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December 6, 2001

U.S. Nuclear Regulatory Commission
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ULNRC-04578

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Gentlemen:

DOCKET NUMBER 50-483
UNION ELECTRIC COMPANY
CALLAWAY PLANT
REVISION TO TECHNICAL SPECIFICATIONS REGARDING
SUSPENSION OF POSITIVE REACTIVITY ADDITIONS

Union Electric Company herewith transmits an application for amendment to Facility Operating License No. NPF-30 for the Callaway Plant.

The proposed amendment revises several of the Required Actions in the Callaway Plant Technical Specifications (TS) that require suspension of operations involving positive reactivity additions or suspension of operations involving reactor coolant system (RCS) boron concentration reductions. In addition, the proposed amendment revises several Limiting Condition for Operation (LCO) Notes that preclude reductions in RCS boron concentration. This amendment revises these Required Actions and LCO Notes to allow small, controlled, safe insertions of positive reactivity, but limits the introduction of positive reactivity such that compliance with the required shutdown margin or refueling boron concentration limits will still be satisfied. This amendment is based on an NRC-approved traveler, TSTF-286 Revision 2.

Union Electric Company is submitting this license amendment application in conjunction with an industry consortium of five plants as a result of a mutual agreement known as Strategic Teaming and Resource Sharing (STARS). The STARS group consists of the five plants operated by TXU Electric, Union Electric Company, Wolf Creek Nuclear Operating Corporation, Pacific Gas and Electric Company, and STP Nuclear Operating Company. Union Electric Company is the lead plant for the proposed license amendment and the other members of the STARS group can also be

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expected to submit plant-specific license amendment requests similar to this one, with the exception of STP Nuclear Operating Company which has already received NRC approval of a license amendment based on TSTF-286 Revision 2. These additional license amendment requests will be submitted on a staggered basis.

The Callaway Plant Onsite Review Committee and the Nuclear Safety Review Board have reviewed this amendment application. Attachments 1 through 5 provide the Evaluation, Markup of Technical Specifications, Retyped Technical Specifications, Proposed Technical Specification Bases Changes, and Proposed FSAR changes, respectively, in support of this amendment request. Attachments 4 and 5 are provided for information only. Final Bases changes will be implemented pursuant to TS 5.5.14, Technical Specifications (TS) Bases Control Program. Final FSAR changes will be implemented after this amendment is approved, subject to the updating requirements of 10CFR50.71(e). Appendix A demonstrates the extent to which TSTF-286 Revision 2 was followed, similar to the Appendix attached to the NRC safety evaluation for H. B. Robinson Unit 2 License Amendment 190. There are no collateral commitments associated with this amendment application.

It has been determined that this amendment application does not involve a significant hazard consideration as determined per 10CFR50.92. Pursuant to 10CFR51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment.

Approval of this amendment application is requested by August 1, 2002. Once approved, this amendment will be implemented within 60 days. In accordance with 10CFR50.91, a copy of this amendment application is being provided to the designated Missouri State official. If you have any questions on this amendment application, please contact us.

Very truly yours,

John D. Blosser
Manager-Regulatory Affairs

DES/mlo

Attachments:

1 - Evaluation
2 - Markup of Technical Specifications
3 - Retyped Technical Specifications
4 - Proposed Technical Specification Bases Changes (for information only)
5 - Proposed FSAR Changes (for information only)

Appendix A - A Correlation of Proposed Changes to Approved TSTF-286, Revision 2, STS Changes

STATE OF MISSOURI)
) S S
COUNTY OF CALLAWAY)

John D. Blosser, of lawful age, being first duly sworn upon oath says that he is Manager Regulatory Affairs, for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By J Blosser
John D. Blosser
Manager Regulatory Affairs

SUBSCRIBED and sworn to before me this 6th day of December, 2001.

Gloria J Taylor

GLORIA J. TAYLOR
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ATTACHMENT ONE

EVALUATION

EVALUATION

1.0 INTRODUCTION

1.1 This amendment application revises several of the Required Actions in the Callaway Plant Technical Specifications (TS) that require suspension of operations involving positive reactivity additions or suspension of operations involving reactor coolant system (RCS) boron concentration reductions. In addition, the proposed amendment revises several Limiting Condition for Operation (LCO) Notes that preclude reductions in RCS boron concentration. This amendment revises these Required Actions and LCO Notes to allow small, controlled, safe insertions of positive reactivity, but limits the introduction of positive reactivity such that compliance with the required shutdown margin (SDM) or refueling boron concentration limits will still be satisfied.

1.2 Final Safety Analysis Report (FSAR) Section

Changes to FSAR Sections 16.1.2.1, 16.1.2.3, 16.1.2.5, and 16.4.1 will be made in conjunction with this amendment application; see the proposed changes in Attachment 5.

2.0 DESCRIPTION OF PROPOSED AMENDMENT

The proposed changes modify the Required Actions and LCO Notes that direct the suspension of activities that involve positive reactivity changes or RCS boron concentration reductions, with the exception of Required Action A.2 of TS 3.9.1 (however, TS Bases changes are attached for that Action). Clarifications are provided in the proposed TS Bases changes as to which plant evolutions are acceptable when operating under a Condition or LCO Note requiring suspension of positive reactivity additions or RCS boron concentration reductions.

The proposed changes will allow limited insertions of positive reactivity that are associated with routine plant operations. The proposed changes will limit the amount of positive reactivity additions that are allowed consistent with assuring appropriate reactivity limits are met, either SDM or refueling boron concentration.

The proposed TS changes are identical to those previously approved in License Amendment 190 for H. B. Robinson Unit 2 (Reference 2), and are based on approved Industry/Technical Specification Task Force (TSTF) Standard

Technical Specification Change Traveler, TSTF-286, Revision 2, "Define 'Operations Involving Positive Reactivity Additions'," (Reference 3). The associated TS Bases changes include plant-specific deviations where required, as noted in the applicable descriptions of changes below or summarized in Appendix A. References are listed in Section 10 of this Evaluation.

The proposed TS changes are as follows:

1. Add a Note to TS 3.3.1, "RTS Instrumentation," Required Action G.1 that states: "Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed."

   Condition G is applicable when the two required Intermediate Range Neutron Flux channels are inoperable. Required Action G.1 currently states: "Suspend operations involving positive reactivity additions." The proposed Note will allow limited plant temperature changes or boron concentration fluctuations associated with RCS temperature control or inventory management.

   Required Action G.1 will continue to require suspension of operations involving positive reactivity additions. Therefore, this proposed change simply clarifies the Required Action. The proposed change to TS 3.3.1 Required Action G.1 differs from TSTF-286, Revision 2 (Reference 3). TSTF-286, Revision 2, Insert 1 adds a Note stating: "Limited plant cooldown or boron dilution is allowed provided the change is accounted for in the calculated SDM." Our proposed change does not include "...provided the change is accounted for in the calculated SDM." In MODES 1 and 2 with $k_{eff} \geq 1.0$, SDM is not a "calculated" value. Rather, SDM is assured by operation within the rod insertion limits of LCO 3.1.5, "Shutdown Bank Insertion Limits," and LCO 3.1.6 "Control Bank Insertion Limits" and by operating the plant per the requirements of LCO 3.4.2, "RCS Minimum Temperature for Criticality." This clarification is also described in the proposed Bases discussion of the new Note. The use of the words "temperature changes" in lieu of "cooldown" is considered more accurate since the Callaway TS allow positive Moderator Temperature Coefficient (MTC) values at reduced power levels. Under positive MTC conditions a temperature increase would cause a positive reactivity addition. The wording "temperature changes" refers to the fact that the MTC must be considered both during cooldown and heatup operations. The use of the words "Limited boron concentration changes associated with RCS inventory control" in lieu of "boron dilution" is consistent with the intent of TSTF-286, Revision 2, as expressed in Insert B1 of the traveler,

and provides further clarification of the Note. This wording is more descriptive of Callaway Plant operations than "boron dilution." This wording is more accurate with regard to the existing plant design which features two independent reactivity control systems: one using the movable control and shutdown rod cluster control assemblies (RCCAs), and the other using the chemical volume and control system (CVCS).

This wording is identical to that approved for H. B. Robinson Unit 2 (Reference 2).

2. Add a Note to TS 3.3.1, "RTS Instrumentation," Required Action I.1 that states: "Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed."

   Condition I is applicable when one of the two required Source Range Neutron Flux channels is inoperable in MODE 2 below P-6. Required Action I.1 currently states: "Suspend operations involving positive reactivity additions." The proposed Note will allow limited plant temperature changes or boron concentration fluctuations associated with RCS temperature control or inventory management.

   Required Action I.1 will continue to require suspension of operations involving positive reactivity additions. Therefore, this proposed change simply clarifies the Required Action. The proposed change to TS 3.3.1 Required Action I.1 differs from TSTF-286, Revision 2, in the same fashion, and for the same reasons, as described above for Required Action G.1 of TS 3.3.1.

   This wording is identical to that approved for H. B. Robinson Unit 2 (Reference 2).

3. Add a Note to TS 3.3.9, "BDMS," Required Action B.1 that states: "Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM."

   Condition B is applicable when both Boron Dilution Mitigation System (BDMS) trains are inoperable. Required Action B.1 currently states: "Suspend operations involving positive reactivity additions." The proposed Note will allow temperature changes provided the temperature change is accounted for in the calculated SDM.

Required Action B.1 will continue to require suspension of operations involving positive reactivity additions. This proposed change allows a temperature change that would increase reactivity of the reactor. Direct monitoring of core reactivity may not be possible with both BDMS trains inoperable if Condition B entry is due to inoperable Source Range Neutron Flux channels; however instrumentation is available to control and monitor RCS temperature changes. This proposed change is identical to Insert 2 of TSTF-286, Revision 2.

4. Revise TS 3.4.5, "RCS Loops - MODE 3," LCO Note a, TS 3.4.6, "RCS Loops - MODE 4," LCO Note 1.a, TS 3.4.7, "RCS Loops - MODE 5, Loops Filled," LCO Note 1.a, and TS 3.4.8, "RCS Loops - MODE 5, Loops Not Filled," LCO Note 1.b, to state: "No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1." These Notes currently state: "No operations are permitted that would cause reduction of the RCS boron concentration."

   These Notes are intended to preclude dilution of the RCS when no forced mixing (i.e. coolant circulation by RHR pumps or reactor coolant pumps) is taking place. The proposed changes allow dilution of the RCS, but the source of boric acid is required to contain a soluble boron concentration greater than that required to meet the SDM requirement of LCO 3.1.1. These proposed changes are identical to Insert 5 of TSTF-286, Revision 2.

5. Revise TS 3.4.5 Required Action D.2, TS 3.4.6 Required Action B.1, TS 3.4.7 Required Action B.1, and TS 3.4.8 Required Action B.1 to state: "Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1." These Required Actions currently state: "Suspend all operations involving a reduction of RCS boron concentration."

   These Required Actions are intended to preclude dilution of the RCS when no forced mixing is taking place. The proposed changes allow dilution of the RCS, but the source of boric acid is required to contain a soluble boron concentration greater than that required to meet the SDM requirement of LCO 3.1.1. These proposed changes are identical to Insert 3 of TSTF-286, Revision 2.

6. Revise TS 3.8.2, "AC Sources - Shutdown," Required Actions A.2.3 and B.3, TS 3.8.5, "DC Sources - Shutdown," Required Action A.2.3, TS 3.8.8, "Inverters - Shutdown," Required Action A.2.3, and TS 3.8.10, "Distribution Systems - Shutdown," Required Action A.2.3 to state: "Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration." These Required Actions currently state: "Initiate action to suspend operations involving positive reactivity additions."

   These Required Actions are intended to initiate suspension of operations involving positive reactivity additions based on the loss of required electrical sources and distribution equipment. The proposed changes allow dilution of the RCS, but the source of boric acid is required to contain a soluble boron concentration greater than that required to meet the SDM requirement of LCO 3.1.1 or the refueling boron concentration of LCO 3.9.1. The proposed changes will also allow temperature changes that could increase reactivity provided the reactivity insertions do not result in a loss of required SDM or required refueling boron concentration. These proposed changes are identical to Insert 8 of TSTF-286, Revision 2.

7. Revise TS 3.9.3, "Nuclear Instrumentation," Required Action A.2 to state: "Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1." This Required Action currently states: "Suspend positive reactivity additions."

   This Required Action is intended to initiate suspension of operations involving positive reactivity additions when there is a loss of one required Source Range Neutron Flux monitor, thereby rendering inoperable the redundant channel for monitoring core reactivity. The proposed change allows dilution of the RCS, but the source of boric acid is required to contain a soluble boron concentration greater than that required to meet the minimum refueling boron concentration requirement of LCO 3.9.1. This proposed change also removes the implicit limitation on temperature changes that could result in a positive reactivity addition. No limitation on temperature change-induced reactivity insertion is needed, because appropriate shutdown margin in MODE 6 is maintained by compliance with LCO 3.9.1. This proposed change is identical to Insert 4 of TSTF-286, Revision 2.

8. Revise the LCO Note for TS 3.9.5, "RHR and Coolant Circulation - High Water Level," to state: "The required RHR loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause introduction into the Reactor Coolant System, coolant with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1." This LCO Note currently states: "The required RHR loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause reduction of the Reactor Coolant System boron concentration."

   This note is intended to preclude dilution of the RCS when no forced mixing is taking place. The proposed change allows dilution of the RCS, but the source of boric acid is required to contain a soluble boron concentration greater than that required to meet the minimum refueling boron concentration requirement of LCO 3.9.1. This proposed change is identical to the markups and Insert 7 of TSTF-286, Revision 2.

9. Revise TS 3.9.5, "RHR and Coolant Circulation - High Water Level," Required Action A.1 and TS 3.9.6, "RHR and Coolant Circulation - Low Water Level," Required Action B.1 to state: "Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1." These Required Actions currently state: "Suspend operations involving a reduction in reactor coolant boron concentration."

   These Required Actions are intended to preclude dilution of the RCS when no forced mixing is taking place. The proposed changes allow dilution of the RCS, but the source of the boric acid is required to contain a soluble boron concentration greater than that required to meet the minimum refueling boron concentration requirement of LCO 3.9.1. These proposed changes are identical to Insert 4 of TSTF-286, Revision 2.

The associated TS Bases will be revised accordingly; see the proposed changes in Attachment 4. Appendix A describes additional LCO 3.3.1, 3.3.9, and 3.4.5 through 3.4.8 Bases changes required to reflect the analysis of an inadvertent boron dilution event for Callaway Plant. The following two additional TS Bases changes were taken from TSTF-286, Revision 2:

1. The Bases for TS 3.9.1, "Boron Concentration," Required Action A.2 will be revised to add the following: "Operations that individually add limited positive reactivity (e.g., temperature fluctuations, inventory addition, or

temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action."

2. An editorial change is made to the Bases for TS 3.9.1 Required Action A.3. The discussion regarding immediately suspending CORE ALTERATIONS or positive reactivity additions is corrected. The word "or" between "CORE ALTERATIONS" and "positive reactivity additions" should be "and" consistent with the requirements of the TS 3.9.1 Required Actions.

Finally, the Bases for TS 3.9.3, "Nuclear Instrumentation," Required Action B.2 will be revised for consistency with the changes made to TS 3.9.3 Required Action A.2. This change was not included in TSTF-286, Revision 2, but is needed since the revised Action A.2 would no longer absolutely preclude positive reactivity additions. This was an oversight in TSTF-286. The list of affected TS in TSTF-286 included "Action 3.9.3.B Bases, Nuclear Instrumentation, NUREG-1431 Only"; however, there were no changes to the Action 3.9.3.B Bases marked on page B 3.9-9 of the traveler.

FSAR Chapter 16 requirements in the following sections will also be revised:

16.1.2.1 Reactivity Control Systems - Boration Systems, Flow Path - Shutdown

16.1.2.3 Reactivity Control Systems - Charging Pump - Shutdown

16.1.2.5 Reactivity Control Systems - Borated Water Source - Shutdown

16.4.1 Reactor Coolant System - Safety Valves - Shutdown

Attachments 2 and 4 provide the TS markups and proposed TS Bases changes, respectively. Attachment 5 provides the proposed FSAR changes.

3.0 BACKGROUND

Callaway Plant implemented the Improved Technical Specifications (ITS) in April 2000 under License Amendment 133 (Reference 1). Since then the industry and the NRC staff have been working to improve the Standard Technical Specifications (STS) NUREGs and, as a result, generic changes have been incorporated into Revision 2 of the STS NUREGs. This proposed amendment

adopts generic changes from TSTF-286, Revision 2, which was incorporated into the STS by the NRC staff on July 6, 2000.

Callaway Plant has two independent reactivity control systems. One uses the movable control and shutdown RCCAs, and the other uses the CVCS to adjust the soluble boron concentration. In MODES 1 and 2, both systems are used to compensate for the reactivity effects from the fuel and coolant temperature changes in the RCS during power operation from full load to no load conditions. In MODES 3, 4, and 5, the CVCS is used to compensate for the reactivity effects from temperature and xenon changes. In MODE 6, the CVCS is used to maintain the refueling boron concentration within the required limits.

The Callaway Plant SDM limits provide sufficient reactivity margin to ensure that the specified acceptable fuel design limits will not be exceeded for normal shutdown and Anticipated Operational Occurrences (AOOs). The SDM definition assumes that the single RCCA with the highest reactivity worth remains fully withdrawn. In MODES 1 and 2, the TS satisfy the required SDM (which is the amount of subcriticality that would immediately occur following the insertion of control and shutdown RCCAs that had been withdrawn, assuming the fuel and moderator temperatures are at hot zero power values) by limiting the insertion of the control and shutdown banks. Small reactivity changes due to RCS coolant inventory management and temperature control are also considered in specifying SDM, including MTC effects. In MODES 3, 4, and 5, the TS specify the required SDM (which is the reactivity margin by which the reactor will remain subcritical with the RCCAs fully inserted) by reference to the Core Operating Limits Report (COLR).

In MODE 6, reactor subcriticality margin is ensured by the limit on the boron concentration of all filled portions of the RCS and the refueling pool that have direct access to the reactor vessel.

The TS will be modified by this amendment to permit the addition of positive reactivity and changes to the RCS boron concentration as long as the change preserves the margin to core criticality as defined by the SDM and refueling boron concentration limit specifications.

NEED FOR CHANGE

The proposed changes are needed to address operational considerations. During Conditions in which these Required Actions are entered, various plant operations must be continued. These activities make it necessary to sometimes add cooler water to the RCS (a positive reactivity change in most cases) or warmer water to

the RCS and may involve inventory makeup from sources that are at a boron concentration less than that in the RCS.

Operational considerations may make it necessary or prudent to use a different residual heat removal (RHR) loop from the one in operation. With the proposed changes, if the newly selected RHR loop is sampled and the boron concentration is slightly lower than that of the RCS, but sufficiently high that SDM and refueling boron concentration limits continue to be met, the switch to a different loop would be acceptable. Alternatively, if the RHR loop is at a different temperature than the RCS average temperature, but the reactivity effects are small enough to assure that SDM and refueling boron concentration limits will continue to be met, again the swap-over to the alternate RHR loop should be allowed. Inventory management evolutions will permit blended makeup to the RCS from the CVCS mixing tee (shown on FSAR Figure 9.3-8, sheet 5, grid E-3) in MODES 3, 4, and 5 as long as both source range neutron flux channels are OPERABLE and at least one RCS loop is in operation, consistent with the mitigation equipment and mixing volume assumptions used in FSAR Section 15.4.6.

These types of activities should not be precluded as long as the required SDM or refueling boron concentration is maintained. The proposed changes provide the flexibility necessary to provide for continued, safe reactor operations while also limiting any potential for excess positive reactivity additions.

4.0 REGULATORY REQUIREMENTS AND GUIDANCE

The regulatory requirements associated with reactivity control include the following:

Criterion 10 -- Reactor design. The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

Criterion 11 -- Reactor inherent protection. The reactor core and associated coolant systems shall be designed so that in the power operating range the net effect of the prompt inherent nuclear feedback characteristics tends to compensate for a rapid increase in reactivity.

Criterion 12 -- Suppression of reactor power oscillations. The reactor core and associated coolant, control, and protection systems shall be designed to assure that power oscillations which can result in conditions exceeding specified

acceptable fuel design limits are not possible or can be reliably and readily detected and suppressed.

Criterion 25 -- Protection system requirements for reactivity control malfunctions. The protection system shall be designed to assure that specified acceptable fuel design limits are not exceeded for any single malfunction of the reactivity control systems, such as accidental withdrawal (not ejection or dropout) of control rods.

Criterion 26 -- Reactivity control system redundancy and capability. Two independent reactivity control systems of different design principles shall be provided. One of the systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified acceptable fuel design limits are not exceeded. The second reactivity control system shall be capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes (including xenon burnout) to assure acceptable fuel design limits are not exceeded. One of the systems shall be capable of holding the reactor core subcritical under cold conditions.

Criterion 27 -- Combined reactivity control systems capability. The reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained.

Criterion 28 -- Reactivity limits. The reactivity control systems shall be designed with appropriate limits on the potential amount and rate of reactivity increase to assure that the effects of postulated reactivity accidents can neither (1) result in damage to the reactor coolant pressure boundary greater than limited local yielding nor (2) sufficiently disturb the core, its support structures or other reactor pressure vessel internals to impair significantly the capability to cool the core. These postulated reactivity accidents shall include consideration of rod ejection (unless prevented by positive means), rod dropout, steam line rupture, changes in reactor coolant temperature and pressure, and cold water addition.

Criterion 29 -- Protection against anticipated operational occurrences. The protection and reactivity control systems shall be designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.

10CFR50.46, Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors --

a. Maximum fuel element cladding temperature is $\leq$ 2200°F;

b. Maximum cladding oxidation is $\leq$ 0.17 times the total cladding thickness before oxidation;

c. Maximum hydrogen generation from a zirconium-water reaction is $\leq$ 0.01 times the hypothetical amount generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;

d. Core is maintained in a coolable geometry; and

e. Adequate core cooling capability is maintained.

5.0 TECHNICAL ANALYSIS

Design Basis and Safety Analysis Considerations

The changes in TSTF-286, Revision 2, revise the following: 1) Required Actions that require suspension of operations involving positive reactivity additions or suspension of RCS boron concentration reductions and 2) various LCO Notes precluding reduction in boron concentration. The revised TS limit the introduction of positive reactivity into the RCS to that which would maintain the TS-required SDM or refueling boron concentrations, as applicable. Additionally, the TS Required Actions that will still require the suspension of positive reactivity changes have Bases additions that clarify the intent is to preclude a loss of required SDM.

The TS Required Actions and LCO Notes that preclude positive reactivity additions and reductions in boron concentration are intended to maintain the required SDM or refueling boron concentration. During Conditions in which these Required Actions are invoked, various plant operations (e.g., maintaining RCS inventory and controlling RCS temperature) must be continued. These necessary activities may involve additions to the RCS of different temperature makeup and may involve makeup from borated sources of water that are at boron concentrations less than the RCS boron concentration. These activities should not be precluded if the overall effect would still assure the required SDM or refueling boron concentration is maintained.

Small changes in reactivity occur as a result of temperature changes that accompany RCS inventory management or RCS temperature control. At the beginning of core life below 70% RTP, positive MTC must also be considered.

The RCS boron concentration is maintained greater than or equal to the concentration required to maintain the required SDM in MODES 3, 4, and 5 or to maintain the required minimum refueling boron concentration in MODE 6. The TS Required Actions and LCO Notes that preclude decreasing the RCS boron concentration in the event that the plant has entered the revised TS Conditions are unduly restrictive if the overall effect on the core would still assure that the required LCO 3.1.1 SDM or LCO 3.9.1 boron concentration is maintained. The proposed change would allow using borated water sources that may decrease the RCS boron concentration while assuring the LCO 3.1.1 SDM or LCO 3.9.1 boron concentration limits are maintained.

The TS-required SDM at Callaway is determined during the reload core design and is ensured during plant operation by the positioning of the RCCA control and shutdown rod banks and through adjustments of the soluble boron concentration in the reactor coolant.

The minimum required SDM is assumed as an initial condition in the safety analyses to ensure that the specified acceptable fuel design limits will not be exceeded for normal shutdown and AOOs, assuming that the highest worth RCCA remains stuck out following a reactor scram. The main steamline break (MSLB) is the most limiting event to establish the minimum SDM value for LCO 3.1.1, and this ensures that the departure from nucleate boiling ratio safety limit is not exceeded.

In MODES 3, 4, and 5, the reactivity of the core must be consistent with the initial conditions assumed for the boron dilution accident analysis to ensure the minimum time required for automatic actuation of the BDMS to terminate the event is met. This is satisfied by complying with the requirements of LCO 3.1.1 for the minimum SDM. Additionally, for MODE 6, the required boron concentration of LCO 3.9.1 ensures subcriticality during refueling operations.

As described in the SDM LCO 3.1.1 Bases, a sufficient shutdown margin ensures that: (1) the reactor can be made subcritical from all operating conditions, transients, and Design Basis Events; (2) the reactivity transients associated with postulated accident conditions are controllable within acceptable limits; and (3) the reactor will be maintained sufficiently subcritical to preclude inadvertent criticality in the shutdown condition. The Bases for the LCO 3.9.1 refueling boron concentration similarly indicate that the limitations on reactivity conditions during

refueling ensure that the reactor will remain subcritical during MODE 6. Since the proposed changes will not alter the limits established in these specifications, there will be no effect on the ability to shutdown and maintain the reactor in a subcritical condition.

During certain conditions that are addressed in this proposed change, addition of water with a reduced boron concentration compared to the RCS and temperature changes will be allowed when forced circulation is not occurring. The proposed changes only permit the addition of inventory from sources whose boron concentration is sufficient to maintain the required boron concentration if the entire RCS inventory was replaced from the selected source. That is, the source of the water being added must be of high enough boron concentration that the effects of stratification, and subsequent mixing upon restoration of forced flow, cannot result in failure to meet the required boron concentration limits. This limitation addresses potential concerns with stratification and subsequent introduction of the "reduced" concentration borated water into the reactor vessel when forced circulation is re-established.

Based on the evaluation above, it is appropriate to make the proposed changes to the affected specifications and similar FSAR Chapter 16 requirements. The proposed changes will not affect the limits on reactivity control, and will not permit operations that could result in exceeding these limits. Therefore, the proposed change will not affect any safety margin or safety limit applicable to the facility.

Probabilistic Risk Assessment (PRA) Evaluation

There is no impact on the Callaway PRA since that study is concerned mainly with time-averaged equipment functionality during full power operation, not actions to be taken to limit minor positive reactivity additions during operation below the P-10 permissive. In any event, functional capabilities of the systems in the LCOs will continue to be met. Required SDM and refueling boron concentration limits will continue to be met.

Summary/Conclusion

The proposed amendment revises several of the Required Actions in the Callaway Plant Technical Specifications that require suspension of operations involving positive reactivity additions or suspension of operations involving RCS boron concentration reductions. In addition, the proposed amendment revises several LCO Notes that preclude reductions in RCS boron concentration. This amendment revises these Required Actions and LCO Notes to allow small,

controlled, safe insertions of positive reactivity, but limits the introduction of positive reactivity such that compliance with the required SDM or refueling boron concentration limits will still be satisfied. The analyses presented above assess the potential impact of the proposed changes on applicable safety analyses. The assessments demonstrate that the change will not adversely affect the design basis, safety analyses, or the safe operation of the plant.

6.0 REGULATORY ANALYSIS

There have been no changes to the plant design such that any of the regulatory requirements in Section 4.0 would come into question. This amendment application revises Required Actions and LCO Notes dealing with the suspension of positive reactivity additions or RCS boron concentration reductions. The evaluation performed by Union Electric Company in Section 5.0 concludes that Callaway Plant will continue to comply with all applicable regulatory requirements.

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

7.0 NO SIGNIFICANT HAZARDS DETERMINATION

This amendment application revises several of the Required Actions in the Callaway Plant Technical Specifications that require suspension of operations involving positive reactivity additions or suspension of operations involving RCS boron concentration reductions. In addition, the proposed amendment revises several LCO Notes that preclude reductions in RCS boron concentration. This amendment revises these Required Actions and LCO Notes to allow small, controlled, safe insertions of positive reactivity, but limits the introduction of positive reactivity such that compliance with the required SDM or refueling boron concentration limits will still be satisfied.

The proposed amendment does not involve a significant hazards consideration for Callaway Plant based on the three standards set forth in 10CFR50.92(c) as discussed below:

(1) Do the proposed changes involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

Overall protection system performance will remain within the bounds of the previously performed accident analyses since there are no hardware changes. The RTS instrumentation and reactivity control systems will be unaffected. Protection systems will continue to function in a manner consistent with the plant design basis. All design, material, and construction standards that were applicable prior to the request are maintained.

The probability and consequences of accidents previously evaluated in the FSAR are not adversely affected because the changes to the Required Actions and LCO Notes assure the limits on SDM and refueling boron concentration continue to be met, consistent with the analysis assumptions and initial conditions included within the safety analysis and licensing basis. The activities covered by this amendment application are routine operating evolutions. The proposed changes do not reduce the capability of reborating the RCS.

The proposed changes will not involve a significant increase in the probability of any event initiators. The initiating event for an inadvertent boron dilution event, as discussed in FSAR Section 15.4.6, is a failure in the reactor makeup control system (RMCS) or operator error such that inventory makeup with the incorrect boron concentration enters the RCS by way of the CVCS mixing tee. Since the RMCS design is unchanged, there will be no initiating event frequency increase associated with equipment failures. However, there could be an increased exposure time per operating cycle to potential operator errors during TS Conditions that, heretofore, prohibited positive reactivity additions. As such, the RTS Instrumentation, BDMS, and RCS Loops TS Bases changes from TSTF-286, Revision 2, have been augmented to preclude the introduction of reactor makeup water into the RCS via the CVCS mixing tee when one source range neutron flux channel (and, thus, the associated BDMS train) is inoperable or when no RCS loop is in operation. The equipment and processes used to implement RCS boration or dilution evolutions are unchanged and the equipment and processes are commonly used throughout the applicable MODES under consideration. There will be no degradation in the performance of, or an increase in the number of challenges imposed on, safety-related equipment assumed to function during an accident situation. There will be no change to normal plant operating parameters or accident mitigation performance. Required Action A.1 of LCO 3.3.9 limits the exposure to one inoperable BDMS train, which may be caused by an inoperable source range neutron flux channel. During the time the

plant is in a TS Condition with a finite equipment restoration time, a single failure of the opposite train is not postulated. However, administrative controls have been added to this Action's Bases to highlight the need for operator awareness during all reactivity manipulations and to preclude introduction of reactor makeup water into the RCS.

The proposed changes will not alter any assumptions or change any mitigation actions in the radiological consequence evaluations in the FSAR.

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

(2) Do the proposed changes create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

There are no hardware changes nor are there any changes in the method by which any safety-related plant system performs its safety function. This amendment will not affect the normal method of plant operation or change any operating limits. The proposed changes merely permit the conduct of normal operating evolutions when additional controls over core reactivity are imposed by the Technical Specifications. The proposed changes do not introduce any new equipment into the plant or alter the manner in which existing equipment will be operated. The changes to operating procedures are minor, with clarifications provided that required limits must continue to be met. No performance requirements or response time limits will be affected. These changes are consistent with assumptions made in the safety analysis and licensing basis regarding limits on SDM and refueling boron concentration.

No new accident scenarios, transient precursors, failure mechanisms, or limiting single failures are introduced as a result of this amendment. There will be no adverse effect or challenges imposed on any safety-related system as a result of this amendment.

This amendment does not alter the design or performance of the 7300 Process Protection System, Nuclear Instrumentation System, or Solid State Protection System used in the plant protection systems.

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

(3) Do the proposed changes involve a significant reduction in a margin of safety?

Response: No

The proposed changes do not alter the limits on SDM or refueling boron concentration. The nominal trip setpoints specified in the Technical Specification Bases and the safety analysis limits assumed in the transient and accident analyses are unchanged. None of the acceptance criteria for any accident analysis is changed.

There will be no effect on the manner in which safety limits or limiting safety system settings are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protection functions. There will be no impact on the overpower limit, departure from nucleate boiling ratio (DNBR) limits, heat flux hot channel factor (F_Q), nuclear enthalpy rise hot channel factor ($F\Delta H$), loss of coolant accident peak cladding temperature (LOCA PCT), peak local power density, or any other margin of safety. The radiological dose consequence acceptance criteria listed in the Standard Review Plan will continue to be met.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Conclusion:

Based on the above, Union Electric Company concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

8.0 ENVIRONMENTAL CONSIDERATION

Union Electric Company has determined that the proposed amendment would change requirements with respect to the installation or use of a facility component located within the restricted area, as defined in 10CFR20, or would change an inspection or surveillance requirement. Union Electric Company has evaluated the proposed change and has determined that the change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amount of effluent that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational

radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22 (c)(9). Therefore, pursuant to 10CFR51.22 (b), an environmental assessment of the proposed change is not required.

9.0 PRECEDENTS

The TS changes requested in this amendment application are identical to those previously approved for H. B. Robinson Steam Electric Plant Unit 2 and are based on changes approved in TSTF-286, Revision 2. See Appendix A for additional discussion.

10.0 REFERENCES

1. Callaway Plant License Amendment 133 dated May 28, 1999, Conversion to Improved Technical Specifications.

2. H. B. Robinson Steam Electric Plant Unit 2 License Amendment 190 dated March 14, 2001.

3. Industry/TSTF Standard Technical Specification Change Traveler TSTF-286, Revision 2, "Define 'Operations Involving Positive Reactivity Additions'."

ATTACHMENT TWO

MARKUP OF TECHNICAL SPECIFICATIONS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. Two Intermediate Range Neutron Flux channels inoperable.	INSERT 1 ~~G.1 Suspend operations involving positive reactivity additions.~~ AND G.2 Reduce THERMAL POWER to < P-6.	Immediately 2 hours
H. Not used.		
I. One Source Range Neutron Flux channel inoperable.	INSERT 2 ~~I.1 Suspend operations involving positive reactivity additions.~~	Immediately
J. Two Source Range Neutron Flux channels inoperable.	J.1 Open reactor trip breakers (RTBs).	Immediately

(continued)

INSERT 1

G.1	----------NOTE---------- Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed. ---------- Suspend operations involving positive reactivity additions.

INSERT 2

I.1	----------NOTE---------- Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed. ---------- Suspend operations involving positive reactivity additions.

3.3 INSTRUMENTATION

3.3.9 Boron Dilution Mitigation System (BDMS)

LCO 3.3.9 Two trains of the BDMS shall be OPERABLE and one RCS loop shall be in operation.

APPLICABILITY: MODES 2 (below P-6 (Intermediate Range Neutron Flux) interlock), 3, 4, and 5.

---------- NOTE ----------
The boron dilution flux multiplication signal may be blocked in MODES 2 (below P-6 (Intermediate Range Neutron Flux) interlock) and 3 during reactor startup.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One train inoperable.	A.1 Restore train to OPERABLE status.	72 hours
B. Two trains inoperable. OR Required Action and associated Completion Time of Condition A not met.	~~B.1~~ ~~Suspend operations involving positive reactivity additions.~~ INSERT 3 AND	Immediately

(continued)

INSERT 3

B.1	----------NOTE---------- Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM. ---------- Suspend operations involving positive reactivity additions.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.5 RCS Loops - MODE 3

LCO 3.4.5 Two RCS loops shall be OPERABLE, and either:

a. Two RCS loops shall be in operation when the Rod Control System is capable of rod withdrawal; or

b. One RCS loop shall be in operation when the Rod Control System is not capable of rod withdrawal.

---NOTE---

All reactor coolant pumps may be removed from operation for ≤ 1 hour per 8 hour period provided:

a. ~~No operations are permitted that would cause reduction of the RCS boron concentration; and~~ INSERT 4

b. Core outlet temperature is maintained at least 10°F below saturation temperature.

APPLICABILITY: MODE 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required RCS loop inoperable.	A.1	Restore required RCS loop to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 4.	12 hours

(continued)

INSERT 4

No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One required RCS loop not in operation with Rod Control System capable of rod withdrawal.	C.1	Restore required RCS loop to operation.	1 hour
	OR		
	C.2	Place the Rod Control System in a condition incapable of rod withdrawal.	1 hour
D. Required RCS loops inoperable. OR No RCS loop in operation.	D.1	Place the Rod Control System in a condition incapable of rod withdrawal.	Immediately
	AND		
	D.2	INSERT 5 ~~Suspend all operations involving a reduction of RCS boron concentration.~~	Immediately
	AND		
	D.3	Initiate action to restore one RCS loop to OPERABLE status and operation.	Immediately

INSERT 5

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops - MODE 4

LCO 3.4.6 Two loops consisting of any combination of RCS loops and residual heat removal (RHR) loops shall be OPERABLE, and one loop shall be in operation.

---------- NOTES ----------

1. All reactor coolant pumps (RCPs) and RHR pumps may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. ~~No operations are permitted that would cause reduction of the RCS boron concentration; and~~ INSERT 4

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. No RCP shall be started with any RCS cold leg temperature ≤ 275°F unless the secondary side water temperature of each steam generator (SG) is ≤ 50°F above each of the RCS cold leg temperatures.

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required loop inoperable.	A.1	Initiate action to restore a second loop to OPERABLE status.	Immediately
	AND		
	A.2	---------- NOTE ---------- Only required if one RHR loop is OPERABLE. ----------	
		Be in MODE 5.	24 hours

(continued)

INSERT 4

No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required loops inoperable. OR No RCS or RHR loop in operation.	B.1 INSERT 5 ~~Suspend all operations involving a reduction of RCS boron concentration.~~ AND B.2 Initiate action to restore one loop to OPERABLE status and operation.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.6.1	Verify one RHR or RCS loop is in operation.	12 hours
SR 3.4.6.2	Verify SG secondary side narrow range water levels are $\geq$ 4% for required RCS loops.	12 hours
SR 3.4.6.3	Verify correct breaker alignment and indicated power are available to the required pump that is not in operation.	7 days

INSERT 5

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops - MODE 5, Loops Filled

LCO 3.4.7 One residual heat removal (RHR) loop shall be OPERABLE and in operation, and either:

a. One additional RHR loop shall be OPERABLE; or

b. The secondary side wide range water level of at least two steam generators (SGs) shall be ≥ 66%.

---------- NOTES ----------

1. The RHR pump of the loop in operation may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. ~~No operations are permitted that would cause reduction of the RCS boron concentration; and~~ INSERT 4

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

3. No reactor coolant pump shall be started with any RCS cold leg temperature ≤ 275°F unless the secondary side water temperature of each SG is ≤ 50°F above each of the RCS cold leg temperatures.

4. All RHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation.

APPLICABILITY: MODE 5 with RCS loops filled.

INSERT 4

No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One RHR loop inoperable. AND Required SGs secondary side water levels not within limits.	A.1	Initiate action to restore a second RHR loop to OPERABLE status. OR	Immediately
	A.2	Initiate action to restore required SG secondary side water levels to within limits.	Immediately
B. Required RHR loops inoperable. OR No RHR loop in operation.	B.1	INSERT 5 ~~Suspend all operations involving a reduction of RCS boron concentration.~~ AND	Immediately
	B.2	Initiate action to restore one RHR loop to OPERABLE status and operation.	Immediately

INSERT 5

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops - MODE 5, Loops Not Filled

LCO 3.4.8 Two residual heat removal (RHR) loops shall be OPERABLE and one RHR loop shall be in operation.

---------- NOTES ----------

1. All RHR pumps may be removed from operation for ≤ 1 hour provided:

   a. The core outlet temperature is maintained at least 10°F below saturation temperature.

   b. ~~No operations are permitted that would cause a reduction of the RCS boron concentration; and~~ INSERT 4

   c. No draining operations to further reduce the RCS water volume are permitted.

2. One RHR loop may be inoperable for ≤ 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

APPLICABILITY: MODE 5 with RCS loops not filled.

---------- NOTE ----------

While this LCO is not met, entry into MODE 5, Loops Not Filled from MODE 5, Loops Filled is not permitted.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RHR loop inoperable.	A.1 Initiate action to restore RHR loop to OPERABLE status.	Immediately

(continued)

INSERT 4

No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. Required RHR loops inoperable. OR No RHR loop in operation.	B.1	INSERT 5 ~~Suspend all operations involving reduction in RCS boron concentration.~~	Immediately
	AND		
	B.2	Initiate action to restore one RHR loop to OPERABLE status and operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.8.1	Verify one RHR loop is in operation.	12 hours
SR 3.4.8.2	Verify correct breaker alignment and indicated power are available to the required RHR pump that is not in operation.	7 days

INSERT 5

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required offsite circuit inoperable. (continued)	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	INSERT 6 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND		
	A.2.4	Initiate action to restore required offsite power circuit to OPERABLE status.	Immediately
B. One required DG inoperable.	B.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	B.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	B.3	INSERT 6 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND		
	B.4	Initiate action to restore required DG to OPERABLE status.	Immediately

(continued)

INSERT 6

Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The Train A or Train B DC electrical power subsystem shall be OPERABLE to support one train of the DC electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required DC electrical power subsystem inoperable.	A.1	Declare affected required feature(s) inoperable.	Immediately
	OR		
	A.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	INSERT 6 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND		
	A.2.4	Initiate action to restore required DC electrical power subsystem to OPERABLE status.	Immediately

INSERT 6

Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

3.8 ELECTRICAL POWER SYSTEMS

3.8.8 Inverters - Shutdown

LCO 3.8.8 The Train A or Train B inverters shall be OPERABLE to support one train of the onsite Class 1E AC vital bus electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required inverters inoperable.	A.1	Declare affected required feature(s) inoperable.	Immediately
	OR		
	A.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	INSERT 6 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND		
	A.2.4	Initiate action to restore required inverters to OPERABLE status.	Immediately

INSERT 6

Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems - Shutdown

LCO 3.8.10 The necessary portion of the Train A or Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE to support one train of equipment required to be OPERABLE.

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required AC, DC, or AC vital bus electrical power distribution subsystems inoperable.	A.1	Declare associated supported required feature(s) inoperable.	Immediately
	OR		
	A.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	INSERT 6 ~~Initiate action to suspend operations involving positive reactivity additions.~~	Immediately
	AND		

(continued)

INSERT 6

Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.

3.9 REFUELING OPERATIONS

3.9.3 Nuclear Instrumentation

LCO 3.9.3 Two source range neutron flux monitors shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required source range neutron flux monitor inoperable.	A.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2	INSERT 7 ~~Suspend positive reactivity additions.~~	Immediately
B. Two required source range neutron flux monitors inoperable.	B.1	Initiate action to restore one source range neutron flux monitor to OPERABLE status.	Immediately
	AND		
	B.2	Perform SR 3.9.1.1.	Once per 12 hours

INSERT 7

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1.

3.9 REFUELING OPERATIONS

3.9.5 Residual Heat Removal (RHR) and Coolant Circulation - High Water Level

LCO 3.9.5 One RHR loop shall be OPERABLE and in operation.

---------- NOTE ----------
The required RHR loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause ~~reduction of the Reactor Coolant System boron concentration.~~ INSERT 8

APPLICABILITY: MODE 6 with the water level ≥ 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. RHR loop requirements not met.	A.1	INSERT 7 ~~Suspend operations involving a reduction in reactor coolant boron concentration.~~	Immediately
	AND		
	A.2	Suspend loading irradiated fuel assemblies in the core.	Immediately
	AND		
	A.3	Initiate action to satisfy RHR loop requirements.	Immediately
	AND		
	A.4	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

INSERT 8

introduction into the Reactor Coolant System, coolant with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1.

INSERT 7

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. No RHR loop in operation.	B.1	INSERT 7 ~~Suspend operations involving a reduction in reactor coolant boron concentration.~~	Immediately
	AND		
	B.2	Initiate action to restore one RHR loop to operation.	Immediately
	AND		
	B.3	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.6.1	Verify one RHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ 1000 gpm.	12 hours
SR 3.9.6.2	Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	7 days

INSERT 7

Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1.

ATTACHMENT THREE

RETYPED TECHNICAL SPECIFICATIONS

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
G. Two Intermediate Range Neutron Flux channels inoperable.	G.1	----------***NOTE***---------- ***Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed.*** ---------- Suspend operations involving positive reactivity additions.	Immediately
	AND		
	G.2	Reduce THERMAL POWER to < P-6.	2 hours
H. Not used.			
I. One Source Range Neutron Flux channel inoperable.	I.1	----------***NOTE***---------- ***Limited boron concentration changes associated with RCS inventory control or limited plant temperature changes are allowed.*** ---------- Suspend operations involving positive reactivity additions.	Immediately
J. Two Source Range Neutron Flux channels inoperable.	J.1	Open reactor trip breakers (RTBs).	Immediately

(continued)

3.3 INSTRUMENTATION

3.3.9 Boron Dilution Mitigation System (BDMS)

LCO 3.3.9 Two trains of the BDMS shall be OPERABLE and one RCS loop shall be in operation.

APPLICABILITY: MODES 2 (below P-6 (Intermediate Range Neutron Flux) interlock), 3, 4, and 5.

---NOTE---
The boron dilution flux multiplication signal may be blocked in MODES 2 (below P-6 (Intermediate Range Neutron Flux) interlock) and 3 during reactor startup.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One train inoperable.	A.1	Restore train to OPERABLE status.	72 hours
B. Two trains inoperable. OR Required Action and associated Completion Time of Condition A not met.	B.1	***----------NOTE----------*** ***Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM.*** ***----------*** Suspend operations involving positive reactivity additions.	Immediately
	AND		

(continued)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.5 RCS Loops - MODE 3

LCO 3.4.5 Two RCS loops shall be OPERABLE, and either:

a. Two RCS loops shall be in operation when the Rod Control System is capable of rod withdrawal; or

b. One RCS loop shall be in operation when the Rod Control System is not capable of rod withdrawal.

---NOTE---

All reactor coolant pumps may be removed from operation for $\leq$ 1 hour per 8 hour period provided:

a. ***No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and***

b. Core outlet temperature is maintained at least 10°F below saturation temperature.

APPLICABILITY: MODE 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required RCS loop inoperable.	A.1	Restore required RCS loop to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	Be in MODE 4.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One required RCS loop not in operation with Rod Control System capable of rod withdrawal.	C.1	Restore required RCS loop to operation.	1 hour
	OR		
	C.2	Place the Rod Control System in a condition incapable of rod withdrawal.	1 hour
D. Required RCS loops inoperable. OR No RCS loop in operation.	D.1	Place the Rod Control System in a condition incapable of rod withdrawal.	Immediately
	AND		
	D.2	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.***	Immediately
	AND		
	D.3	Initiate action to restore one RCS loop to OPERABLE status and operation.	Immediately

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops - MODE 4

LCO 3.4.6 Two loops consisting of any combination of RCS loops and residual heat removal (RHR) loops shall be OPERABLE, and one loop shall be in operation.

---------- NOTES ----------

1. All reactor coolant pumps (RCPs) and RHR pumps may be removed from operation for $\leq$ 1 hour per 8 hour period provided:

   a. ***No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and***

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. No RCP shall be started with any RCS cold leg temperature $\leq$ 275°F unless the secondary side water temperature of each steam generator (SG) is $\leq$ 50°F above each of the RCS cold leg temperatures.

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required loop inoperable.	A.1	Initiate action to restore a second loop to OPERABLE status.	Immediately
	AND		
	A.2	---------- NOTE ---------- Only required if one RHR loop is OPERABLE. ----------	
		Be in MODE 5.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. Required loops inoperable. OR No RCS or RHR loop in operation.	B.1	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.***	Immediately
	AND		
	B.2	Initiate action to restore one loop to OPERABLE status and operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.6.1	Verify one RHR or RCS loop is in operation.	12 hours
SR 3.4.6.2	Verify SG secondary side narrow range water levels are $\geq$ 4% for required RCS loops.	12 hours
SR 3.4.6.3	Verify correct breaker alignment and indicated power are available to the required pump that is not in operation.	7 days

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops - MODE 5, Loops Filled

LCO 3.4.7 One residual heat removal (RHR) loop shall be OPERABLE and in operation, and either:

a. One additional RHR loop shall be OPERABLE; or

b. The secondary side wide range water level of at least two steam generators (SGs) shall be $\geq$ 66%.

---------- NOTES----------

1. The RHR pump of the loop in operation may be removed from operation for $\leq$ 1 hour per 8 hour period provided:

   a. ***No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and***

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

3. No reactor coolant pump shall be started with any RCS cold leg temperature $\leq$ 275°F unless the secondary side water temperature of each SG is $\leq$ 50°F above each of the RCS cold leg temperatures.

4. All RHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation.

APPLICABILITY: MODE 5 with RCS loops filled.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One RHR loop inoperable. AND Required SGs secondary side water levels not within limits.	A.1	Initiate action to restore a second RHR loop to OPERABLE status. OR	Immediately
	A.2	Initiate action to restore required SG secondary side water levels to within limits.	Immediately
B. Required RHR loops inoperable. OR No RHR loop in operation.	B.1	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.*** AND	Immediately
	B.2	Initiate action to restore one RHR loop to OPERABLE status and operation.	Immediately

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops - MODE 5, Loops Not Filled

LCO 3.4.8 Two residual heat removal (RHR) loops shall be OPERABLE and one RHR loop shall be in operation.

---NOTES---

1. All RHR pumps may be removed from operation for $\leq$ 1 hour provided:

   a. The core outlet temperature is maintained at least 10°F below saturation temperature.

   b. ***No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and***

   c. No draining operations to further reduce the RCS water volume are permitted.

2. One RHR loop may be inoperable for $\leq$ 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

APPLICABILITY: MODE 5 with RCS loops not filled.

---NOTE---

While this LCO is not met, entry into MODE 5, Loops Not Filled from MODE 5, Loops Filled is not permitted.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RHR loop inoperable.	A.1 Initiate action to restore RHR loop to OPERABLE status.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. Required RHR loops inoperable. OR No RHR loop in operation.	B.1	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet SDM of LCO 3.1.1.***	Immediately
	AND		
	B.2	Initiate action to restore one RHR loop to OPERABLE status and operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.8.1	Verify one RHR loop is in operation.	12 hours
SR 3.4.8.2	Verify correct breaker alignment and indicated power are available to the required RHR pump that is not in operation.	7 days

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required offsite circuit inoperable. (continued)	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	***Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.***	Immediately
	AND		
	A.2.4	Initiate action to restore required offsite power circuit to OPERABLE status.	Immediately
B. One required DG inoperable.	B.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	B.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	B.3	***Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.***	Immediately
	AND		

(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One required DG inoperable. (continued)	B.4 Initiate action to restore required DG to OPERABLE status.	Immediately
C. One required LSELS (shutdown portion) inoperable.	C.1 Declare the affected DG and offsite circuit inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.2.1	----------NOTE ---------- The following SRs are not required to be performed: SR 3.8.1.3, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.14 through SR 3.8.1.16, and SR 3.8.1.18, (Shutdown Load Sequencer only). ----------	
	For AC 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 SR 3.8.1.4 SR 3.8.1.5 SR 3.8.1.6 SR 3.8.1.7 SR 3.8.1.10 SR 3.8.1.11 SR 3.8.1.14 SR 3.8.1.15 SR 3.8.1.16 SR 3.8.1.18 (shutdown load sequencer only) SR 3.8.1.21 (shutdown load sequencer only)	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5 The Train A or Train B DC electrical power subsystem shall be OPERABLE to support one train of the DC electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required DC electrical power subsystem inoperable.	A.1	Declare affected required feature(s) inoperable.	Immediately
	OR		
	A.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	***Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.***	Immediately
	AND		
			(continued)

ACTIONS

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.5.1	----------NOTE ---------- The following SRs are not required to be performed: SR 3.8.4.6, SR 3.8.4.7, and SR 3.8.4.8. ----------	
	For DC sources required to be OPERABLE, 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

3.8 ELECTRICAL POWER SYSTEMS

3.8.8 Inverters - Shutdown

LCO 3.8.8 The Train A or Train B inverters shall be OPERABLE to support one train of the onsite Class 1E AC vital bus electrical power distribution subsystems required by LCO 3.8.10, "Distribution Systems - Shutdown."

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required inverters inoperable.	A.1	Declare affected required feature(s) inoperable.	Immediately
	OR		
	A.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	***Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.***	Immediately
	AND		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (continued)	A.2.4 Initiate action to restore required inverters to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.8.1	Verify correct inverter voltage, and alignments to required AC vital buses.	7 days

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems - Shutdown

LCO 3.8.10 The necessary portion of the Train A or Train B AC, DC, and AC vital bus electrical power distribution subsystems shall be OPERABLE to support one train of equipment required to be OPERABLE.

APPLICABILITY: MODES 5 and 6

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required AC, DC, or AC vital bus electrical power distribution subsystems inoperable.	A.1	Declare associated supported required feature(s) inoperable.	Immediately
	OR		
	A.2.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2.2	Suspend movement of irradiated fuel assemblies.	Immediately
	AND		
	A.2.3	***Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.***	Immediately
	AND		

(continued)

3.9 REFUELING OPERATIONS

3.9.3 Nuclear Instrumentation

LCO 3.9.3 Two source range neutron flux monitors shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required source range neutron flux monitor inoperable.	A.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	A.2	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1.***	Immediately
B. Two required source range neutron flux monitors inoperable.	B.1	Initiate action to restore one source range neutron flux monitor to OPERABLE status.	Immediately
	AND		
	B.2	Perform SR 3.9.1.1.	Once per 12 hours

3.9 REFUELING OPERATIONS

3.9.5 Residual Heat Removal (RHR) and Coolant Circulation - High Water Level

LCO 3.9.5 One RHR loop shall be OPERABLE and in operation.

---NOTE---

The required RHR loop may be removed from operation for ≤ 1 hour per 8 hour period, provided no operations are permitted that would cause ***introduction into the Reactor Coolant System, coolant with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1.***

APPLICABILITY: MODE 6 with the water level ≥ 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. RHR loop requirements not met.	A.1	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1.***	Immediately
	AND		
	A.2	Suspend loading irradiated fuel assemblies in the core.	Immediately
	AND		
			(continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.3	Initiate action to satisfy RHR loop requirements.	Immediately
	AND		
	A.4	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify one RHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ 1000 gpm.	12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. No RHR loop in operation.	B.1	***Suspend operations that would cause introduction into the RCS, coolant with boron concentration less than required to meet the boron concentration of LCO 3.9.1.***	Immediately
	AND		
	B.2	Initiate action to restore one RHR loop to operation.	Immediately
	AND		
	B.3	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.6.1	Verify one RHR loop is in operation and circulating reactor coolant at a flow rate of $\geq$ 1000 gpm.	12 hours
SR 3.9.6.2	Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	7 days

ATTACHMENT FOUR

PROPOSED TECHNICAL SPECIFICATION BASES CHANGES

BASES

ACTIONS

G.1 and G.2 (continued)

Below P-6, the Source Range Neutron Flux channels will be able to monitor the core power level. The Completion Time of 2 hours will allow a slow and controlled power reduction to less than the P-6 setpoint and takes into account the low probability of occurrence of an event during this period that may require the protection afforded by the NIS Intermediate Range Neutron Flux trip.

INSERT BASES 1

H.1

Not used.

I.1

Condition I applies to one inoperable Source Range Neutron Flux trip channel when in MODE 2 below the P-6 setpoint. With the unit in this Condition, below P-6, the NIS source range performs the monitoring and protection functions. With one of the two channels inoperable, operations involving positive reactivity additions shall be suspended immediately.

This will preclude any power escalation. With only one source range channel OPERABLE, core protection is severely reduced and any actions that add positive reactivity to the core must be suspended immediately.

INSERT BASES 2

J.1

Condition J applies to two inoperable Source Range Neutron Flux trip channels when in MODE 2 below the P-6 setpoint or in MODE 3, 4, or 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. With the unit in this Condition, below P-6, the NIS source range performs the monitoring and protection functions. With both source range channels inoperable, the Reactor Trip Breakers (RTBs) must be opened immediately. With the RTBs open, the core is in a more stable condition.

K.1, K.2.1, and K.2.2

Condition K applies to one inoperable source range channel in MODE 3, 4, or 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. With the unit in this Condition, below P-6,

(continued)

INSERT BASES 1

Required Action G.1 is modified by a Note to indicate that normal plant control operations that individually add limited positive reactivity (i.e., temperature or boron concentration fluctuations associated with RCS inventory management or temperature control) are not precluded by this Action, provided the SDM limits specified in the COLR are met and the requirements of LCOs 3.1.5, 3.1.6, and 3.4.2 are met.

INSERT BASES 2

Required Action I.1 is modified by a Note to indicate that normal plant control operations that individually add limited positive reactivity (i.e., temperature or boron concentration fluctuations associated with RCS inventory management or temperature control) are not precluded by this Action, provided the SDM limits specified in the COLR are met, the requirements of LCOs 3.1.5, 3.1.6, and 3.4.2 are met, and the initial and critical boron concentration assumptions in FSAR Section 15.4.6 (Ref. 16) are satisfied. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when one source range neutron flux channel is inoperable.

BASES

ACTIONS

K.1, K.2.1, and K.2.2 (continued)

the NIS source range performs the monitoring and protection functions. With one of the source range channels inoperable, 48 hours is allowed to restore it to an OPERABLE status. If the channel cannot be returned to an OPERABLE status, action must be initiated within the same 48 hours to fully insert all rods. One additional hour is allowed to place the Rod Control System in a condition incapable of rod withdrawal (e.g., by de-energizing all CRDMs, by opening the RTBs, or de-energizing the motor generator (MG) sets). Once these ACTIONS are completed, the core is in a more stable condition. The allowance of 48 hours to restore the channel to OPERABLE status, and the additional hour to place the Rod Control System in a condition incapable of rod withdrawal, are justified in Reference 5. INSERT BASES 2A

L.1, L.2, and L.3

Not used.

M.1 and M.2

Condition M applies to the following reactor trip Functions:

- Pressurizer Pressure - Low;
- Pressurizer Water Level - High;
- Reactor Coolant Flow - Low;
- Undervoltage RCPs; and
- Underfrequency RCPs.

With one channel inoperable, the inoperable channel must be placed in the tripped condition within 6 hours. For the Pressurizer Pressure - Low, Pressurizer Water Level - High, Undervoltage RCPs, and Underfrequency RCPs trip Functions, placing the channel in the tripped condition when above the P-7 setpoint results in a partial trip condition requiring only one additional channel to initiate a reactor trip. For the Reactor Coolant Flow - Low trip Function, placing the channel in the tripped condition when above the P-8 setpoint results in a partial trip condition requiring only one additional channel in the same loop to initiate a reactor trip. For the Reactor Coolant Flow - Low trip Function, two tripped channels in two

(continued)

INSERT BASES 2A

Normal plant control operations that individually add limited positive reactivity (i.e., temperature or boron concentration fluctuations associated with RCS inventory management or temperature control) are permitted provided the SDM limits specified in the COLR are met and the initial and critical boron concentration assumptions in FSAR Section 15.4.6 (Ref. 16) are satisfied. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when one source range neutron flux channel is inoperable.

BASES

REFERENCES (continued)

8. FSAR Section 16.3, Table 16.3-1.

9. WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," January 1996.

10. RFR-16940A.

11. WCAP-9226, "Reactor Core Response to Excessive Secondary Steam Releases," Revision 1, January 1978.

12. NRC Generic Letter 85-09 dated May 23, 1985.

13. FSAR Section 15.1.1.

14. RFR - 18637A.

15. WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," October 1998.

16. FSAR Section 15.4.6.

B 3.3 INSTRUMENTATION

B 3.3.9 Boron Dilution Mitigation System (BDMS)

BASES

BACKGROUND

The primary purpose of the BDMS is to mitigate the consequences of the inadvertent addition of unborated primary grade water into the Reactor Coolant System (RCS) when the plant is in MODES 2 (below P-6 setpoint), 3, 4, and 5.

The BDMS utilizes two channels of source range instrumentation. Each source range channel provides a signal to its microprocessor, which continuously records the counts per minute. At the end of each discrete one-minute interval, an algorithm compares the average counts per minute value (flux rate) of that 1 minute interval with the average counts per minute value for the previous nine, 1 minute intervals. If the flux rate during a 1 minute interval is greater than or equal to 1.7 times the flux rate during any of the prior nine 1 minute intervals, the BDMS provides a signal to initiate mitigating actions.

Upon detection of a flux multiplication by either source range instrumentation train, an alarm is sounded to alert the operator and valve movement is automatically initiated to terminate the dilution and start boration. Valves that isolate the refueling water storage tank (RWST) are opened to supply borated water to the suction of the centrifugal charging pumps, and valves which isolate the Volume Control Tank are closed to terminate the dilution.

APPLICABLE SAFETY ANALYSES

The BDMS senses abnormal increases in source range counts per minute (flux rate) and actuates VCT and RWST valves to mitigate the consequences of an inadvertent boron dilution event as described in Reference 1. The accident analyses rely on automatic BDMS actuation to mitigate the consequences of inadvertent boron dilution events. The operation of one RCS loop in MODES 2 (below P-6 setpoint), 3, 4, and5 provides adequate flow to ensure mixing, prevent stratification, and produce gradual reactivity changes during RCS boron concentration reductions. The reactivity change rate associated with boron reduction will, therefore, be within the transient mitigation capability of the BDMS. With no reactor coolant loop in operation in the above MODES, boron dilutions must be terminated and dilution sources isolated. The boron dilution analysis in these MODES takes credit for the mixing volume associated with having at least one reactor coolant loop in operation.

in MODES 3, 4, and 5. The MODE 2 analysis in Reference 1 credits the source range reactor trip function, in conjunction with operator action.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The event is successfully terminated after the volume of water from the normally closed RWST suction isolation valves to the RCS via the normal charging flow path is purged and inadvertent criticality is avoided. The primary success path for mitigation is fulfilled when the VCT suction path is isolated; however, the analysis also accounts for the volume of CVCS piping from the RWST to the RCS that must be purged since its boron content is dependent on time in cycle life and may itself represent a dilution source.

The BDMS satisfies Criterion 3 of 10CFR50.36(c)(2)(ii).

LCO

LCO 3.3.9 provides the requirements for OPERABILITY of the instrumentation that provides control room indication of core neutron levels, and that mitigates the consequences of a boron dilution event. Two redundant trains are required to be OPERABLE to provide protection against single failure. In addition, LCO 3.3.9 requires that one RCS loop shall be in operation.

Because the BDMS utilizes the source range instrumentation in its detection system, the OPERABILITY of that portion of the detection system is also part of the OPERABILITY of the Reactor Trip System. The flux multiplication algorithm, the alarms, and signals to the motor control centers for the suction valves all must be OPERABLE for a train in the system to be considered OPERABLE. As required for this LCO, the BDMS extends to, and includes, the RWST suction isolation valves (BNLCV0112D, E) and the VCT suction isolation valves (BGLCV0112B, C).

With insufficient RCS mixing volume, i.e. no RCS loop in operation, Condition C must be entered.

APPLICABILITY

The BDMS must be OPERABLE in MODES 2 (below P-6 setpoint), 3, 4, and 5 because the safety analysis identifies this system as the primary means to mitigate an inadvertent boron dilution of the RCS in MODES 3, 4, and 5 and the P-6 setpoint establishes the point at which RTS protection is shifted to the intermediate range neutron flux channels. The BDMS OPERABILITY requirements are not applicable in MODES 1 and 2 (above P-6 setpoint) because an inadvertent boron dilution would be terminated by Overtemperature ΔT or operator action. The Overtemperature ΔT trip Function is discussed in LCO 3.3.1, "RTS Instrumentation."

(continued)

BASES

APPLICABILITY (continued)

In MODE 6, a dilution event is precluded by locked valves (BGV0178 and BGV0601) that isolate the RCS from the potential source of unborated water (according to LCO 3.9.2, "Unborated Water Source Isolation Valves").

The Applicability is modified by a Note that allows the boron dilution flux multiplication signal to be blocked during reactor startup in MODE 2 (below P-6 setpoint) and MODE 3. Blocking the flux multiplication signal is acceptable during startup provided the reactor trip breakers are closed with the intent to withdraw rods for startup. The P-6 interlock provides a backup block signal to the source range flux multiplication circuit.

ACTIONS

The most common cause of channel inoperability is outright failure or drift of the bistable or process module sufficient to exceed the tolerance allowed by the unit specific calibration procedure. Typically, the drift is found to be small and results in a delay of actuation rather than a total loss of function. This determination of setpoint drift is generally made during the performance of a COT when the process instrumentation is set up for adjustment to bring it to within specification. If the Trip Setpoint is less conservative than the tolerance specified by the calibration procedure, the channel must be declared inoperable immediately and the appropriate Condition entered.

A.1

With one train of the BDMS inoperable, Required Action A.1 requires that the inoperable train must be restored to OPERABLE status within 72 hours. In this Condition, the remaining BDMS train is adequate to provide protection. The 72 hour Completion Time is based on the BDMS Function and is consistent with Engineered Safety Feature Actuation System Completion Times for loss of one redundant train. Also, the remaining OPERABLE train provides continuous indication of core power status to the operator, has an alarm function, and sends a signal to both trains of the BDMS to assure system actuation.

INSERT BASES 3

B.1, B.2, B.3.1, and B.3.2

With two trains inoperable, or the Required Action and associated Completion Time of Condition A not met, the initial action (Required Action B.1) is to suspend all operations involving positive reactivity additions immediately. This includes withdrawal of control or shutdown rods and intentional boron dilution.

(continued)

INSERT BASES 3

Administrative controls require operator awareness during all reactivity manipulations. These administrative controls include:

- Reactivity management briefs of the Control Room Operations Staff (typically conducted at the beginning of each shift);
- Use of self-verification techniques by all licensed operators performing core reactivity manipulations;
- Peer checks for all reactivity manipulations during routine operations and for all positive reactivity additions during transient or off-normal operations;
- Off-normal procedures are available that address reactor makeup control system (RMCS) malfunctions and potential loss of shutdown margin (SDM).

During any and all rod motion, operators monitor all available indications of nuclear power. During RCS boron concentration change evolutions, operators observe the various indications and alarms provided in the RMCS design for monitoring proper system operation as discussed in FSAR Section 15.4.6 (Reference 1). Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when one BDMS train is inoperable.

BASES

ACTIONS

B.1, B.2, B.3.1, and B.3.2 (continued)

Required Action B.2 verifies the SDM according to SR 3.1.1.1 within 1 hour and once per 12 hours thereafter. This action is intended to confirm that no unintended boron dilution has occurred while the BDMS was inoperable, and that the required SDM has been maintained. The specified Completion Time takes into consideration sufficient time for the initial determination of SDM and other information available in the control room related to SDM.

Required Action B.3.1 requires valves listed in LCO 3.9.2 (Required Action A.2), BGV0178 and BGV0601, to be secured to prevent the flow of unborated water into the RCS. Once it is recognized that two trains of the BDMS are inoperable, the operators will be aware of the possibility of a boron dilution, and the 4 hour Completion Time is adequate to complete the requirements of LCO 3.9.2. The recurring 31 day verification of Required Action B.3.2 ensures these valves remain closed for an extended Condition B entry.

INSERT BASES 3A

C.1 and C.2

Condition C is entered with no RCS loop in operation. The operation of one RCS loop provides adequate flow to ensure mixing, prevent stratification, and produce gradual reactivity changes during RCS boron concentration reductions. The reactivity change rate associated with boron reduction will, therefore, be within the transient mitigation capability of the Boron Dilution Mitigation System (BDMS). With no reactor coolant loop in operation, dilution sources must be isolated. The boron dilution analysis takes credit for the mixing volume associated with having at least one reactor coolant loop in operation.

Required Action C.1 requires that valves BGV0178 and BGV0601 be closed and secured to prevent the flow of unborated water into the RCS. The 4 hour Completion Time is adequate to perform these local valve manipulations. The recurring 31 day verification of Required Action C.2 ensures these valves remain closed and secured for an extended Condition C entry.

(continued)

INSERT BASES 3A

Required Action B.1 is modified by a Note which permits plant temperature changes provided the temperature change is accounted for in the calculated SDM. Introduction of temperature changes, including temperature increases when a positive MTC exists, must be evaluated to ensure they do not result in a loss of required SDM.

BASES

LCO (continued)

Utilization of the Note is permitted provided the following conditions are met, along with any other conditions imposed by test procedures:

INSERT BASES 4

a. No operations are permitted that would dilute the RCS boron concentration ~~thereby maintaining the margin to criticality. Boron reduction~~ is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

An OPERABLE RCS loop consists of one OPERABLE RCP and one OPERABLE SG in accordance with the Steam Generator Tube Surveillance Program, which has the minimum water level specified in SR 3.4.5.2. An RCP is OPERABLE if it is capable of being powered and is able to provide forced flow if required.

APPLICABILITY

In MODE 3, this LCO ensures forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. The most stringent condition of the LCO, that is, two RCS loops OPERABLE and two RCS loops in operation, applies to MODE 3 with the Rod Control System capable of rod withdrawal. The least stringent condition, that is, two RCS loops OPERABLE and one RCS loop in operation, applies to MODE 3 with the Rod Control System not capable of rod withdrawal.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2";
LCO 3.4.6, "RCS Loops - MODE 4";
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6).

(continued)

INSERT BASES 4

with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1, thereby maintaining the margin to criticality. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation. Boron dilution with coolant at boron concentrations less than required to assure the SDM is maintained

BASES

ACTIONS

D.1, D.2, and D.3 (continued)

INSERT BASES 6

sets). All operations involving ~~a reduction of RCS boron concentration~~ must be suspended, and action to restore one of the RCS loops to OPERABLE status and operation must be initiated. Boron dilution requires forced circulation for proper mixing, and defeating the Rod Control System removes the possibility of an inadvertent rod withdrawal. The immediate Completion Time reflects the importance of maintaining operation for heat removal. The action to restore must be continued until one loop is restored to OPERABLE status and operation.

INSERT BASES 7

SURVEILLANCE REQUIREMENTS

SR 3.4.5.1

This SR requires verification every 12 hours that the required loops are in operation. Verification may include flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RCS loop performance.

SR 3.4.5.2

SR 3.4.5.2 requires verification of SG OPERABILITY. SG OPERABILITY is verified by ensuring that the secondary side narrow range water level is $\geq$ 4% for required RCS loops. If the SG secondary side narrow range water level is < 4%, the tubes may become uncovered and the associated loop may not be capable of providing the heat sink for removal of the decay heat. The 12 hour Frequency is considered adequate in view of other indications available in the control room to alert the operator to a loss of SG level.

SR 3.4.5.3

Verification that the required RCPs are OPERABLE ensures that safety analyses limits are met. The requirement also ensures that an additional RCP can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power availability to the required RCPs.

REFERENCES

1. FSAR Section 15.4.6.

INSERT BASES 6

introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1

INSERT BASES 7

Suspending the introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation, consistent with Required Action C.1 of LCO 3.3.9, "Boron Dilution Mitigation System (BDMS)."

BASES (continued)

LCO

The purpose of this LCO is to require that at least two loops be OPERABLE in MODE 4 and that one of these loops be in operation. The LCO allows the two loops that are required to be OPERABLE to consist of any combination of RCS loops and RHR loops. Any one loop in operation provides enough flow to remove the decay heat from the core with forced circulation. An additional loop is required to be OPERABLE to provide redundancy for heat removal.

Note 1 permits all RCPs or RHR pumps to be removed from operation for ≤ 1 hour per 8 hour period. The purpose of the Note is to permit tests that are required to be performed without flow or pump noise. The 1 hour time period is adequate to perform the necessary testing, and operating experience has shown that boron stratification is not a problem during this short period with no forced flow.

Utilization of Note 1 is permitted provided the following conditions are met along with any other conditions imposed by test procedures:

INSERT BASES 4

a. No operations are permitted that would dilute the RCS boron concentration ~~, thereforе maintaining the margin to criticality. Boron reduction~~ is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 requires that the secondary side water temperature of each SG be ≤ 50°F above each of the RCS cold leg temperatures before the start of an RCP with any RCS cold leg temperature ≤ 275°F. This restraint is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

An OPERABLE RCS loop is comprised of an OPERABLE RCP and an OPERABLE SG in accordance with the Steam Generator Tube Surveillance Program, which has the minimum water level specified in SR 3.4.6.2.

Similarly for the RHR System, an OPERABLE RHR loop comprises an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RCPs and RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required.

(continued)

INSERT BASES 4

with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1, thereby maintaining the margin to criticality. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation. Boron dilution with coolant at boron concentrations less than required to assure the SDM is maintained

BASES (continued)

APPLICABILITY

In MODE 4, this LCO ensures forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of either RCS or RHR provides sufficient circulation for these purposes. However, two loops consisting of any combination of RCS and RHR loops are required to be OPERABLE to meet single failure considerations.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2";
LCO 3.4.5, "RCS Loops - MODE 3";
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6).

ACTIONS

A.1 and A.2

If one required loop is inoperable, redundancy for heat removal is lost. Action must be initiated to restore a second RCS or RHR loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

The unit must be brought to MODE 5 within 24 hours if, as indicated in the Note to Required Action A.2, one RHR loop is OPERABLE. Bringing the unit to MODE 5 is a conservative action with regard to decay heat removal. With only one RHR loop OPERABLE, redundancy for decay heat removal is lost and, in the event of a loss of the remaining RHR loop, it would be safer to initiate that loss from MODE 5 ($\leq$ 200°F) rather than MODE 4 (200 to 350°F). The Completion Time of 24 hours is a reasonable time, based on operating experience, to reach MODE 5 from MODE 4 in an orderly manner and without challenging plant systems.

B.1 and B.2

If no loop is OPERABLE or in operation, except during conditions permitted by Note 1 in the LCO section, all operations involving ~~a reduction of RCS boron concentration~~ must be suspended and action to restore one RCS or RHR loop to OPERABLE status and operation must be initiated. Boron dilution requires forced circulation from at least one

INSERT BASES 6

(continued)

BASES

ACTIONS

B.1 and B.2 (continued)

RCP for proper mixing so that inadvertent criticality can be prevented. The immediate Completion Times reflect the importance of maintaining operation for decay heat removal. The action to restore must be continued until one loop is restored to OPERABLE status and operation.

INSERT BASES 7

SURVEILLANCE REQUIREMENTS

SR 3.4.6.1

This SR requires verification every 12 hours that one RCS or RHR loop is in operation. Verification may include flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RCS and RHR loop performance.

SR 3.4.6.2

SR 3.4.6.2 requires verification of SG OPERABILITY. SG OPERABILITY is verified by ensuring that the secondary side narrow range water level is $\geq$ 4% for required RCS loops. If the SG secondary side narrow range water level is < 4%, the tubes may become uncovered and the associated loop may not be capable of providing the heat sink necessary for removal of decay heat. The 12 hour Frequency is considered adequate in view of other indications available in the control room to alert the operator to the loss of SG level.

SR 3.4.6.3

Verification that the required pump is OPERABLE ensures that an additional RCS or RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available the required pump. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. FSAR Section 15.4.6.

INSERT BASES 6

introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1

INSERT BASES 7

Suspending the introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation, consistent with Required Action C.1 of LCO 3.3.9, "Boron Dilution Mitigation System (BDMS)."

BASES

INSERT BASES 4

LCO (continued)

a. No operations are permitted that would dilute the RCS boron concentration ~~therefore maintaining the margin to criticality. Boron reduction~~ is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 allows one RHR loop to be inoperable for a period of up to 2 hours, provided that the other RHR loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible.

Note 3 requires that the secondary side water temperature of each SG be $\leq$ 50°F above each of the RCS cold leg temperatures before the start of a reactor coolant pump (RCP) with any RCS cold leg temperature $\leq$ 275°F. This restriction is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of RHR loops from operation when at least one RCS loop is in operation. This Note provides for the transition to MODE 4 where an RCS loop is permitted to be in operation and replaces the RCS circulation function provided by the RHR loops.

RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. An OPERABLE SG can perform as a heat sink via natural circulation when it has an adequate water level and is OPERABLE in accordance with the Steam Generator Tube Surveillance Program.

APPLICABILITY

In MODE 5 with RCS loops filled, this LCO requires forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of RHR provides sufficient circulation for these purposes. However, one additional RHR loop is required to be OPERABLE, or the secondary side wide range water level of at least two SGs is required to be $\geq$ 66%.

Operation in other MODES is covered by:

(continued)

INSERT BASES 4

with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1, thereby maintaining the margin to criticality. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation. Boron dilution with coolant at boron concentrations less than required to assure the SDM is maintained

BASES

APPLICABILITY (continued)

LCO 3.4.4, "RCS Loops - MODES 1 and 2";
LCO 3.4.5, "RCS Loops - MODE 3";
LCO 3.4.6, "RCS Loops - MODE 4";
LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6).

ACTIONS

A.1 and A.2

If one RHR loop is inoperable and the required SGs have secondary side wide range water levels < 66%, redundancy for heat removal is lost. Action must be initiated immediately to restore a second RHR loop to OPERABLE status or to restore the required SG secondary side water levels. Either Required Action A.1 or Required Action A.2 will restore redundant heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

INSERT BASES 6

If no RHR loop is in operation, except during conditions permitted by Notes 1 and 4, or if no loop is OPERABLE, all operations involving ~~a reduction of RCS boron concentration~~ must be suspended and action to restore one RHR loop to OPERABLE status and operation must be initiated. To prevent inadvertent criticality during a boron dilution, forced circulation from at least one RCP is required to provide proper mixing. The immediate Completion Times reflect the importance of maintaining operation for heat removal.

INSERT BASES 7

SURVEILLANCE REQUIREMENTS

SR 3.4.7.1

This SR requires verification every 12 hours that the required loop is in operation. Verification may include flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RHR loop performance.

(continued)

INSERT BASES 6

introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1

INSERT BASES 7

Suspending the introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation, consistent with Required Action C.1 of LCO 3.3.9, "Boron Dilution Mitigation System (BDMS)."

BASES

LCO (continued)

LCO requirement for one loop in operation. An additional RHR loop is required to be OPERABLE to meet single failure considerations.

Note 1 permits all RHR pumps to be removed from operation for ≤ 1 hour. The circumstances for stopping both RHR pumps are to be limited to situations when the outage time is short and core outlet temperature is maintained at least 10°F below saturation temperature. ~~The Note prohibits boron dilution or draining operations when RHR forced flow is stopped.~~ INSERT BASES 5

Note 2 allows one RHR loop to be inoperable for a period of ≤ 2 hours, provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

An OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required.

APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the RHR System.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2";
LCO 3.4.5, "RCS Loops - MODE 3";
LCO 3.4.6, "RCS Loops - MODE 4";
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6).

The Applicability is modified by a Note stating that entry into MODE 5 with RCS loops not filled from MODE 5 with RCS loops filled is not permitted while LCO 3.4.8 is not met. This Note specifies an exception to LCO 3.0.4 and would prevent draining the RCS, which would eliminate the possibility of SG heat removal, while the RHR function was degraded.

(continued)

INSERT BASES 5

The Note prohibits boron dilution with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1 is maintained or draining operations when RHR forced flow is stopped. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when no RCS loop is in operation.

BASES (continued)

ACTIONS

A.1

If only one RHR loop is OPERABLE and in operation, redundancy for RHR is lost. Action must be initiated to restore a second loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

INSERT BASES 6

If no required RHR loops are OPERABLE or in operation, except during conditions permitted by Note 1, all operations involving ~~a reduction of RCS boron concentration~~ must be suspended and action must be initiated immediately to restore an RHR loop to OPERABLE status and operation. Boron dilution requires forced circulation from at least one RCP for proper mixing so that inadvertent criticality can be prevented. The immediate Completion Time reflects the importance of maintaining operation for heat removal. The action to restore must continue until one loop is restored to OPERABLE status and operation.

INSERT BASES 7A

SURVEILLANCE REQUIREMENTS

SR 3.4.8.1

This SR requires verification every 12 hours that one loop is in operation. Verification may include flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RHR loop performance.

SR 3.4.8.2

Verification that a second RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the RHR pump. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. FSAR Section 15.4.6.

INSERT BASES 6

introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1

INSERT BASES 7A

Suspending the introduction of coolant, into the RCS, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. Introduction of reactor makeup water into the RCS from the Chemical and Volume Control System mixing tee is not permitted when the RCS loops are not filled or when no RCS loop is in operation, consistent with Required Action C.1 of LCO 3.3.9, "Boron Dilution Mitigation System (BDMS)."

BASES

ACTIONS (continued)

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4

With the offsite circuit not available to one required train, the option would still exist to declare all required features inoperable. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With the required DG inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions. ~~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.~~ INSERT BASES 8

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

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

Pursuant to LCO 3.0.6, the Distribution System's ACTIONS would not be entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A are modified by a Note to indicate that when Condition A is entered with no AC power to the required ESF bus, the ACTIONS for LCO 3.8.10 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit, whether or not a train is de-energized.

LCO 3.8.10 would provide the appropriate restrictions for the situation involving a de-energized train.

C.1

Required Action C.1 provides assurance that the appropriate Action is entered for the affected DG and offsite circuit if the shutdown portion of the Load Shedder and Emergency Load Sequencer (LSELS) becomes inoperable. The shutdown portion of the LSELS is an essential support

(continued)

INSERT BASES 8

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

BASES

ACTIONS

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

movement of irradiated fuel assemblies, and operations involving positive reactivity additions. ~~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.~~

INSERT BASES 9

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 subsystem and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the unit 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 subsystem should be completed as quickly as possible in order to minimize the time during which the unit 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. 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 (SR 3.8.4.6, SR 3.8.4.7, and SR 3.8.4.8) must still be capable of being met, but actual performance is not required.

REFERENCES

1. FSAR, Chapter 6.
2. FSAR, Chapter 15.

INSERT BASES 9

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

BASES

LCO
(continued)

TRAIN A		TRAIN B	
Bus NN01 energized from Inverter NN11 connected to DC bus NK01	Bus NN03 energized from Inverter NN13 connected to DC bus NK03	Bus NN02 energized from Inverter NN12 connected to DC bus NK02	Bus NN04 energized from Inverter NN14 connected to DC bus NK04

APPLICABILITY The inverters required to be OPERABLE in MODES 5 and 6 provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core;

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

c. Systems 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.

Inverter requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.7.

ACTIONS A.1, A.2.1, A.2.2, A.2.3, and A.2.4

By the allowance of the option to declare required features inoperable with the associated inverter(s) inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCOs' Required 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, and operations involving positive reactivity additions). ~~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.~~

INSERT BASES 9

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the

(continued)

INSERT BASES 9

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

BASES (continued)

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required 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, and operations involving positive reactivity additions). INSERT BASES 9

Suspension of these activities does 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 AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the unit safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal (RHR) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR inoperable and not in operation, which results in taking the appropriate RHR actions. This would assure consideration is given to shutdown cooling systems that are without required power and that appropriate actions are taken to assure operability of these required systems.

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

SURVEILLANCE REQUIREMENTS

SR 3.8.10.1

This Surveillance verifies that the required AC, DC, and AC vital bus electrical power distribution subsystems are functioning properly, with all the buses energized. The verification of proper voltage availability on the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. The 7 day Frequency takes into account the capability of the

(continued)

INSERT BASES 9

that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

BASES

APPLICABLE SAFETY ANALYSES (continued)

3. After the level has been lowered to below the cavity seal/shield ring, further draining of the area enclosed by the inside diameter of the ring is performed via the RHR connection to the Chemical and Volume Control letdown line.

The RCS boron concentration satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO requires that a minimum boron concentration be maintained in the filled portions of the RCS and the refueling pool, that have direct access to the reactor vessel while in MODE 6. The boron concentration limit ensures that a core k_{eff} of ≤ 0.95 is maintained during fuel handling operations, and shall in all cases be ≥ 2000 ppm. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a $k_{eff} \leq 0.95$. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM), LCO 3.1.5, "Shutdown Bank Insertion Limits," and LCO 3.1.6, "Control Bank Insertion Limits," ensure that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

The Applicability is modified by a Note stating that transition from MODE 5 to MODE 6 is not permitted while the LCO is not met. This Note specifies an exception to LCO 3.0.4 and prohibits the transition when boron concentration limits are not met. This Note assures that core reactivity is maintained within limits during fuel handling operations.

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the filled portions of the RCS and the refueling pool that have direct access to the reactor vessel, is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position. INSERT BASES 10

(continued)

INSERT BASES 10

Operations that individually add limited positive reactivity (e.g., temperature fluctuations, inventory addition, or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action.

BASES

ACTIONS (continued)

A.3

In addition to immediately suspending CORE ALTERATIONS or positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

This SR ensures that the coolant boron concentration in the filled portions of the RCS and the refueling pool that have direct access to the reactor vessel, is within the LCO limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis.

A minimum Frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The Frequency is based on operating experience, which has shown 72 hours to be adequate.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26.

2. FSAR, Chapter 15, Section 15.4.

3. Amendment 97 to Facility Operating License No. NPF-30, Callaway Unit 1, dated March 31, 1995.

4. Callaway Plant Request for Resolution 17070.

BASES

LCO (continued)

Monitor(s) are acceptable equivalent control room indication(s) for Westinghouse Source Range Neutron Flux Monitor(s) in MODE 6, including CORE ALTERATIONS, with the complete fuel assembly inventory set within the reactor vessel or with the Gamma Metrics Source Range Neutron Flux Monitor(s) coupled to the core. Reactor Engineering shall determine whether each monitor is coupled to the core.

APPLICABILITY

In MODE 6, the source range neutron flux monitors must be OPERABLE to determine changes in core reactivity. In other modes, the source range monitors are governed by LCO 3.3.1, LCO 3.3.3, LCO 3.3.4, and LCO 3.3.9.

ACTIONS

A.1 and A.2

With only one source range neutron flux monitor OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, CORE ALTERATIONS and ~~positive reactivity additions must be suspended immediately.~~ Performance of Required Action A.1 shall not preclude completion of movement of a component to a safe position.

INSERT BASES 11

B.1

With no source range neutron flux monitor OPERABLE, action to restore a monitor to OPERABLE status shall be initiated immediately. Once initiated, action shall be continued until a source range neutron flux monitor is restored to OPERABLE status.

B.2

With no source range neutron flux monitor OPERABLE, there are no direct means of detecting changes in core reactivity. However, since CORE ALTERATIONS and ~~positive reactivity additions~~ are not to be made, the core reactivity condition is stabilized until the source range neutron flux monitors are OPERABLE. This stabilized condition is determined by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

INSERT BASES 12

The Completion Time of once per 12 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration and ensures that unplanned changes in boron concentration would be identified. The

(continued)

INSERT BASES 11

introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1 must be suspended immediately. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

INSERT BASES 12

boron concentration changes inconsistent with Required Action A.2

BASES

LCO (continued)

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the RCS temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

The LCO is modified by a Note that allows the required operating RHR loop to be removed from service for up to 1 hour per 8 hour period, provided no operations are permitted that would ~~cause a reduction of the RCS boron concentration. Boron concentration reduction~~ is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling pool.

INSERT BASES 13

APPLICABILITY

One RHR loop must be OPERABLE and in operation in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange, to provide decay heat removal. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.7, "Refueling Pool Water Level." Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level < 23 ft are located in LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level." Additional RHR loop requirements in MODE 6 with the water level ≥ 23 feet above the top of the reactor vessel flange are located in FSAR 16.1.2.1, "Flow Path-Shutdown Limiting Condition For Operation."

ACTIONS

RHR loop requirements are met by having one RHR loop OPERABLE and in operation, except as permitted in the Note to the LCO.

(continued)

INSERT BASES 13

dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure the minimum required RCS boron concentration is maintained

BASES

ACTIONS (continued)

A.1

INSERT BASES 14

If RHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. ~~Reduced boron concentrations cannot occur by the addition of water with a lower boron concentration than that contained in the RCS because all unborated water sources are isolated and~~ administrative controls are placed on refueling decontamination activities (See Bases for LCO 3.9.1).

A.2

If RHR loop requirements are not met, actions shall be taken immediately to suspend loading of irradiated fuel assemblies in the core. With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling pool water level of 23 ft above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase decay heat load, such as loading a fuel assembly, is a prudent action under this condition. Performance of Required Action A.2 shall not preclude completion of movement of a component to a safe condition.

A.3

If RHR loop requirements are not met, actions shall be initiated and continued in order to satisfy RHR loop requirements. With the unit in MODE 6 and the refueling water level $\geq$ 23 ft above the top of the reactor vessel flange, corrective actions shall be initiated immediately.

A.4

If RHR loop requirements are not met, all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere must be closed within 4 hours. With the RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Closing containment penetrations that are open to the outside atmosphere ensures dose limits are not exceeded.

The Completion Time of 4 hours is reasonable, based on the low probability of the coolant boiling in that time.

(continued)

INSERT BASES 14

Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

BASES

LCO (continued)

An OPERABLE RHR loop consists of an RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the RCS temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs. An OPERABLE RHR loop must be capable of being realigned to provide an OPERABLE flow path.

APPLICABILITY

Two RHR loops are required to be OPERABLE, and one RHR loop must be in operation in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level ≥ 23 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level." Additional RHR loop requirements in MODE 6 with the water level ≥ 23 feet above the top of the reactor vessel flange are located in FSAR 16.1.2.1, "Flow Path-Shutdown Limiting Condition For Operation."

The Applicability is modified by a Note stating that entry into a MODE or other specified condition in the Applicability is not permitted while the LCO is not met. This note specifies an exception to LCO 3.0.4 and would prevent the transition into MODE 6 with less than 23 feet of water above the top of the vessel flange while the RHR function was degraded.

ACTIONS

A.1 and A.2

If less than the required number of RHR loops are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status and restored to operation in accordance with the LCO or until ≥ 23 ft of water level is established above the reactor vessel flange. When the water level is ≥ 23 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.5, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1

INSERT BASES 14

If no RHR loop is in operation, there will be no forced circulation to provide mixing to establish uniform boron concentrations. ~~Reduced boron concentrations cannot occur by the addition of water with a lower boron concentration than that contained in the RCS, because all of the~~

(continued)

INSERT BASES 14

Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

BASES

ACTIONS

B.1 (continued)

~~unborated water sources are isolated and~~ administrative controls are placed on refueling decontamination activities (See Bases for LCO 3.9.1).

B.2

If no RHR loop is in operation, actions shall be initiated immediately, and continued, to restore one RHR loop to operation. Since the unit is in Conditions A and B concurrently, the restoration of two OPERABLE RHR loops and one operating RHR loop should be accomplished expeditiously.

B.3

If no RHR loop is in operation, all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere must be closed within 4 hours. With the RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Closing containment penetrations that are open to the outside atmosphere ensures that dose limits are not exceeded.

The Completion Time of 4 hours is reasonable at water levels above reduced inventory, based on the low probability of the coolant boiling in that time. At reduced inventory conditions, additional actions are taken to provide containment closure in a reduced period of time (Reference 2). Reduced inventory is defined as RCS level lower than 3 feet below the reactor vessel flange.

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1

This Surveillance demonstrates that one RHR loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator for monitoring the RHR System in the control room.

SR 3.9.6.2

Verification that the required pump is OPERABLE ensures that an additional RHR pump can be placed in operation, if needed, to maintain

(continued)

ATTACHMENT FIVE

PROPOSED FSAR CHANGES

APPLICABILITY: MODES 4, 5, and 6.

ACTION:

With none of the above flow paths OPERABLE or capable of being powered from an OPERABLE emergency power source, suspend all operations involving CORE ALTERATIONS or ~~positive reactivity changes.~~ INSERT FSAR 1

16.1.2.1.1 SURVEILLANCE REQUIREMENTS

At least one of the above required flow paths shall be demonstrated OPERABLE at least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

16.1.2.1.2 BASES

The Boration Systems ensure that negative reactivity control is available during each MODE of facility operation. The components required to perform this function include: (1) borated water sources, (2) centrifugal charging pumps (Modes 4-6), RHR pumps (Mode 6 with water level greater than 23-feet above the reactor vessel flange and with reactor vessel head removed), or SI pumps (Mode 6 with reactor vessel head removed), (3) separate flow paths, (4) boric acid transfer pumps, and (5) an emergency power supply from OPERABLE diesel generators (for Modes 4, 5, and 6 only).

INSERT FSAR 1

positive reactivity additions that could result in loss of required SDM or boron concentration.

With the RCS average temperature equal to or greater than 350°F, a minimum of two boron injection flow paths are required to ensure functional capability in the event an assumed single failure renders one of the flow paths inoperable. The Boration capability of either flow path is sufficient to provide the SHUTDOWN MARGIN specified in the COLR. The maximum expected boration capability requirement occurs at EOL from full power equilibrium xenon conditions and requires either 17,658 gallons of 7000 ppm borated water from the boric acid storage tanks or 83,745 gallons of 2350 ppm borated water from the RWST. With the RCS average temperature less than 350°F, only one boron injection flow path is required.

With the RCS temperature below 200°F, one Boration System is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor, ~~and the~~ additional restrictions prohibiting CORE ALTERATIONS and positive reactivity ~~changes in the event the single Boron Injection System becomes inoperable.~~ INSERT FSAR 2

apply in MODES 4, 5, and 6

The boron capability required below 200°F is sufficient to provide the SHUTDOWN MARGIN specified in the COLR. This condition requires either 2968 gallons of 7000 ppm borated water from the boric acid storage tanks or 14,076 gallons of 2350 ppm borated water from the RWST.

The contained water volume limits include allowance for water not available because of discharge line location and other physical characteristics.

The limits on contained water volume and boron concentration of the RWST also ensure a minimum equilibrium sump pH of 7.1 for the solution recirculated within Containment after a LOCA. This pH level minimizes the evolution of iodine and minimizes the effect of chloride and caustic stress corrosion on mechanical systems and components.

Either of the Centrifugal Charging Pumps (CCP), PBG05A or PBG05B, may still be considered operable with its associated discharge to Reactor Coolant Pump Seal throttle valve, BGHV8357A or BGHV8357B inoperable provided that the valve is closed. Each CCP is protected from degradation by its recirculation line.

For Modes 4, 5, and 6, an OPERABLE emergency diesel generator (D/G) must be aligned to provide emergency power to the OPERABLE CCP and OPERABLE Boric Acid Transfer Pump (BATP).

One of the following flow paths are required to satisfy the requirements of Section 16.1.2.1:

1) OPERABLE RWST through valve BNLCV0112D to the suction of the 'A' train CCP. Emergency power is supplied by the 'A' Diesel Generator.

INSERT FSAR 2

additions that could result in loss of required SDM (MODES 4 and 5) or boron concentration (MODE 6). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must be evaluated to ensure they do not result in a loss of required SDM.

16.1.2.3 ECCS PUMPS - SHUTDOWN LIMITING CONDITION FOR OPERATION

One safety injection pump, centrifugal charging pump, or residual heat removal pump in the boron injection flow path required by Section 16.1.2.1 shall be OPERABLE and capable of being powered from an OPERABLE emergency power source.

APPLICABILITY:

MODES 4 and 5 (for centrifugal charging pump), and MODE 6 (for safety injection, centrifugal charging, or residual heat removal pump as defined in Section 16.1.2.1).

ACTION:

With no centrifugal charging pump, safety injection pump, or residual heat removal pump in the boron injection flow path OPERABLE or capable of being powered from an OPERABLE emergency power source, suspend all operations involving CORE ALTERATIONS ~~or positive reactivity changes.~~ or INSERT FSAR 1

16.1.2.3.1 SURVEILLANCE REQUIREMENTS

The above required safety injection, centrifugal charging, or residual heat removal pump in the boron injection flow path shall be demonstrated OPERABLE by verifying each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head in accordance with the Inservice Testing Program.

16.1.2.3.2 BASES

See Section 16.1.2.1.2.

INSERT FSAR 1

positive reactivity additions that could result in loss of required SDM or boron concentration.

16.1.2.5 BORATED WATER SOURCE - SHUTDOWN
LIMITING CONDITION FOR OPERATION

As a minimum, one of the following borated water sources, if required by Section 16.1.2.1 for MODES 5 and 6, shall be OPERABLE:

a. A Boric Acid Storage System with:

1) A minimum contained borated water volume of 2968 gallons,
2) Between 7000 and 7700 ppm of boron, and
3) A minimum solution temperature of 65°F; or

b. The refueling water storage tank (RWST) with:

1) A minimum contained borated water volume of 55,416 gallons,
2) A minimum boron concentration of 2350 ppm, and
3) A minimum solution temperature of 37°F.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no borated water source OPERABLE, suspend all operations involving CORE ALTERATIONS or ~~positive reactivity changes.~~ INSERT FSAR 1

16.1.2.5.1 SURVEILLANCE REQUIREMENTS

The above required borated water source shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1) Verifying the boron concentration of the water,
2) Verifying the contained borated water volume, and
3) Verifying the Boric Acid Storage System solution temperature when it is the source of borated water.

b. At least once per 24 hours by verifying the RWST temperature when it is the source of borated water and the outside air temperature is less than 37°F.

16.1.2.5.2 BASES

See Section 16.1.2.1.2.

INSERT FSAR 1

positive reactivity additions that could result in loss of required SDM or boron concentration.

16.4 REACTOR COOLANT SYSTEM

16.4.1 SAFETY VALVES

16.4.1.1 SHUTDOWN LIMITING CONDITION FOR OPERATION

A minimum of one pressurizer Code safety valve shall be OPERABLE with a lift setting of ≥2411 psig and ≤2509 psig (The lift setting pressure shall correspond to ambient conditions of the valve at nominal operating temperature and pressure.)

APPLICABILITY: MODE 4 with any RCS cold leg temperature ≤275 degrees F and MODE 5.

ACTION:

With no pressurizer Code safety valve OPERABLE, immediately suspend all operations involving positive reactivity ~~changes~~ and place an OPERABLE RHR loop into operation in the shutdown cooling mode.

INSERT FSAR 3

16.4.1.1.1 SURVEILLANCE REQUIREMENTS

No additional requirements other than those required by the Inservice Testing Program. The lift setting shall be within ±1% of 2460 psig following testing.

16.4.1.1.2 BASES

The relief capacity of a single safety valve is adequate to relieve any overpressure condition which could occur during shutdown. In the event that no safety valves are OPERABLE, an operating RHR loop, connected to the RCS, provides overpressure relief capability and will prevent RCS overpressurization. In addition, the Cold Overpressure Mitigation System provides a diverse means of protection against RCS overpressurization at low temperatures. INSERT FSAR 4

INSERT FSAR 3

additions that could result in loss of required SDM

INSERT FSAR 4

Suspending positive reactivity additions that could result in failure to meet the minimum SDM limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

APPENDIX A

A Correlation of Proposed Changes to Approved TSTF-286, Revision 2 STS Changes

The following TSTF-286 changes are applicable to Callaway, but required some additional justification or clarification before incorporation, as discussed in Section 2.0 of Attachment 1, "Description of Proposed Amendment." Note that TS Bases changes are included in this list for information only, since they were included in a similar list attached to the NRC Safety Evaluation for Reference 2 of Attachment 1. As stated in the cover letter, TS Bases changes are provided for information only since they are under licensee control. The discussion below provides a correlation between the manner in which Callaway intends to revise our TS Bases vs. the TS Bases changes included in the approved traveler. These deviations from TSTF-286, Revision 2, are identical to those previously approved for H. B. Robinson, Unit 2 with an additional reference in the 3.3.1 Action G.1 Bases changes to the COLR, since that document specifies the SDM limits:

- 3.3.1 Action G.1 RTS Instrumentation
- 3.3.1 Action G.1 Bases RTS Instrumentation
- 3.3.1 Action I.1 RTS Instrumentation

The following TSTF-286 TS changes are applicable to Callaway and are therefore incorporated identically as written in the traveler:

- 3.3.9 Action B.1 BDMS
- 3.3.9 Action B.1 Bases BDMS
- 3.4.5 LCO Note a RCS Loops – MODE 3
- 3.4.5 Action D.2 RCS Loops – MODE 3
- 3.4.6 LCO Note 1.a RCS Loops – MODE 4
- 3.4.6 Action B.1 RCS Loops – MODE 4
- 3.4.7 LCO Note 1.a RCS Loops – MODE 5, Loops Filled
- 3.4.7 Action B.1 RCS Loops – MODE 5, Loops Filled
- 3.4.8 LCO Note 1.b RCS Loops – MODE 5, Loops Not Filled
- 3.4.8 Action B.1 RCS Loops – MODE 5, Loops Not Filled
- 3.8.2 Action A.2.3 AC Sources – Shutdown
- 3.8.2 Action B.3 AC Sources – Shutdown
- 3.8.5 Action A.2.3 DC Sources – Shutdown
- 3.8.8 Action A.2.3 Inverters – Shutdown
- 3.8.10 Action A.2.3 Distribution Systems – Shutdown
- 3.9.1 Action A.3 Bases Boron Concentration
- 3.9.3 Action A.2 Nuclear Instrumentation

- 3.9.5 LCO Note — RHR and Coolant Circulation – High Water Level
- 3.9.5 Action A.1 — RHR and Coolant Circulation – High Water Level
- 3.9.6 Action B.1 — RHR and Coolant Circulation – Low Water Level

The following TSTF-286 TS changes are applicable to Callaway; however, requirements related to the analysis of an inadvertent boron dilution event need clarification. For example, sentences detailing the requirement to have at least one RCP in operation to satisfy the mixing requirements for the inadvertent boron dilution event are retained. These sentences were added during the ITS conversion and are consistent with the analysis basis, as further discussed in TS 3.3.9 and FSAR Section 15.4.6. Clarification is added regarding the equipment credited during various operating MODES. In addition, restrictions on the use of the CVCS mixing tee for introducing reactor makeup water into the RCS during those times when one source range neutron flux channel is inoperable and during loss of RCS flow conditions, limitations on the RCS makeup sources to satisfy not only SDM limits but also the RCS boron concentration assumptions used in FSAR Section 15.4.6, and administrative controls during all reactivity manipulations are added to prudently recognize the potential for an initiating event, analysis assumptions and initial conditions, and the reduced mitigative capability for an inadvertent boron dilution event.

- 3.3.1 Action I.1 Bases — RTS Instrumentation
- 3.3.1 Condition K Bases — RTS Instrumentation
- 3.3.1 References — RTS Instrumentation
- 3.3.9 ASA Bases — BDMS
- 3.3.9 Applicability Bases — BDMS
- 3.3.9 Action A.1 Bases — BDMS
- 3.4.5 LCO Note a Bases — RCS Loops – MODE 3
- 3.4.5 Action D.2 Bases — RCS Loops – MODE 3
- 3.4.6 LCO Note 1.a Bases — RCS Loops – MODE 4
- 3.4.6 Action B.1 Bases — RCS Loops – MODE 4
- 3.4.7 LCO Note 1.a Bases — RCS Loops – MODE 5, Loops Filled
- 3.4.7 Action B.1 Bases — RCS Loops – MODE 5, Loops Filled
- 3.4.8 LCO Note 1.b Bases — RCS Loops – MODE 5, Loops Not Filled
- 3.4.8 Action B.1 Bases — RCS Loops – MODE 5, Loops Not Filled

The following TSTF-286 TS changes are applicable to Callaway and are incorporated with minor editorial changes identical to those previously approved for H. B. Robinson, Unit 2:

- 3.8.2 Action A.2.3 Bases — AC Sources – Shutdown

- 3.8.2 Action B.3 Bases — AC Sources – Shutdown
- 3.8.5 Action A.2.3 Bases — DC Sources – Shutdown
- 3.8.8 Action A.2.3 Bases — Inverters – Shutdown
- 3.8.10 Action A.2.3 Bases — Distribution Systems – Shutdown
- 3.9.1 Action A.2 Bases — Boron Concentration
- 3.9.3 Action A.2 Bases — Nuclear Instrumentation
- 3.9.5 LCO Note Bases — RHR and Coolant Circulation – High Water Level
- 3.9.5 Action A.1 Bases — RHR and Coolant Circulation – High Water Level
- 3.9.6 Action B.1 Bases — RHR and Coolant Circulation – Low Water Level

The following change is in addition to those contained in TSTF-286; however, it is directly related to the TSTF-286 change to the 3.9.3 Action A.2 Bases, as discussed in Section 2.0 of Attachment 1, "Description of Proposed Amendment." This was an oversight in TSTF-286. The list of affected TS in TSTF-286 included "Action 3.9.3.B Bases, Nuclear Instrumentation, NUREG-1431 Only"; however, there were no changes to the Action 3.9.3.B Bases marked on page B 3.9-9 of the traveler.

- 3.9.3 Action B.2 Bases — Nuclear Instrumentation

The following TSTF-286 TS changes are not applicable to Callaway and are therefore not incorporated:

- 3.3.1 Action L.1 — RTS Instrumentation
- 3.3.1 Action L.1 Bases — RTS Instrumentation
- 3.4.18 LCO Note a — RCS Isolated Loop Startup
- SR 3.4.18.2 — RCS Isolated Loop Startup
- 3.4.18 Background Bases — RCS Isolated Loop Startup
- SR 3.4.18.2 Bases — RCS Isolated Loop Startup

The following changes in the list of affected TS in TSTF-286 are not applicable to NUREG-1431 (Westinghouse plants) and are therefore not incorporated:

- Action 3.4.5.C — RCS Loops – MODE 3
- Action 3.4.5.C Bases — RCS Loops – MODE 3
- Action 3.9.2.A — Nuclear Instrumentation
- Action 3.9.2.A Bases — Nuclear Instrumentation
- Action 3.9.2.B Bases — Nuclear Instrumentation

• Action 3.3.9.B	Source Range Neutron Flux
• Action 3.3.9.B Bases	Source Range Neutron Flux
• Action 3.3.10.B	Intermediate Range Neutron Flux
• Action 3.3.10.B Bases	Intermediate Range Neutron Flux
• LCO 3.9.4	DHR and Coolant Circulation – High Water Level
• LCO 3.9.4 Bases	DHR and Coolant Circulation – High Water Level
• Action 3.9.4.A	DHR and Coolant Circulation – High Water Level
• Action 3.9.4.A Bases	DHR and Coolant Circulation – High Water Level
• Action 3.9.5.B	DHR and Coolant Circulation – Low Water Level
• Action 3.9.5.B Bases	DHR and Coolant Circulation – Low Water Level
• Action 3.3.8.A Bases	CRIS (Analog)
• Action 3.3.8.C	CRIS (Analog)
• Action 3.3.9.A Bases	CRIS (Digital)
• Action 3.3.9.C	CRIS (Digital)
• Action 3.3.13.A	[Logarithmic] Power Monitoring Channels (Analog)
• Action 3.3.13.A	[Logarithmic] Power Monitoring Channels (Digital)
• Action 3.3.13.A Bases	[Logarithmic] Power Monitoring Channels (Analog)
• Action 3.3.13.A Bases	[Logarithmic] Power Monitoring Channels (Digital)
• LCO 3.9.4	SDC and Coolant Circulation – High Water Level
• LCO 3.9.4 Bases	SDC and Coolant Circulation – High Water Level
• Action 3.9.4.A	SDC and Coolant Circulation – High Water Level
• Action 3.9.4.A Bases	SDC and Coolant Circulation – High Water Level
• Action 3.9.5.B	SDC and Coolant Circulation – Low Water Level
• Action 3.9.5.B Bases	SDC and Coolant Circulation – Low Water Level