preparer of GTST:

Since Bases references to FSAR Sections and Chapters are to an external document, it is appropriate to include the “FSAR” modifier.

The remaining changes are editorial and they provide clarity and consistency.

VII. GTST Safety Evaluation

Technical Analysis:

A. Removing CORE ALTERATIONS from Specifications and Bases

AP1000 defines CORE ALTERATION as follows "CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position."

For Pressurized water Reactors (PWRs) like AP1000, as discussed in TSTF-471, CORE ALTERATIONS can only occur when the reactor vessel head is removed, which only applies in MODE 6.

There are only two accidents considered during MODE 6 for PWRs: a fuel handling accident and a boron dilution accident. According to the Standard Review Plan, a fuel handling accident is initiated by the dropping of a irradiated fuel assembly, either in the containment or in the fuel building. There are no mitigation actions, except to credit ventilation systems to reduce the dose consequences. Suspension of CORE ALTERATIONS, except for suspension of movement of irradiated fuel, will not prevent or impair the mitigation of a fuel handling accident.

A boron dilution accident is initiated by a dilution source which results in the boron concentration dropping below that required to maintain the SHUTDOWN MARGIN. The accident is mitigated by stopping the dilution. Suspension of CORE ALTERATIONS has no effect on the mitigation of a boron dilution accident. Movement of control rods or fuel do not affect the initial conditions of a boron dilution accident as it is assumed that the control rods and fuel are in the most adverse conditions with a large safety margin ($k_{eff} \leq 0.95$). To address the possibility of a misloaded fuel assembly in GTS 3.9.3 (NUREG-1431 STS 3.9.2), Required Action A.1 is revised to require immediately suspending positive reactivity additions if one (or more) required nuclear instrumentation source range neutron flux range monitor is inoperable. This precludes movement of fuel assemblies which could add reactivity to the core.

Therefore, with the exception of suspending movement of irradiated fuel assemblies, there are no DBAs or transients that are initiated by, or mitigation affected by, suspension of CORE ALTERATIONS. Accordingly, if Required Actions that require suspension of CORE ALTERATIONS also require suspension of movement of irradiated fuel, suspension of CORE ALTERATIONS provides no safety benefit.

In TS 3.8.2 of AP1000, when a one or more required DC electrical power subsystem is inoperable, the Required Actions require:

- Suspension of CORE ALTERATIONS,
- Suspension of movement of irradiated fuel assemblies,
- Suspension of operation with a potential for draining the reactor vessel, and
- Suspension of operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

As discussed above, because the Required Actions require the suspension of movement of irradiated fuel assemblies, the initiating conditions for a fuel handling accident are prohibited. Because the Required Actions require the suspension of positive reactivity additions that could result in a loss of SDM, the initial conditions for a boron dilution accident are prevented. Therefore, the action to suspend CORE ALTERATIONS provides no safety benefit and is not needed.

Several benefits are expected. Plants will not be required to take actions to ensure that no prohibited CORE ALTERATIONS take place. This will avoid unnecessary personnel dose and will not distract the plant and NRC from more safety significant issues.

B. Adding a Condition for inoperable battery charger(s) in one division

Difference in numbering scheme between AP1000 and the Standard Plant in TSTF-500, Rev. 2

AP1000 GTS Section 3.8 uses different numbering than the STS on which TSTF-500 is based. Subsection 3.8.2, “DC Sources- Shutdown” in AP1000 corresponds to the Subsection 3.8.5, “DC Sources - Shutdown” in the Westinghouse STS, NUREG-1431, being referred to in TSTF-500, Rev. 2. These differences, relating to the numbering of TS Subsections, are administrative and do not affect the applicability of changes in TSTF-500 for incorporation into the AP1000 STS.

Design differences between AP1000 and the Standard Plant in TSTF-500, Rev. 2

The AP1000 DC system design differs from the design assumed for the standard plant described in the Bases for STS NUREG-1431 and in TSTF-500, Rev. 2. The 250 VDC electrical power system in AP1000 consists of four independent safety related Class 1E DC electrical power subsystems (Division A, B, C, and D). The DC system on which TSTF-500 is based is a 125/250 VDC electrical power system consisting of two independent and redundant safety related Class 1E DC electrical power subsystems (Train A and Train B). Considering this difference in designs between AP1000 and the plant described in TSTF-500, it is expected that the applicable Conditions will be different. For the AP1000 DC electrical power system with four subsystems, more Conditions may apply and the implications of inoperability can be different. In defining the AP1000 TS requirements, these differences are taken into consideration. The TSTF safety evaluation, in general, remains applicable since it considers loss of capability to define the requirements, which applies for systems with different design configurations.

There are also differences in the number and types of battery banks and battery chargers between the AP1000 design and the standard plant in TSTF-500, Rev. 2. In AP1000, two divisions, Divisions A and D each consist of one 24 hour battery bank, one battery charger, and the associated control equipment and interconnecting cable. Other two divisions, Divisions B and C each consist of two battery banks (one 24 hour and one 72 hour), two battery chargers, and the associated control equipment and interconnecting cabling. The loads on the battery banks (including those on the associated inverters) are grouped according to their role in response to a Design Basis Accident (DBA). Loads which are a one time or limited duration load (engineered safeguards features (ESF) actuation cabinets and reactor trip function) required within the first 24 hours following an accident are connected to the “24 hour” battery bank. Loads which are continuous or required beyond the first 24 hours following an accident (emergency lighting, post accident monitoring, and Qualified Data Processing System) are connected to the “72 hour” battery bank. There are a total of six battery banks. A battery bank consists of two battery strings connected in series. Each battery string consists of 60 cells connected in series. Divisions A and D each have one 2400 ampere hour battery bank and Divisions B and C each have two 2400 ampere hour battery banks. For the Standard plant in TSTF-500, the [125/250] VDC electrical power system each of the two subsystems consists of

[two] 125 VDC batteries [(each battery [50]% capacity)], the associated battery charger(s) for each battery, and all the associated control equipment and interconnecting cabling. The [Train A and Train B] DC electrical power subsystems provide the control power for its associated Class 1E AC power load group, [4.16] kV switchgear, and [480] V load centers. The DC electrical power subsystems also provide DC electrical power to the inverters, which in turn power the AC vital buses. In both cases, each battery has adequate storage capacity to carry the required load for the required duration.

For AP1000 design, there is one installed spare battery bank and one installed spare battery charger, which provide backup service in the event that one of the battery banks and/or one of the preferred battery chargers is out of service. The spare battery bank and charger are Class 1E and have the same rating as the primary components. If the spare battery bank with the charger is substituted for one of the preferred battery banks or chargers, then the requirements of independence and redundancy between subsystems are maintained and the division is OPERABLE. For the standard plant in TSTF-500, there is [one] spare battery charger per subsystem, which provides backup service in the event that the preferred battery charger is out of service. If the spare battery charger is substituted for one of the preferred battery chargers, then the requirements of independence and redundancy between subsystems are maintained.

Consideration of AP1000 design differences in technical evaluation for the applicable changes based on TSTF-500, Rev. 2

The proposed change in TSTF-500 to add a Condition for inoperable battery charger(s) in one subsystem effectively increases the Completion Time for an inoperable battery charger. The new Condition A and associated Required Actions A.1, A.2, and A.3 are added for Conditions when one or more battery charger(s) for any one division becomes inoperable. In that regard, this change is the same as TS 3.8.1, DC Sources - Operating, Condition A, Required Actions A.1, A.2, and A.3, and their associated Completion Times. Condition A was approved in VEGP Units 3 and 4 plant-specific TS in Amendment 13. This is consistent with TSTF-500 changes to LCO 3.8.5 in NUREG-1431 Rev.3, except brackets are not used because it will not be an optional provision for AP1000.

In providing the extended Completion Time it requires that the battery terminal voltage is restored to greater than or equal to the minimum established float voltage within 6 hours and battery float current is verified to be less than or equal to 2 amps once per 24 hours. These actions provide assurance that a battery discharge is terminated and if the battery has been discharged as a result of an inoperable battery charger, it has been fully charged. The third action for the Condition allows 72 hours to restore the battery charger to operable status. These actions are also justified based on the availability of a spare charger. A longer Completion Time will require additional justification, as discussed below. The Required Actions and Completion Time are consistent with that for a similar Condition in Specification 3.8.1.

Required Action A.1 assures that the discharge is terminated within 6 hours by requiring that the battery terminal voltage be restored to greater than or equal to the minimum established voltage. Required Action A.2 assures that the battery has sufficient capacity to perform its duty cycle. The Completion Time of 24 hours is considered sufficient to recharge the lost capacity and a reasonable time to fully recharge the battery. Since 24 hours is considered sufficient to fully recharge the batteries, no Reviewer's Note is provided for request for additional time for this Action.

Required Actions A.2 require the use of float current for monitoring the state-of-charge for batteries and establishing a return to service. As stated in TSTF-500, Rev. 2, a plant should provide plant/battery specific bases for the 2 amp value for return to service limit. Accordingly, the placement of brackets for the 2 amp value is appropriate and acceptable. In the Bases for

Required Actions A.2, a discussion of the 2 amp value used for the battery float current is included, based on TSTF-500, Rev.2. This addition explains the use of the 2 amp value and is appropriate and acceptable.

Required Action A.3 to restore the battery charger to OPERABLE status has a Completion Time of 72 hours. Given that there are four Divisions in DC electrical power system and the Condition involves inoperable battery charger(s) in one of the divisions, the risk of continuing operation in the Condition is considered minimal. The 72 hours Completion Time reflects a reasonable time considering the risk of operation with one or more battery charger in one division inoperable.

The change to the existing Condition A (new Condition B) to address the situation in which the Required Actions and associated Completion Times of new Condition A are not met provides conservative actions to be followed.

C. Remaining changes:

The remaining changes are editorial, clarifying, grammatical, or otherwise considered administrative. These changes do not affect the technical content, but improve the readability, implementation, and understanding of the requirements, and are therefore acceptable.

Having found that this GTST's proposed changes to the GTS and Bases are acceptable, the NRC staff concludes that AP1000 STS Subsection 3.8.2 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

None

VIII. Review Information

Evaluator Comments:

In addressing the changes to AP1000 STS based on TSTF-500, Rev.2, a review was conducted of the changes that are already included, based on implementation of TSTF-360-A earlier and an analysis to determine the additional changes that apply to the AP1000 design. A summary discussion is provided in Section VI to present a clear understanding of the changes that are additionally applicable. In determining the additional changes that apply consideration was also given to the approved AP1000 GTS as part of the AP1000 DCD. The following comments may be useful to the reviewer.

1. TSTF-500, Rev. 2 uses the term “subsystem” instead of the term “division.” AP1000 GTS uses both “division” and “subsystem” in the Specifications and Bases. From the Bases discussion, it is understood that both “division” and “subsystem” refer to the same aspect of the system. No change is made. It may be appropriate to present the Specifications and Bases in terms of “division” removing use of “subsystem” throughout.

2. AP1000 GTS does not use brackets and Reviewer's Notes in this Section. The values used for battery parameters and Completion Times were finalized in AP1000 DCD Rev. 19 or were approved in VEGP Units 3 and 4 plant-specific TS in Amendment 13. All brackets and reviewer's notes were removed from AP1000 STS.

Pranab K. Samanta
Brookhaven National Laboratory
631-344-4948
samanta@bnl.gov

Review Information:

Availability for public review and comment on Revision 0 of this traveler approved by NRC staff on 4/15/2014.

APOG Comments (Ref. 7) and Resolutions

(Internal #3) Throughout the Bases, references to Sections and Chapters of the FSAR do not include the “FSAR” clarifier. Since these Section and Chapter references are to an external document, it is appropriate to include the “FSAR” modifier. This is resolved by adding the FSAR modifier as appropriate.

(Internal #16) _TSTF-500, APOG recommendations regarding TSTF-500 were addressed. TSTF-500 related changes, not applicable to AP1000 STS, were removed. A discussion of the changes that were retained is presented in the GTST. Brackets for battery parameters and Completion Times were removed.

(Internal #450) 3.8.02, Pg. 08, A correction was made in Section VI of the GTST revising the completion time from “days” to “hours.”

(Internal #451) 3.8.02, Pg. 09, Discussion under rationale for TSTF-471 for boron dilution accident was clarified with correct citation of GTS and STS subsections.

(Internal #452) 3.8.02, Pg. 12, In Section VI of the GTST, reference to DOC L22 was corrected by replacing “22” with “L22.”

(Internal #453) 3.8.02, Pg. 13, Discussion in Section VII under heading “A. Removing CORE ALTERATIONS from Specifications and Bases” was clarified with correct citation of GTS and STS subsections.

(Internal #454, #455) 3.8.02, Pg. 21 and 32, For Required Actions A.3, “Charger(s)” was replaced with “charger(s).” For Condition B, logical connector “OR” was indented.

(Internal #456) 3.8.02, Pg. 39, Editorial corrections were made in the “Actions” section of the Bases, under heading “B.1, B.2.1, B.2.2, B.2.3, and B.2.4.”

NRC Final Approval Date: April 28, 2015

NRC Contact:

T. Robert Tjader
United States Nuclear Regulatory Commission
301-415-1187
Theodore.Tjader@nrc.gov

IX. Evaluator Comments for Consideration in Finalizing Technical Specifications and Bases

None

X. References Used in GTST

1. AP1000 DCD, Revision 19, Section 16, “Technical Specifications,” June 2011 (ML11171A500).

2. Southern Nuclear Operating Company, Vogtle Electric Generating Plant, Unit 3 and 4, Technical Specifications Upgrade License Amendment Request, February 24, 2011 (ML12065A057).

3. TSTF-GG-05-01, Technical Specification Task Force (TSTF) Writer's Guide for Plant-Specific Improved Technical Specifications, Revision 1.

4. RAI Letter No. 01 Related to License Amendment Request (LAR) 12-002 for the Vogtle Electric Generating Plant Units 3 and 4 Combined Licenses, September 7, 2012 (ML12251A355).

5. Southern Nuclear Operating Company, Vogtle Electric Generating Plant, Units 3 and 4, Response to Request for Additional Information Letter No. 01 Related to License Amendment Request LAR-12-002, ND-12-2015, October 04, 2012 (ML12286A363 and ML12286A360).

6. NRC Safety Evaluation (SE) for Amendment No. 13 to Combined License (COL) No. NPF-91 for Vogtle Electric Generating Plant (VEGP) Unit 3, and Amendment No. 13 to COL No. NPF-92 for VEGP Unit 4, September 9, 2013 (ADAMS Package Accession No. ML13238A337), which contains:

ML13238A355,	Cover Letter - Issuance of License Amendment No. 13 for Vogtle Units 3 and 4 (LAR 12-002).
ML13238A359,	Enclosure 1 - Amendment No. 13 to COL No. NPF-91
ML13239A256,	Enclosure 2 - Amendment No. 13 to COL No. NPF-92
ML13239A284,	Enclosure 3 - Revised plant-specific TS pages (Attachment to Amendment No. 13)
ML13239A287,	Enclosure 4 - Safety Evaluation (SE), and Attachment 1 - Acronyms
ML13239A288,	SE Attachment 2 - Table A - Administrative Changes
ML13239A319,	SE Attachment 3 - Table M - More Restrictive Changes
ML13239A333,	SE Attachment 4 - Table R - Relocated Specifications
ML13239A331,	SE Attachment 5 - Table D - Detail Removed Changes
ML13239A316,	SE Attachment 6 - Table L - Less Restrictive Changes

   The following documents were subsequently issued to correct an administrative error in Enclosure 3:

ML13277A616,	Letter - Correction To The Attachment (Replacement Pages) - Vogtle Electric Generating Plant Units 3 and 4- Issuance of Amendment Re: Technical Specifications Upgrade (LAR 12-002) (TAC No. RP9402)
ML13277A637,	Enclosure 3 - Revised plant-specific TS pages (Attachment to Amendment No. 13) (corrected)

7. APOG-2014-008, APOG (AP1000 Utilities) Comments on AP1000 Standardized Technical Specifications (STS) Generic Technical Specification Travelers (GTSTs), Docket ID NRC-2014-0147, September 22, 2014 (ML 14265A493).

XI. MARKUP of the Applicable GTS Subsection for Preparation of the STS NUREG

The entire section of the Specifications and the Bases associated with this GTST is presented next.

Changes to the Specifications and Bases are denoted as follows: Deleted portions are marked in strikethrough red font, and inserted portions in bold blue font.

3.8 ELECTRICAL POWER SYSTEMS

3.8.2 DC Sources – Shutdown

LCO 3.8.2 DC electrical power subsystems shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.6, "Distribution Systems – Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

----------NOTES----------
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required battery chargers in one division inoperable.	**A.1 Restore battery terminal voltage to greater than or equal to the minimum established voltage.**	**6 hours**
	AND	
	A.2 Verify battery float current ≤ 2 amps.	**Once per 24 hours**
	AND	
	A.3 Restore battery charger(s) to OPERABLE status.	**72 hours**

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~A~~**B**. One or more required DC electrical power subsystems inoperable **for reasons other than Condition A.** **OR** **Required Actions and associated Completion Time of Condition A not met.**	~~A~~**B**.1 Declare affected required features inoperable. OR ~~A.2.1 Suspend CORE ALTERATIONS.~~ ~~AND~~ ~~A.2.2~~**B.2.1** Suspend movement of irradiated fuel assemblies. AND **B**~~A~~.2.~~3~~**2** Suspend operations with a potential for draining the reactor vessel. AND **B**~~A~~.2.~~4~~**3** Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. AND ~~A.2.5~~**B.2.4** Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately ~~Immediately~~ Immediately Immediately Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.2.1	----------NOTE---------- The following SRs are not required to be performed: SR 3.8.1.2 and SR 3.8.1.3. ---------- For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.1.1 SR 3.8.1.2 SR 3.8.1.3	In accordance with applicable SRs

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 DC Sources – Shutdown

BASES

BACKGROUND

A description of the Class 1E DC power sources is provided in the Bases for LCO 3.8.1, “DC Sources - Operating.”

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the **FSAR** Chapter 6 (Ref. 1) and **FSAR** Chapter 15 (Ref. 2), assume engineered safety features are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the emergency auxiliaries and control and switching during all MODES of operation.

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

The OPERABILITY of the minimum Class 1E DC power sources during MODES 5 and 6 and during movement of irradiated fuel assemblies ensures that:

a. The unit 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 Class 1E DC power sources are provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal

BASES

APPLICABLE SAFETY ANALYSES (continued)

consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case Design Basis Accidents which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, “Guidelines for Industry Actions to Assess Shutdown Management,” as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The Class 1E DC Sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Class 1E DC electrical power subsystems are required to be OPERABLE to support required trains of Class 1E Distribution System divisions required to be OPERABLE by LCO 3.8.6. This ensures the availability of sufficient Class 1E DC 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, inadvertent reactor vessel draindown).

As described in the previous section, “Applicable Safety Analyses,” in the event of an accident during shutdown, the Technical Specifications are designed to maintain the plant in such a condition that, even with a single failure, the plant will not be in immediate difficulty.

BASES

APPLICABILITY

The Class 1E DC power sources required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies 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 Class 1E DC electrical power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.1, “DC Sources - Operating.”

ACTIONS

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

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

Condition A represents one division with one or two battery chargers inoperable (e.g., the voltage limit of SR 3.8.1.1 is not maintained). The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Action A.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 6 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

BASES

ACTIONS (continued)

the battery terminal voltage to greater than or equal to the minimum established float voltage provides good assurance that, within 24 hours, the battery will be restored to its fully charged condition (Required Action A.2) from any discharge that might have occurred due to the charger inoperability.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus, there is good assurance of fully recharging the battery within 24 hours, avoiding a premature shutdown with its own attendant risk.

If the charger is operating in the current limit mode after 6 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 24 hours (Required Action A.2).

Required Action A.2 requires that the battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If at the expiration of the initial 24 hour period the battery float current is not less than or equal to 2 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

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

BASES

ACTIONS (continued)

B~~A~~.1, B.2.1, B.2.2, B.2.3, and **B~~A~~.2.4**

With one or more of the required (per LCO 3.8.6, “Distribution Systems - Shutdown”) Class 1E DC power subsystems inoperable, the remaining subsystems may be capable of supporting sufficient systems to allow continuation of ~~CORE ALTERATIONS,~~ **irradiated** fuel movement~~, and/or~~ **and** operations with a potential for draining the reactor vessel. By allowing the option to declare required features inoperable with the associated DC power source(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. In many instances this option would likely involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend ~~CORE ALTERATIONS,~~ movement of irradiated fuel assemblies, any activities that could potentially result in inadvertent draining of the reactor vessel, and operations involving positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit) to assure continued safe operation. The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required SDM is maintained.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize 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 Class 1E DC electrical power to the unit safety systems.

The installed spare battery bank and charger may be used to restore an inoperable Class 1E DC power subsystem; however, all applicable surveillances must be met by the spare equipment used, prior to declaring the subsystem OPERABLE.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required Class 1E DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires performance of all Surveillances required by SR 3.8.1.1 through SR 3.8.1.3. Therefore, see the corresponding Bases for LCO 3.8.1 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.

REFERENCES

1. **FSAR** Chapter 6, “Engineered Safety Features.”
2. **FSAR** Chapter 15, “Accident Analysis.”

XII. Applicable STS Subsection After Incorporation of this GTST's Modifications

The entire subsection of the Specifications and the Bases associated with this GTST, following incorporation of the modifications, is presented next.

3.8 ELECTRICAL POWER SYSTEMS

3.8.2 DC Sources – Shutdown

LCO 3.8.2 DC electrical power subsystems shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.6, "Distribution Systems – Shutdown."

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

----------NOTES----------
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required battery chargers in one division inoperable.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established voltage.	6 hours
	AND	
	A.2 Verify battery float current ≤ 2 amps.	Once per 24 hours
	AND	
	A.3 Restore battery charger(s) to OPERABLE status.	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One or more required DC electrical power subsystems inoperable for reasons other than Condition A. OR Required Actions and associated Completion Time of Condition A not met.	B.1 Declare affected required features inoperable. OR B.2.1 Suspend movement of irradiated fuel assemblies. AND B.2.2 Suspend operations with a potential for draining the reactor vessel. AND B.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration. AND B.2.4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately Immediately Immediately Immediately Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.2.1	----------NOTE---------- The following SRs are not required to be performed: SR 3.8.1.2 and SR 3.8.1.3. ----------	
	For DC sources required to be OPERABLE, the following SRs are applicable: SR 3.8.1.1 SR 3.8.1.2 SR 3.8.1.3	In accordance with applicable SRs

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 DC Sources – Shutdown

BASES

BACKGROUND

A description of the Class 1E DC power sources is provided in the Bases for LCO 3.8.1, “DC Sources - Operating.”

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR Chapter 6 (Ref. 1) and FSAR Chapter 15 (Ref. 2), assume engineered safety features are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the emergency auxiliaries and control and switching during all MODES of operation.

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

The OPERABILITY of the minimum Class 1E DC power sources during MODES 5 and 6 and during movement of irradiated fuel assemblies ensures that:

a. The unit 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 Class 1E DC power sources are provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal

BASES

APPLICABLE SAFETY ANALYSES (continued)

consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case Design Basis Accidents which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, “Guidelines for Industry Actions to Assess Shutdown Management,” as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The Class 1E DC Sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Class 1E DC electrical power subsystems are required to be OPERABLE to support required trains of Class 1E Distribution System divisions required to be OPERABLE by LCO 3.8.6. This ensures the availability of sufficient Class 1E DC 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, inadvertent reactor vessel draindown).

As described in the previous section, “Applicable Safety Analyses,” in the event of an accident during shutdown, the Technical Specifications are designed to maintain the plant in such a condition that, even with a single failure, the plant will not be in immediate difficulty.

BASES

APPLICABILITY

The Class 1E DC power sources required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies 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 Class 1E DC electrical power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.1, “DC Sources - Operating.”

ACTIONS

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

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

Condition A represents one division with one or two battery chargers inoperable (e.g., the voltage limit of SR 3.8.1.1 is not maintained). The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Action A.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 6 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

BASES

ACTIONS (continued)

established float voltage provides good assurance that, within 24 hours, the battery will be restored to its fully charged condition (Required Action A.2) from any discharge that might have occurred due to the charger inoperability.

A discharged battery having terminal voltage of at least the minimum established float voltage indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus, there is good assurance of fully recharging the battery within 24 hours, avoiding a premature shutdown with its own attendant risk.

If the charger is operating in the current limit mode after 6 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 24 hours (Required Action A.2).

Required Action A.2 requires that the battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If at the expiration of the initial 24 hour period the battery float current is not less than or equal to 2 amps this indicates there may be additional battery problems and the battery must be declared inoperable.

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

BASES

ACTIONS (continued)

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

With one or more of the required (per LCO 3.8.6, “Distribution Systems - Shutdown”) Class 1E DC power subsystems inoperable, the remaining subsystems may be capable of supporting sufficient systems to allow continuation of irradiated fuel movement and operations with a potential for draining the reactor vessel. By allowing the option to declare required features inoperable with the associated DC power source(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO ACTIONS. In many instances this option would likely involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend movement of irradiated fuel assemblies, any activities that could potentially result in inadvertent draining of the reactor vessel, and operations involving positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit) to assure continued safe operation. The Required Action to suspend positive reactivity additions does not preclude actions to maintain or increase reactor vessel inventory, provided the required SDM is maintained.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize 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 Class 1E DC electrical power to the unit safety systems.

The installed spare battery bank and charger may be used to restore an inoperable Class 1E DC power subsystem; however, all applicable surveillances must be met by the spare equipment used, prior to declaring the subsystem OPERABLE.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required Class 1E DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires performance of all Surveillances required by SR 3.8.1.1 through SR 3.8.1.3. Therefore, see the corresponding Bases for LCO 3.8.1 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.

REFERENCES

1. FSAR Chapter 6, “Engineered Safety Features.”
2. FSAR Chapter 15, “Accident Analysis.”