



Callaway Plant

October 22, 2019

ULNRC-06537

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

10 CFR 50.73

Ladies and Gentlemen:

**DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
RENEWED FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2019-006-00
UNRECOGNIZED INOPERABILITY OF
BORON DILUTION MITIGATION SYSTEM TRAIN 'B'**

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(i)(B) to report discovery of conditions and operations prohibited by Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)," and TS Limiting Condition of Operation (LCO) 3.0.4, "LCO Applicability," due to unrecognized inoperability of BDMS Train B.

This letter does not contain new commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "Roger C. Wink", written over a horizontal line.

Roger C. Wink
Manager, Regulatory Affairs

Enclosure
LER 2019-006-00

cc: Mr. Scott A. Morris
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
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Index and send hardcopy to QA File A160.0761

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LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)
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Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

1. Facility Name Callaway Plant Unit 1	2. Docket Number 05000483	3. Page 1 OF 4
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4. Title
Unrecognized Inoperability of Boron Dilution Mitigation System (BDMS) Train 'B'

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	YEAR	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
05	10	2019	2019	- 006	- 00	10	22	2019	Facility Name	Docket Number
										05000
									Facility Name	Docket Number
										05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
5	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
10. Power Level	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
0%	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A

12. Licensee Contact for this LER

Licensee Contact T.B. Elwood, Supervising Engineer, Regulatory Affairs and Licensing	Telephone Number (Include Area Code) 314-225-1905
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

Cause	System	Component	Manufacturer	Reportable to ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	JC	HIS	Grayhill	Y					

14. Supplemental Report Expected

☐ Yes (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ No

15. Expected Submission Date

Month	Day	Year

ABSTRACT (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On August 23, 2019, it was discovered that Flux Doubling Test Bypass Switch S604 had failed to close when it was placed in its Normal position at 1543 on May 10, 2019. This failure would have prevented train 'B' of the Boron Dilution Mitigation System from performing its required safety function when required to be Operable in accordance with Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)," for the periods from 1543 on May 10, 2019 to 2259 on May 16, 2019, and from 2301 on May 16, 2019 to 1212 on May 17, 2019. Due to the unrecognized inoperability of BDMS train 'B', the TS 3.3.9 Limiting Condition of Operation (LCO) requiring two trains of BDMS to be Operable was not met during these periods, and the applicable Required Actions were not completed within their specified Completion Times. In addition, Mode changes were performed during these periods of BDMS train 'B' inoperability without satisfying the provisions of TS LCO 3.0.4.a, thereby resulting in a violation of TS LCO 3.0.4. Following discovery of the failure on August 23, 2019, remedial actions were taken to close the affected switch in its Normal position.

Failure of the switch contacts to close on May 10, 2019 has been attributed to either a stack misalignment or mechanical binding. Corrective actions to prevent recurrence include establishing requirements to verify continuity through the Flux Double Test Bypass Switches for both BDMS trains when the switches are manipulated, and to replace the affected switch at the next available opportunity.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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1. FACILITY NAME

Callaway Plant Unit 1

2. DOCKET NUMBER

05000-483

3. LER NUMBER

YEAR

SEQUENTIAL

REV

NUMBER

NO.

2019

- 006

- 00

NARRATIVE**1. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):**

The event reported in this LER involves the Boron Dilution Mitigation System (BDMS). The function of the BDMS [EIS System: JC] is to mitigate the consequences of the inadvertent addition of unborated primary grade water into the Reactor Coolant System (RCS) [EIS System: AB] when the plant is in Modes 2 (below the P-6 bistable [EIS System: AB] interlock setpoint), 3, 4, and 5. The addition of unborated primary grade water into the RCS results in boron dilution and the potential for an inadvertent boron dilution event.

The BDMS utilizes two channels of source range instrumentation. 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 of the RCS.

Technical Specification (TS) 3.3.9, "Boron Dilution Mitigation System (BDMS)," provides the Limiting Condition for Operation, Conditions, Required Actions, and Surveillance Requirements for the BDMS.

2. INITIAL PLANT CONDITIONS:

At the time of the event, Callaway was in Mode 5 at 0% power with RCS loops filled following completion of core reload and prior to ascension to higher Modes in Refuel 23.

3. EVENT DESCRIPTION:

TS Limiting Condition for Operation (LCO) 3.3.9 requires two (i.e., both) trains of BDMS to be Operable when the plant is in Modes 2 (below P-6 setpoint), 3, 4, and 5.

At 1543 on 05/10/2019, Flux Doubling Test Bypass Switch S604 [EIS Component: HIS] was repositioned from its Alternate Source position to its Normal position. As the plant was in Mode 5 at the time, the affected BDMS train 'B' was required to be Operable per TS LCO 3.3.9. However, on 08/23/2019, it was discovered that there was a lack of continuity through the S604 switch. It was then concluded that the lack of continuity must have existed since the switch was repositioned on 05/10/2019. This unrecognized failure of the switch to close would have prevented BDMS train 'B' from performing its required safety function.

During the period that BDMS train 'B' was inoperable, a change from Mode 5 to Mode 4 occurred at 1217 on 05/11/2019, a change from Mode 4 to Mode 3 occurred at 1951 on 05/14/2019, and a change from Mode 3 to Mode 2 occurred at 2224 on 05/16/2019. The Modes of applicability for TS LCO 3.3.9 were briefly exited at 2259 on 05/16/2019, when the permissive P-6 (flux doubling) interlock channels changed to a "Set" status during the first approach to criticality in Mode 2.

At 2301 on 05/16/2019, the permissive P-6 interlock channels cleared, causing re-entry into the Modes of applicability for TS 3.3.9. Subsequently, a high source range neutron flux trip (which had not been blocked in a timely manner due to human error) caused an unplanned transition from Mode 2 to Mode 3 at 2303 on 05/16/2019. A second approach to criticality began at 1115 on 05/17/2019, followed by a change from Mode 3 to Mode 2 at 1123. The permissive P-6 interlock channels changed to a "Set" status again at 1212 on 05/17/2019, exiting the Modes of applicability for TS 3.3.9.

Between 1212 on 05/17/2019 and discovery of the failure on 08/23/2019, BDMS was not required to be Operable, as Callaway remained in Mode 1, which is outside the Modes of applicability for TS 3.3.9.



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Callaway Plant Unit 1	05000-483	YEAR	SEQUENTIAL NUMBER	REV NO.
		2019	- 006	- 00

4. ASSESSMENT OF SAFETY CONSEQUENCES:

The operations involving positive reactivity additions and Mode changes during the periods when train 'B' of BDMS was inoperable did not significantly degrade plant safety. The failure did not affect the independent and redundant BDMS train 'A', and during the periods when BDMS train 'B' was incapable of performing its required safety function during applicable Modes, there were no instances when BDMS train 'A' was removed from service. Therefore, the ability of BDMS to mitigate an inadvertent dilution of the RCS was never lost.

5. REPORTING REQUIREMENTS:

This LER is submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) to report conditions and operations that were prohibited by TS 3.3.9 and TS LCO 3.0.4.

The inoperability of BDMS train 'B' at 1543 on 05/10/2019 (though unknown at the time) should have caused entry into TS 3.3.9 Condition A, with Required Action A.1 in effect to restore the train to Operable status within a Completion Time of 72 hours. Due to the failure to perform Required Action A.1 within its associated Completion Time, TS 3.3.9 Condition B should have been entered at 1543 on 05/13/2019, with the following Required Actions in effect:

- Required Action B.1 to suspend operations involving positive reactivity additions within a Completion Time of "Immediately," AND
- Required Action B.2 to perform TS Surveillance Requirement (SR) 3.1.1.1 [i.e., shutdown margin calculations] within a Completion Time of 1 hour and once per 12 hours thereafter, AND
- Required Action B.3.1 to close and secure unborated water source isolation valves within a Completion Time of 4 hours, AND
- Required Action B.3.2 to verify unborated water source isolation valves are closed and secured within a Completion Time of once per 31 days.

Required Actions B.1, B.2 and B.3.1 were not performed within their specified Completion Times, thereby resulting in operations (i.e., positive reactivity additions) and conditions (i.e., sources of unborated water being unisolated and shutdown margin calculations not being performed at an increased frequency) that were prohibited by TS 3.3.9.

In addition, per TS LCO 3.0.4, when an LCO is not met, entry into a Mode or other specified condition in the Applicability shall only be made:

- a. When the associated Actions to be entered permit continued operation in the Mode or other specified condition in the Applicability for an unlimited period of time; or
- b. After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the Mode or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications; or
- c. When an allowance is stated in the individual value, parameter, or other Specification.

TS LCO 3.0.4.a was applicable to the event, because once 72 hours have elapsed with an inoperable BDMS train, TS 3.3.9 Condition A is to be continued into Condition B, which provides Required Actions that permit continued operation in the Modes of applicability for an unlimited time. However, as the Required Actions of TS 3.3.9 Conditions A and B were not met, each of the Mode changes that occurred during the periods when BDMS train 'B' was incapable of performing its required safety function during applicable Modes constituted operations that were prohibited by TS LCO 3.0.4.

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Callaway Plant Unit 1	05000-483	2019	- 006	- 00

6. CAUSE OF THE EVENT:

An equipment failure analysis identified the cause of the failure as an electrical contact failure due to stack misalignment or mechanical binding within the switch. However, the root cause of the event was the lack of an indication or test to verify continuity through the affected switch, which resulted in untimely discovery of the failure.

An extent-of-condition review determined that the corresponding switch in the alternate train may potentially be susceptible to the same failure mode, but it has been verified to be operating properly.

7. CORRECTIVE ACTIONS:

Remedial actions were taken on 08/23/2019 to exercise the affected switch in order to correct the misaligned or bound condition and verify continuity through the switch. To prevent recurrence, the affected switch will be replaced and inspected at the next available opportunity. In addition, to ensure that any future failures of the switches within the extent-of-condition will be detected and corrected in a timely manner, procedures and written instructions are being revised to direct the performance of a continuity check after each time the switches are re-positioned. Until the revised procedures and written instructions are issued, guidance to perform these continuity checks is being provided in an Operations Information Report (OIR).

8. PREVIOUS SIMILAR EVENTS:

None.