



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

June 29, 2010

Mr. Adam C. Heflin  
Senior Vice President and  
Chief Nuclear Officer  
Union Electric Company  
P.O. Box 620  
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: REVISION OF  
BORON DILUTION MITIGATION SYSTEM TECHNICAL SPECIFICATION (TAC  
NO. ME1411)

Dear Mr. Heflin:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 200 to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated June 1, 2009 (ULNRC-05633), as supplemented by letters dated August 27, 2009 (ULNRC-05655), and March 4, 2010 (ULNRC-05682).

The amendment revises the Limiting Condition for Operation (LCO) Applicability Note for TS 3.3.9, "Boron Dilution Mitigation System (BDMS)." The LCO Applicability Note has been revised to clarify the situations during which the BDMS signal may be blocked in MODES 2 and 3.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in black ink, appearing to read "Mohan C. Thadani".

Mohan C. Thadani, Senior Project Manager  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures:

1. Amendment No. 200 to NPF-30
2. Safety Evaluation

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 200  
License No. NPF-30

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Union Electric Company (UE, the licensee), dated June 1, 2009, as supplemented by letters dated August 27, 2009, and March 4, 2010, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Part I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

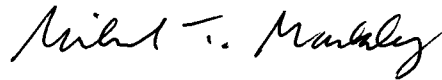
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C.(2) of Facility Operating License No. NPF-30 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan\*

The Technical Specifications contained in Appendix A, as revised through Amendment No. 200 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This amendment is effective as of its date of issuance, and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Michael T. Markley, Chief  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Facility Operating  
License No. NPF-30 and  
Technical Specifications

Date of Issuance: June 29, 2010

ATTACHMENT TO LICENSE AMENDMENT NO. 200

FACILITY OPERATING LICENSE NO. NPF-30

DOCKET NO. 50-483

Replace the following pages of the Facility Operating License No. NPF-30 and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility Operating License

REMOVE

-3-

INSERT

-3-

Technical Specifications

REMOVE

3.3-74

3.3-75

3.3-76

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INSERT

3.3-74

3.3-75

3.3-76

3.3-77

- (4) UE, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source of special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
  - (5) UE, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
- (1) Maximum Power Level  
  
UE is authorized to operate the facility at reactor core power levels not in excess of 3565 megawatts thermal (100% power) in accordance with the conditions specified herein.
  - (2) Technical Specifications and Environmental Protection Plan\*  
  
The Technical Specifications contained in Appendix A, as revised through Amendment No. 200, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.
  - (3) Environmental Qualification (Section 3.11, SSER #3)\*\*  
  
Deleted per Amendment No. 169

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\* Amendments 133, 134, & 135 were effective as of April 30, 2000 however these amendments were implemented on April 1, 2000.

\*\* The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

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:

1. During subcritical physics testing;
  2. During control bank movement in MODE 2 (below P-6 (Intermediate Range Neutron Flux) interlock);
  3. During control bank movement in MODE 3;
  4. During shutdown bank movement in MODE 3.
- 

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One train inoperable.	A.1 Restore train to OPERABLE status.	72 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>B. Two trains inoperable.</p> <p><u>OR</u></p> <p>Required Action and associated Completion Time of Condition A not met.</p>	<p>B.1</p> <p>----- NOTE -----            Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM.            -----</p> <p>Suspend operations involving positive reactivity additions.</p>	<p>Immediately</p>
	<p><u>AND</u></p>	
	<p>B.2</p> <p>Perform SR 3.1.1.1.</p>	<p>1 hour</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p>
	<p><u>AND</u></p>	
	<p>B.3.1</p> <p>Close and secure unborated water source isolation valves.</p>	<p>4 hours</p>
<p><u>AND</u></p>		
<p>B.3.2</p> <p>Verify unborated water source isolation valves are closed and secured.</p>	<p>Once per 31 days</p>	

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. No RCS loop in operation.	C.1 Close and secure unborated water source isolation valves.	4 hours
	<p><u>AND</u></p> C.2 Verify unborated water source isolation valves are closed and secured.	Once per 31 days



SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.2	<p>----- NOTE ----- Only required to be performed in MODE 5. -----</p> <p>Verify BGV0178 is secured in the closed position.</p>	31 days
SR 3.3.9.3	<p>----- NOTE ----- Not required to be performed until 4 hours after reducing power below P-6 interlock. -----</p> <p>Perform COT and verify nominal flux multiplication setpoint of 1.7.</p>	184 days
SR 3.3.9.4	<p>----- NOTE ----- Neutron detectors are excluded from CHANNEL CALIBRATION. -----</p> <p>Perform CHANNEL CALIBRATION.</p>	18 months
SR 3.3.9.5	Verify the centrifugal charging pump suction valves from the RWST open and the CVCS volume control tank discharge valves close in less than or equal to 30 seconds on a simulated or actual actuation signal.	18 months
SR 3.3.9.6	Verify one RCS loop is in operation.	12 hours



UNITED STATES  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 200 TO

FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By application dated June 1, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML091530290), as supplemented by letters dated August 27, 2009 (ADAMS Accession No. ML092400224), and March 4, 2010 (ADAMS Accession No. ML100630796), Union Electric Company (the licensee) requested changes to Facility Operating License No. NPF-30 for the Callaway Plant, Unit 1 (Callaway).

The supplemental letters dated August 27, 2009, and March 4, 2010, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on August 25, 2009 (74 FR 42933).

The licensee proposed to revise the Limiting Condition for Operation (LCO) Applicability Note for Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)." The LCO Applicability Note would be revised to clarify the situations during which the BDMS signal may be blocked in MODES 2 and 3.

The letter dated August 27, 2009, provided the licensee's response to the NRC Request for Additional Information. The final proposed markup of TSs was provided to the NRC by the licensee in its supplemental letter dated March 4, 2010.

2.0 REGULATORY EVALUATION

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 to unborated primary-grade water into the RCS results in unanticipated reactivity increase, due to boron dilution and has the potential to cause 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 planned criticality). The system detects an inadvertent boron dilution event by monitoring the output of both source range neutron flux detectors.

The accident analysis in the Callaway Final Safety Analysis Report (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.

The NRC's regulatory 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) LCOs; (3) surveillance requirements; (4) design features; and (5) administrative controls. The four criteria defined by 10 CFR 50.36(c)(2)(ii) for determining whether particular items should be included in the TS LCOs, are as follows:

- (A) *Criterion 1.* Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.
- (B) *Criterion 2.* A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier;
- (C) *Criterion 3.* A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
- (D) *Criterion 4.* A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

In its letter dated June 1, 2009, the licensee identified the following General Design Criteria (GDC) in Appendix A to 10 CFR Part 50 as being applicable 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, tsunamis, 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.

### 3.0 TECHNICAL EVALUATION

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 chemical and volume control system or an operator error 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 as required by TS 3.9.2.

Current LCO Applicability Note to TS 3.3.9 states:

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.

Both of these operating MODES are transitory in nature as the plant is maneuvered toward MODE 1 power operation after an outage.

Proposed LCO Applicability Note to TS 3.3.9 would state:

The boron dilution flux multiplication signal may be blocked:

1. During subcritical physics testing;
2. During control bank movement in MODE 2 (below P-6 (Intermediate Range Neutron Flux) interlock);
3. During control bank movement in MODE 3;
4. During shutdown bank movement in MODE 3.

In its letter dated June 1, 2009, the licensee further states that blocking of the flux multiplication signal during startup is acceptable based on the heightened operator awareness and reactivity management administrative controls in place during these evolutions. In its supplemental letter dated March 4, 2010, the licensee submitted administrative controls to the TS 3.3.9 Bases as part of this TS change, including:

- 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 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 IE-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.

The proposed Note provides additional detail and clarity to the existing LCO 3.3.9 and conservatively limits the conditions under which the BDMS signal may be blocked. In its supplemental letter dated March 4, 2010, the licensee proposed bases to clarify the conditions under which the BDMS function would be blocked, including:

Under the revised LCO Applicability Note, the BDMS function would be blocked during subcritical physics testing which either directly involves rod movement or is performed at the same time as such testing, and the BDMS function would also be blocked during a rod withdrawal approach to criticality.

The NRC has no objection to the proposed TS Bases. Since the inadvertent boron dilution events are caused frequently by operator error, the NRC staff considers the licensee's measures to heighten operator awareness, during dilution operations, to be an effective justification for blocking the BDMS signal under the defined circumstances.

The NRC staff is also aware that many plants, of Callaway's design and power rating, are not equipped with BDMS systems. These plants rely upon operator action to mitigate inadvertent boron dilution events. Therefore, the staff concludes that the licensee's proposed Applicability Note to TS LCO 3.3.9 to block the BDMS signal (1) during subcritical physics testing; (2) during control bank movement in MODE 2 (below the P-6 interlock); (3) during control bank movement in MODE 3; and (4) during shutdown bank movement in MODE 3, enhances safety, and is, therefore, acceptable. The staff agrees that these are operations wherein operators are required to be closely monitoring the core reactivity level (i.e., to be performing basically the same function as the BDMS).

Based on the above, the NRC staff concludes that enhanced safety will be achieved after the change is implemented, because the change provides clarification, ensures heightened operator awareness during boron dilution operations, is more conservative than the licensee's current requirements. Therefore, the NRC staff concludes that the revised TS will continue to satisfy the requirements in 10 CFR 50.36 and maintain adequate safety. Therefore, the proposed change to the TS LCO Applicability Note is acceptable.

#### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Missouri State official was notified of the proposed issuance of the amendment. The State official had no comments.

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding as published in the *Federal Register* on August 25, 2009 (74 FR 42933). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

#### 6.0 CONCLUSION

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

Principal Contributor: V. Cusumano

Date: June 29, 2010

June 29, 2010

Mr. Adam C. Heflin  
Senior Vice President and  
Chief Nuclear Officer  
Union Electric Company  
P.O. Box 620  
Fulton, MO 65251

SUBJECT: CALLAWAY PLANT, UNIT 1 - ISSUANCE OF AMENDMENT RE: REVISION OF  
BORON DILUTION MITIGATION SYSTEM TECHNICAL SPECIFICATION (TAC  
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A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,  
/RA/

Mohan C. Thadani, Senior Project Manager  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-483

Enclosures:

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**ADAMS Accession No. ML101550104**

\*SE memo dated

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NAME	MThadani	JBurkhardt	SMiranda*	RElliott*	AJones	MMarkley	MThadani
DATE	6/21/10	6/9/10	5/11/10	5/11/10	6/17/10	6/29/10	6/29/10

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