Union Electric
Callaway Plant

PO Box 620
Fulton, MO 65251

June 1, 2009

ULNRC-05633

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

10 CFR 50.90

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
(LDCN 09-0017)
REVISION OF TECHNICAL SPECIFICATION 3.3.9

AmerenUE herewith transmits an application for amendment to Facility Operating License Number NPF-30 for the Callaway Plant.

The proposed amendment would revise the LCO Applicability Note for Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)." The LCO Applicability Note would be revised to more explicitly define what the term "during reactor startup" means in MODES 2 and 3. This revision to the Applicability Note is proposed to clarify the situations during which the BDMS signal may be blocked.

Attachments 1 through 4 provide the Evaluation, Markup of Technical Specifications, Retyped Technical Specifications, and Proposed Technical Specification Bases Changes, respectively, in support of this amendment request. No commitments are contained in this amendment application.

It has been determined that this amendment application does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

The Callaway Onsite Review Committee and a subcommittee of the Nuclear Safety Review Board have reviewed and approved the attached licensing evaluations and have approved the submittal of this amendment application.

AmerenUE requests approval of this license amendment request prior to March 1, 2010 so that it might be implemented prior to the next refueling outage (Refuel 17, spring 2010). AmerenUE further requests that the license amendment be made effective upon NRC issuance, to be implemented within 90 days from the date of issuance.

In accordance with 10 CFR 50.91, 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 me at (573) 676-8528, or Mr. Scott Maglio at (573) 676-8719.

I declare under penalty of perjury that the foregoing is true and correct.

Very truly yours,

Executed on: 6/1/09

Scott Sandbothe

Scott Sandbothe
Manager, Regulatory Affairs

GGY/nls

Attachments

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

cc: U.S. Nuclear Regulatory Commission (Original and 1 copy)
Attn: Document Control Desk
Washington, DC 20555-0001

Mr. Elmo E. Collins, Jr.
Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
612 E . Lamar Blvd., Suite 400
Arlington, TX 76011-4125

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
Steedman, MO 65077

Mr. Mohan C. Thadani (2 copies)
Senior Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8G14
Washington, DC 20555-2738

Index and send hardcopy to QA File A160.0761

Hardcopy:

Certrec Corporation
4200 South Hulen, Suite 422
Fort Worth, TX 76109
(Certrec receives ALL attachments as long as they are non-safeguards and may be publicly disclosed.)

Electronic distribution for the following can be made via Tech Spec ULNRC Distribution:

A. C. Heflin
F. M. Diya
T. E. Herrmann
L. S. Sandbothe
S. A. Maglio
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L. M. Belsky (NSRB)
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G. G. Yates
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Mr. Dennis Buschbaum (TXU)
Mr. Scott Bauer (Palo Verde)
Mr. Stan Ketelsen (PG&E)
Mr. Wayne Harrison (STPNOC)
Mr. John O'Neill (Pillsbury Winthrop Shaw Pittman LLP)
Missouri Public Service Commission
Mr. Floyd Gilzow (DNR)

EVALUATION

EVALUATION

1.0 DESCRIPTION

The proposed change in this amendment application would revise the LCO Applicability Note for Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)." The LCO Applicability Note would be revised to more explicitly define what the term "during reactor startup" means in MODES 2 and 3. This revision to the Applicability Note is requested in order to clearly define the situations during which the BDMS signal may be blocked.

2.0 PROPOSED CHANGES

This amendment application requests the following changes.

The LCO Applicability Note for TS 3.3.9 currently reads as follows:

> "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."

The proposed change to the LCO Applicability Note would read:

> "The boron dilution flux multiplication signal may be blocked in MODE 2 (below P-6 (Intermediate Range Neutron Flux) interlock) during control bank withdrawal and in MODE 3 during shutdown bank withdrawal."

The TS markups and retyped pages are provided in Attachments 2 and 3, respectively. Corresponding TS Bases changes are provided for information only in Attachment 4.

3.0 BACKGROUND

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

TS 3.3.9 requires that two trains of the BDMS be operable to detect and mitigate an inadvertent boron dilution event in these MODES before a complete loss of shutdown margin occurs (i.e., prior to criticality). The system detects an inadvertent boron dilution event by monitoring the output of both source range neutron flux detectors. The BDMS microprocessor monitors the core flux readings in discrete 1-minute intervals and retains the average monitored flux data for up to 10 of those intervals. The microprocessor compares the flux value in the most recent interval to each of the prior 9 intervals and actuates an alarm and automatic mitigation functions (i.e., charging pump suction valve swapover from the volume control tank (VCT) to the refueling water storage tank (RWST) in order to terminate the dilution and initiate boration) when the flux multiplication setpoint of 1.7 is reached. Valves that isolate the RWST are automatically opened to supply borated water to the suction of the charging pumps, and valves which isolate the VCT are then automatically closed to terminate the dilution.

The accident analysis in FSAR Section 15.4.6 relies on automatic BDMS actuation to mitigate the consequences of inadvertent boron dilution events in MODES 3, 4, and 5.

Inadvertent Dilution Event Description

One of the principal means of positive reactivity insertion to the core is the addition of unborated, primary grade water from the reactor makeup water system (RMWS) into the RCS through the reactor makeup portion of the chemical and volume control system (CVCS).

Boron dilution with these systems is a manually initiated operation requiring close operator surveillance and is performed in accordance with strict administrative controls that limit the rate and duration of the dilution. A boric acid blend system is available to allow the operator to match the makeup boron concentration to that of the RCS during normal charging.

The principal means of causing an inadvertent boron dilution event are the opening of the RMWS flow control valve (BGFCV0111A) and the failure of the blend system, either by controller or mechanical failure. The CVCS and RMWS are designed to limit (even under various postulated failure modes) the potential rate of dilution to values that, with indication by alarms and instrumentation, will allow sufficient time for operator response to terminate the dilution. An inadvertent dilution from the RMWS may be terminated by closing the primary water makeup control valve. The expected sources of an inadvertent dilution may also be terminated by closing VCT isolation valves in the CVCS, i.e., BGLCV0112B and 0112C (as depicted in FSAR Figure 9.3-8 sheet 3). Re-boration is achieved by opening the isolation valves from the RWST, i.e., BNLCV0112D and 0112E, or by borating from the boric acid tanks (BATs), to allow the addition of borated water into the RCS. However, the re-boration path is not modeled in the accident analysis (other than establishing the piping volume that must be purged of less borated fluid) since the event is over, from a safety analysis perspective, once the dilution source water is fully purged and it has been demonstrated that shutdown margin has not been completely eroded.

Generally, to intentionally initiate a dilution the operator must perform two distinct actions:

1) Switch the RMWS control of the makeup from the automatic makeup mode to the dilute or alternate dilute mode, and

2) Turn the RMWS makeup control handswitch to the "Run" position.

Failure to carry out either of the above actions prevents initiation of dilution.

In addition, during normal operation, the operator may add borated water to the RCS by blending boric acid from the BATs with unborated, primary grade water. This requires the operator to determine the concentration of the addition and to set the blended flow rate and the boric acid flow rate. The makeup controller will then limit the sum of the boric acid flow rate and primary grade water flow rate to the blended flow rate after turning the RMWS makeup control handswitch to the "Run" position (i.e., the controller regulates the unborated, primary grade makeup water flow rate).

An inadvertent boron dilution may be initiated by a failure in the RMWS which results in either a reduction in the boric acid flow rate from the BATs or an increase in the flow rate of unborated water from the reactor makeup water storage tank (RMWST).

Detection of an Inadvertent Boron Dilution Event in Modes 3, 4, and 5

The inadvertent boron dilution event is assumed to be initiated through a malfunction in the reactor makeup control system (RMCS) or by operator error. Several indications and alarms are provided in the RMCS design for monitoring proper system operation. The available alarms and indications include:

- boric acid flow indication and deviation alarm;
- audible clicks from the boric acid totalizer (flow integrator);
- boric acid flow strip chart recorder;
- total makeup blended flow indication and deviation alarm;
- audible clicks from the total makeup blended flow totalizer (flow integrator);
- total makeup blended flow strip chart recorder;
- high charging flow indication and alarm;
- centrifugal charging pump, boric acid transfer pump, and reactor makeup control system pump status lights; and
- boron concentration measurement system.

Several potential RMCS failures will result in an increase in the VCT water level and pressure. The available alarms are the high VCT pressure, high VCT water level, and high-high VCT water level/full divert to the recycle holdup tank (RHT) alarms.

Other diverse indications of an ongoing inadvertent boron dilution event are provided by the nuclear instrumentation system (NIS). The available indications and alarms when the reactor is subcritical include:

- high source range neutron flux at shutdown alarm;
- indicated and recorded source range neutron flux rate count rate and indicated startup rate;
- audible source range neutron flux count rate; and
- source range neutron flux multiplication alarm.

FSAR Chapter 15 Analysis

Although not specifically required for an ANS Condition II event, the inadvertent boron dilution event is currently analyzed to demonstrate that the event is terminated prior to the time the shutdown margin is completely eroded. If it is demonstrated that the reactor remains subcritical during the event, including the assumption of a single active failure or single operator error, there will be no power, pressure, or temperature excursions which could challenge the RCS and main steam system pressure limits, the minimum DNBR limits, or lead to a more serious plant condition.

The MODE 2 analysis of an inadvertent boron dilution event in FSAR Section 15.4.6 credits operator action after an automatic reactor trip on high source range neutron flux and the MODE 3 analysis credits automatic mitigation by the BDMS with steady state initial conditions and static initial rod positions at bounding RCS T-avg values (350°F and 557°F) at either end of MODE 3. Neither analysis considers the transient effects implicit with withdrawing the shutdown or control banks, nor was the BDMS intended to actuate during planned shutdown or control bank withdrawal.

Need for Change

In May 2000 AmerenUE (Union Electric Company) applied for a license amendment that would have deleted the BDMS and replaced it with a system solely crediting operator action based on cues from volume control tank level and administrative controls implemented to assure a closed system between the RCS and CVCS. As discussed in Reference 7.1, that amendment application was withdrawn after no inadvertent dilution events were experienced in Refuel 11 (April-May 2001 refueling outage). Since Refuel 11, however, there have been 5 BMDS actuation events (charging suction valve swapovers) that were not required to mitigate a boron dilution transient. Two of the 5 events occurred in MODES that would not be rectified by the proposed changes in this amendment request (one occurred in MODE 4 and another occurred in no MODE with the core fully offloaded); however, three of the 5 would have been prevented by the proposed change. One of these occurred during the restart from a forced outage in April 2003 during shutdown bank withdrawal in MODE 3, and two occurred during restart from Refuel 16 in November 2008 during control bank withdrawal in MODE 2. These three events had different contributing causal factors (procedure guidance in one, P-6 bistable chatter in the other two); however, several common factors between them include:

- Diversion of control room operating staff attention away from truly significant evolutions during reactivity changes
- Ensuing plant shutdowns
- Revised estimated critical position calculations and subsequent approaches to criticality
- Water processing to remove unnecessary effects of boration from the RWST
- Lost critical path time.

4.0 TECHNICAL ANALYSIS

The inadvertent boron dilution event is considered in the licensing basis of Callaway Plant. This event is postulated to be initiated by a malfunction in the CVCS which results in a decrease in the boron concentration of the RCS. The possibility of this event is considered for all modes of plant operation except MODE 6 during which inadvertent dilutions are administratively precluded by valve closure per TS 3.9.2.

Several studies have been performed concerning the risk associated with inadvertent boron dilution events, particularly during shutdown and refueling. Among the most relevant is NSAC-183 (Reference 7.2) Several conclusions of this report are applicable to the analysis of the inadvertent boron dilution event:

1) Due to their self-limiting nature, gradual inadvertent boron dilution events are not expected to cause core damage, even if they are unmitigated.

2) No inadvertent criticalities have resulted from any of the gradual inadvertent boron dilution events that had occurred as of the publication date of that report.

3) The frequency of gradual inadvertent boron dilution events reported at commercial nuclear plants in the United States has declined significantly. The expected frequency of an inadvertent criticality from an inadvertent boron dilution event was characterized in NSAC-183 as less than 1E-4 per reactor year.

In the current licensing basis analysis (FSAR Section 15.4.6) of the inadvertent boron dilution event in Modes 3, 4, and 5, the BDMS is relied upon to detect subcritical multiplication indicative of an inadvertent boron dilution and to initiate automatic valve swapovers to terminate the dilution. The analysis demonstrates that the automatic BDMS actuates and effectively mitigates the boron dilution transient prior to the complete loss of shutdown margin (i.e., prior to criticality).

Blocking BDMS Signal During Reactor Startup

The LCO Applicability in TS 3.3.9 is currently modified by a Note that allows the BDMS flux multiplication signal to be blocked in MODE 2 (below the P-6 setpoint) and MODE 3 during reactor startup. Both of these operating MODES are transitory in nature as the plant is maneuvered toward MODE 1 power operation after an outage; therefore, the term "during reactor startup" is unclear with respect to when the signal may be blocked.

As a result of converting Callaway's TS to the Improved Technical Specifications modeled after the standard in NUREG-1431 for Westinghouse plants, which ultimately resulted in Callaway License Amendment 133 (Reference 7.3), the current TS 3.3.9 Applicability Note was adopted from NUREG-1431 with minor plant-specific changes (MODE 2 Applicability limited to below P-6 at which point the source range neutron flux channels are de-energized and the use of the term "flux multiplication" instead of "flux doubling"). The TS Bases associated with Reference 7.3 similarly adopted the wording from NUREG-1431, with plant-specific nomenclature added, and included a single sentence on the meaning of "during reactor startup":

> "Blocking the flux multiplication signal is acceptable during startup provided the reactor trip breakers are closed with the intent to withdraw rods for startup."

Three years after implementation of the ITS amendment at Callaway, a Licensee Event Report (LER) was filed (Reference 7.4) in which the consensus of plant staff opinion at the time was that the LCO Applicability Note should be narrowly interpreted such that the provision for blocking the flux multiplication signal should only be used during control bank withdrawal. The plant operators declare MODE 2 entry just prior to withdrawing the first control bank, but the plant is in MODE 3 during withdrawal of all the shutdown banks. The basis behind the LER was a very conservative and literal interpretation tied to the FSAR Section 15.4.6 analysis taking credit for the BDMS in MODE 3. Absent an explicit allowance in the wording of the LCO Applicability Note in TS 3.3.9, the position taken in the LER was that the phrase "intent to withdraw rods for startup" applied only to the control banks. After the LER was filed in June 2003, the TS 3.3.9 Bases were revised to reinterpret the LCO Applicability Note such that it did not apply to shutdown bank withdrawal. This amendment request intends to clearly define the TS Applicability Note and undo the overly conservative TS Bases changes made in 2003.

Specifically, the LCO Applicability Note would be revised to allow the BDMS signal to be blocked in MODE 2 (below the P-6 setpoint) during control bank withdrawal and in MODE 3 during shutdown bank withdrawal. The BDMS signal would be blocked just prior to shutdown bank withdrawal in MODE 3 using block control switches SEHS0011 and SEHS0012 on the main control board. Shutdown bank withdrawal typically takes 2 hours; however, it is estimated that shutdown bank withdrawal would take approximately

30 minutes if the proposed change were approved. After the shutdown banks are fully withdrawn, the BDMS function would be restored (unblocked) until just prior to control bank withdrawal, at which point the BDMS function would again be blocked using SEHS0011 and SEHS0012 and by placing the "two-phi" source range flux multiplication module normal/test switches (SEIN0031A and SEIN0032A) in the test position at the NIS racks . The latter action also blocks the BDMS alarm function.

MODE 2 is administratively declared just prior to the commencement of control bank withdrawal even though k_{eff} would not yet be greater than or equal to 0.99 at that time. After the P-6 setpoint is exceeded (intermediate range neutron flux level equivalent to 1E-10 amps), LCO 3.3.9 is no longer applicable. Hot zero power (reactor critical) is nominally in the area of an intermediate range neutron flux indication of 1E-08 amps. The initial conditions of the MODE 2 boron dilution analysis in FSAR Section 15.4.6 include the shutdown banks being fully withdrawn and the control banks withdrawn to the 0% power rod insertion limits depicted in the COLR (control bank A fully withdrawn, control banks B and C partially withdrawn, and control bank D fully inserted).

Blocking the flux multiplication signal is acceptable during withdrawal of the shutdown and control banks based on the heightened operator awareness and reactivity management administrative controls in place during these evolutions. Administrative controls require operator awareness during all reactivity manipulations. A description of specific administrative controls will be added to the TS 3.3.9 LCO Bases. The specific administrative controls include the following:

- 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 RMCS malfunctions and loss of shutdown margin (SDM);

- Criticality is anticipated anytime the shutdown banks are being withdrawn, and when RCS boron dilution is in progress, and when the control banks are being withdrawn;

- RCS boron dilutions are not performed after control bank withdrawal has been initiated until the reactor is critical and stabilized with an intermediate flux nuclear instrumentation system (NIS) reading of 1E-08 amps; and

- A senior reactor operator (SRO) is designated as the reactivity management SRO. Positive reactivity additions are added by only one method during the approach to criticality.

In the subcritical portion of MODE 2 and in MODE 3 when the rod control system is capable of rod withdrawal, LCO 3.1.9, "RCS Boron Limitations < 500°F," and Function 2.b of TS Table 3.3.1-1, "RTS Instrumentation," provide requirements to protect against a rod withdrawal from subcritical (RWFS) event. Since an inadvertent boron dilution event is a much slower reactivity transient than the RWFS event, those measures in LCOs 3.1.9 and 3.3.1 would also provide protection against the effects of an inadvertent boron dilution event in the upper portion of MODE 3 and in MODE 2 below P-6.

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.

Similar Allowances in Other Technical Specifications

The justification for the proposed change to the LCO Applicability Note is similar to that used in several Technical Specifications where provisions allow equipment to be removed from service, or to be placed in non-safeguards lineups, or operating limits to be out of specification, for short durations, typically under administrative controls. The following are examples from the Callaway TS:

- TS 3.1.5 and TS 3.1.6 Applicability Notes allow control bank and shutdown bank insertion limits to be not met during rod freedom of movement surveillances required by SR 3.1.4.2.

- TS Table 3.3.2-1 footnote (n) allows the blocking of the auxiliary feedwater actuation signal that is generated upon the trip of both main feedwater pumps (Function 6.g of TS Table 3.3.2-1). This block is allowed just before shutdown of the last operating main feedwater pump and is restored just after the first main feedwater pump is put into service following performance of its startup trip test.

- TS 3.4.1 Applicability Note allows the pressurizer pressure limit to not apply during power ramps or step changes.

- TS 3.4.5 through TS 3.4.8 and TS 3.9.5 LCO Notes allow the required reactor coolant pumps and/or RHR pumps to be removed from operation for 1 hour during an 8 hour period, RHR pumps to be removed from service for 2 hours for surveillance testing, or RHR pumps to be removed from service for 15 minutes for pump swaps.

- TS 3.4.10 Applicability Note allows pressurizer safety valve lift settings to be out of specification in MODES 3 and 4 for 54 hours after MODE 3 entry as long as a preliminary cold setting was made.

- TS 3.4.12 LCO Notes allow both CCPs to be capable of injecting for 1 hour for pump swaps, both safety injection (SI) pumps to be used for decay heat removal if needed during low level conditions in MODES 5 and 6, and the accumulator isolation valves to be unisolated with sufficiently low accumulator pressures.

- TS 3.4.14 Applicability and TS 3.5.3 LCO Note allow RHR operability exceptions in MODE 4 during lineup transitions between the decay heat removal configuration and the standby lineup for ECCS service.

- TS 3.5.2 LCO Notes allow both SI pumps to be isolated for 2 hours for pressure isolation valve (TS 3.4.14) testing per SR 3.4.14.1 and all ECCS pumps to be incapable of RCS injection (per TS 3.4.12 requirements) for up to 4 hours after MODE 3 entry or an RCS temperature of 375°F, whichever occurs first.

- TS 3.6.3 ACTIONS Note and TS 3.9.4 LCO Note allow containment penetration flow paths to be unisolated intermittently under administrative controls.

- TS 3.7.10 and 3.7.13 LCO Notes allow envelope boundaries to be intermittently opened under administrative controls.

- TS 3.9.2 LCO Note allows unborated water source isolation valves to be unisolated under administrative control.

None of the above Technical Specifications require entry into a default Condition for loss of safety function and several allow limited operation outside of any Condition entry. As demonstrated by the above 19 LCO examples, limited allowances for operating the plant outside of the strict boundaries of a given accident analysis have been approved by NRC, typically for short durations with compensating administrative controls. This is the essential justification behind the change requested in this amendment application.

5.0 REGULATORY SAFETY ANALYSIS

This section addresses the standards of 10 CFR 50.92 as well as the applicable regulatory requirements and acceptance criteria.

The proposed change in this amendment application would revise the LCO Applicability for Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)." The LCO Applicability Note would be revised to more explicitly define what the term "during reactor startup" means in MODES 2 and 3. This revision to the Applicability Note is proposed to clarify the situations during which the BDMS signal may be blocked.

5.1 No Significant Hazards Consideration (NSHC)

AmerenUE has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," Part 50.92(c), as discussed below:

1. Does the proposed change 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 design changes. All design, material, and construction standards that were applicable prior to this amendment request will be maintained. There will be no changes to any design or operating limits.

The proposed change will not adversely affect accident initiators or precursors nor adversely alter the design assumptions, conditions, and configuration of the facility or the manner in which the plant is operated and maintained. There are no design or operating changes to the reactor makeup water system (RMWS), the reactor makeup control system (RMCS), or the chemical and volume control system (CVCS). There will be no decrease in the boron concentration of the boric acid tanks. There will be no changes to the BDMS setpoint or the operation of the BDMS, other than the limited durations during which flux multiplication signal blocking would be allowed. Therefore, there will be no changes that would serve to increase the likelihood of occurrence of an inadvertent boron dilution event.

The proposed change will not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended functions to mitigate the consequences of an initiating event within the applicable acceptance limits. Exceptions to Technical Specification requirements are allowed and, in fact, rather commonplace when plant operation would otherwise be restricted in a manner that is not commensurate with the desired safety objective, especially when those exceptions are of short duration and are accompanied by compensatory measures.

The proposed change does not physically alter safety-related systems nor affect the way in which safety-related systems perform their functions.

The inadvertent boron dilution analysis acceptance criteria will continue to be met with the proposed change, with consideration given to the fact that the current licensing basis analyses do not assume concurrent rod withdrawal in the MODES 2 and 3 boron dilution analyses. The licensing basis analyses assume that positive reactivity insertion is being added by a single method, i.e., boron dilution. The MODE 2 licensing basis analysis of an inadvertent boron dilution event in FSAR Section 15.4.6 assumes that the shutdown banks are fully withdrawn and that the control banks are withdrawn to the 0% power rod insertion limits depicted in the COLR. The MODE 2 analysis credits operator action to swap the charging suction source after an automatic reactor trip, and corresponding rod insertion, on high source range neutron flux. The MODE 3 licensing basis analysis credits automatic mitigation by the BDMS with steady state initial conditions and static initial rod positions (all shutdown and control banks are fully inserted other than the single most reactive rod which is assumed to be fully withdrawn) at bounding RCS T-avg values at either end of MODE 3. Neither the analysis nor the BDMS design basis assumes that the system protects against a rod withdrawal event.

The proposed change will not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. The applicable radiological dose criteria will continue to be met.

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

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

Response: No

There are no proposed design changes nor are there any changes in the method by which any safety-related plant structure, system, or component (SSC) performs its specified safety function. The proposed change will not affect the normal method of plant operation or change any operating parameters. Equipment performance necessary to fulfill safety analysis missions will be unaffected. The proposed change will not alter any assumptions required to meet the safety analysis acceptance criteria.

No new accident scenarios, transient precursors, failure mechanisms, or limiting single failures will be 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.

The proposed amendment will 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.

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

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

Response: No

There will be no 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. Mode-specific required shutdown margins in the COLR will not be changed. The applicable radiological dose consequence acceptance criteria will continue to be met.

The proposed change does not eliminate any surveillances or alter the frequency of surveillances required by the Technical Specifications. None of the acceptance criteria for any accident analysis will be changed.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Conclusion:

Based on the above evaluation, AmerenUE 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.

5.2 Applicable Regulatory Requirements / Criteria

Section 182a of the Atomic Energy Act requires applicants for nuclear power plant operating licenses to include Technical Specifications (TSs) as part of the license. The TSs ensure the operational capability of structures, systems, and components that are required to protect the health and safety of the public. The U.S. Nuclear Regulatory Commission's (NRC's) requirements related to the content of the TSs are contained in Section 50.36 of Title 10 of the *Code of Federal Regulations* (10 CFR 50.36) which requires that the TSs include items in the following specific categories: (1) safety limits, limiting safety systems settings, and limiting control settings; (2) limiting conditions for operation; (3) surveillance requirements per 10 CFR 50.36(c)(3); (4) design features; and (5) administrative controls.

This amendment application is related to the second category above (LCOs) and is a less restrictive change; however, the requested change still affords an adequate assurance of safety when judged against applicable standards.

The following regulatory requirements and guidance documents also apply to the BDMS:

- GDC 2 requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without the loss of the capability to perform their safety functions.

- GDC 4 requires that structures, systems, and components important to safety be designed to accommodate the effects of, and to be compatible with, the environmental conditions associated with the normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, discharging fluids that may result from equipment failures, and from events and conditions outside the nuclear power unit. However, dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.

- GDC 10 requires that specified acceptable fuel design limits are not exceeded during steady state operation, normal operational transients, and anticipated operational occurrences (AOOs). This is accomplished by having a departure from nucleate boiling (DNB) design basis which requires that the minimum departure from nucleate boiling ratio (DNBR) of the limiting rod during Condition I and II events is greater than or equal to the DNBR design limits.

- GDC 13 requires that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems.

- GDC 15 requires that the design conditions of the reactor coolant pressure boundary (RCPB) are not exceeded during any condition of normal operation, including anticipated operational occurrences.

- GDC 20 requires that the protection system(s) shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.

- GDC 21 requires that the protection system(s) shall be designed for high functional reliability and testability.

- GDC 22 through GDC 25 and GDC 29 require various design attributes for the protection system(s), including independence, safe failure modes, separation from control systems, requirements for reactivity control malfunctions, and protection against anticipated operational occurrences.

- GDC 26 requires that the reactivity control systems must be redundant and capable of holding the reactor core subcritical when shut down under cold conditions. Maintenance of the shutdown margin (SDM) ensures that postulated reactivity events will not damage the fuel.

- Standard Review Plan (SRP), NUREG-0800, Section 15.4.6 provides specific guidance as to how compliance with the General Design Criteria 10, 13, 15, and 26 may be demonstrated for an inadvertent boron dilution event.

- Regulatory Guide 1.22 discusses an acceptable method of satisfying GDC-20 and GDC-21 regarding the periodic testing of protection system actuation functions. These periodic tests should duplicate, as closely as practicable, the performance that is required of the actuation devices in the event of an accident.

- 10 CFR 50.55a(h) requires that the protection systems meet IEEE 279-1971. Section 4.2 of IEEE 279-1971 discusses the general functional requirement for protection systems to assure they satisfy the single failure criterion.

There will be no changes to the BDMS such that compliance with any of the above regulatory requirements and guidance documents would come into question. The above discussions demonstrate that the plant will continue to comply with all applicable regulatory requirements.

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

6.0 ENVIRONMENTAL CONSIDERATION

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

7.0 REFERENCES

7.1 Letter from Jack Donohew (NRC) to Garry L. Randolph (Union Electric Company) dated August 20, 2001, "Callaway Plant, Unit 1 – Withdrawal of Amendment Request Related to the Boron Dilution Mitigation System Elimination (TAC No. MA9065)."

7.2 NSAC-183 dated December1992, "Risk of PWR Inadvertent Criticality During Shutdown and Refueling."

7.3 Letter from Jack N. Donohew (NRC) to Garry L. Randolph (Union Electric Company) dated May 28, 1999, "Conversion to Improved Technical Specifications for Callaway Plant, Unit 1 – Amendment No. 133 to Facility Operating License No. NPF-30 (TAC No. M98803)."

7.4 Letter from Warren A. Witt (Union Electric Company) to USNRC Document Control Desk dated June 9, 2003, "Docket Number 50-483, Callaway Plant Unit 1, Union Electric Co., Facility Operating License NPF-30, Licensee Event Report 2003-004-00, Boron Dilution Mitigation System Blocked in MODE 3."

ATTACHMENT 2

MARKUP OF TECHNICAL SPECIFICATIONS

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.

INSERT 1

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)

INSERT 1

--NOTE--

The boron dilution flux multiplication signal may be blocked in MODE 2 (below P-6 (Intermediate Range Neutron Flux) interlock) during control bank withdrawal and in MODE 3 during shutdown bank withdrawal.

ATTACHMENT 3

RETYPED TECHNICAL SPECIFICATIONS

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 MODE 2 (below P-6 (Intermediate Range Neutron Flux) interlock) during control bank withdrawal and in MODE 3 during shutdown bank withdrawal.

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)

ATTACHMENT 4

PROPOSED TECHNICAL SPECIFICATION BASES CHANGES
(for information only)

BASES

LCO (continued)

(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 as discussed in Reference 1. The Overtemperature ΔT trip Function is discussed in LCO 3.3.1, "RTS Instrumentation."

In MODE 6, an inadvertent dilution event is precluded by locked valves for unborated reactor makeup water (BGV0178 and BGV0601), CVCS resin vessels configured with resin for dilution during normal operation (BG8522A, BG8522B, BGV0039, BGV0043, BGV0051, and BGV0055), and the purge line used during flushing of CVCS letdown radiation monitor (SJV0703) that isolate the RCS from the potential sources 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 commence the withdrawal of control banks for startup. This Applicability Note can not be used to block BDMS prior to or during shutdown bank withdrawal. The P-6 interlock provides a backup block signal to the source range flux multiplication circuit.~~

INSERT 2

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

(continued)

The Applicability is modified by a Note that allows the boron dilution flux multiplication signal to be blocked in MODE 2 (below the P-6 setpoint) during control bank withdrawal and in MODE 3 during shutdown bank withdrawal. The BDMS function may be blocked just prior to shutdown bank withdrawal in MODE 3 using switches SEHS0011 and SEHS0012 on the main control board. After the shutdown banks are fully withdrawn, the BDMS function will be restored (unblocked) until just prior to control bank withdrawal, at which point the BDMS function may again be blocked using SEHS0011 and SEHS0012 and by placing the two-phi module normal/test switches in the test position at the NIS racks (SEIN0031A and SEIN0032A). MODE 2 is administratively declared just prior to the commencement of control bank withdrawal even though k_{eff} should not yet be greater than or equal to 0.99 at that time. After the P-6 setpoint is exceeded, this LCO is no longer applicable. Blocking the flux multiplication signal is acceptable during withdrawal of the shutdown and control banks based on the heightened operator awareness and reactivity management administrative controls in place during these evolutions.

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);

- Criticality is anticipated anytime the shutdown banks are being withdrawn, and when RCS boron dilution is in progress, and when the control banks are being withdrawn;

- RCS boron dilutions are not performed after control bank withdrawal has been initiated until the reactor is critical and stabilized with an intermediate flux nuclear instrumentation system (NIS) reading of 1E-08 amps; and

- A senior reactor operator (SRO) is designated as the reactivity management SRO. Positive reactivity additions are added by only one method during the approach to criticality.

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).

BASES

ACTIONS (continued)

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 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.

(moved to Applicability Bases and supplemented)

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).

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

(continued)