



Callaway Plant

July 15, 2019

ULNRC-06521

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 COMPANY  
RENEWED FACILITY OPERATING LICENSE NPF-30  
LICENSEE EVENT REPORT 2019-003-00  
REACTOR TRIP DUE TO SOURCE RANGE HI-FLUX**

The enclosed license event report is submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A) to report a reactor protection system actuation during startup and an auxiliary feedwater system actuation due to a plant trip caused by Source Range Hi-Flux.

This letter does not contain any new commitments

Executed on: 7/15/19

Sincerely,

A handwritten signature in black ink, appearing to read "Frederick Bianco", written over a horizontal line.

Frederick Bianco  
Senior Director, Nuclear Operations

Enclosure  
LER 2019-003-00

cc: Mr. Scott A. Morris  
Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region IV  
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Arlington, TX 76011-4511

Senior Resident Inspector  
Callaway Resident Office  
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Mr. L. John Klos  
Project Manager, Callaway Plant  
Office of Nuclear Reactor Regulation  
U. S. Nuclear Regulatory Commission  
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Washington, DC 20555-0001

**Index and send hardcopy to QA File A160.0761**

**Hardcopy:**

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Mr. Jay Silberg (Pillsbury Winthrop Shaw Pittman LLP)

Missouri Public Service Commission



## 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](mailto: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 05000-483	3. Page 1 of 4
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4. Title Reactor Trip due to Source Range Hi-Flux										
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	16	2019	2019	003	00	07	15	2019	Facility Name	Docket Number
										05000
										05000

9. Operating Mode	11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
2	<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 checked="" 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)
000	<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 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
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14. Supplemental Report Expected <input type="checkbox"/> Yes (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> No	15. Expected Submission Date	Month	Day	Year

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

At 2303 on May 16, 2019, Callaway plant tripped during reactor startup due to a Source Range (SR) Hi-Flux trip signal, which resulted in reactor protection system and auxiliary feedwater system actuations. The control room operators failed to block the SR Hi-Flux trip prior to reaching the setpoint of 10E5 counts per second. All plant systems responded as expected.

Analysis identified the following causes and contributing causes:

1. The Reactor Operators did not have an appropriate strategy for monitoring SR detector count rate relative to other critical parameters that were being monitored.
2. The Control Room Supervisor was also fulfilling the role of Reactivity Management Senior Reactor Operator but became distracted from this primary function. The reactor startup procedure required going to several attachments and performing lower priority steps prior to blocking the SR Hi-Flux trip, thus delaying performance of this action.
3. The reactor startup procedure did not support expeditious action to block the SR Hi-Flux trip.
4. Operators were not aware of the time constraints when blocking the SR Hi-Flux trip.

Corrective actions include revising the reactor startup procedure to ensure the correct monitoring behaviors and revising the standard to require an additional Senior Reactor Operator who can focus solely on reactivity control.

**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	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Callaway Plant Unit 1	05000-483	2019	- 003	00

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

The reactor trip system at Callaway Plant includes a Source Range (SR) Hi-Flux reactor trip [EIS System: AB], Component: XI] function with a setpoint of 10E5 counts per second. The P-6 bistable [EIS System: AB] is an interlock that ensures the intermediate range instrumentation is properly monitoring reactor power, prior to blocking the SR trip setpoints and relying on the intermediate range instrumentation during reactor startup (approach to critical). When one channel of the intermediate range instrumentation picks up (at approximately 10E-10 amperes), the P-6 bistable activates, allowing the SR Hi-Flux reactor trip to be blocked.

**2. INITIAL PLANT CONDITIONS**

Callaway was at 0% Power/Mode 2 at the discovery time of this event.

**3. EVENT DESCRIPTION**

Control room operators failed to block the SR Hi-Flux reactor trip in time after the P-6 bistable interlock was reached, resulting in an automatic reactor trip. The following describes the sequence of events leading up to this event, the causes and contributing causes of the event, and corrective actions taken to prevent recurrence of such an event.

On May 16, 2019 at 1900, control room operators began to perform a reactor startup to conclude refuel 23 and resume plant operations. At approximately 2000, a dilution was performed to get reactor coolant system (RCS) [EIS System: AB] boron concentration within 10 parts per million of the estimated critical position boron requirement. While the control room operators waited for proper RCS boron mixing, a review of the reactor startup procedure was performed. At 2100, a status brief was held to discuss an overview of reactor startup performance, continuous actions, individual roles, and actions to address blocking the SR Hi-Flux trip.

At 2224, the plant procedurally entered Mode 2 with SR instruments N31 and N32 indicating 220 counts per second and 340 counts per second, respectively. At 2226, reactor startup was commenced by withdrawing 'A' Control Bank in 50 step increments. At 2248, 'D' Control Bank withdrawal to 5 steps was complete. When the SR count rate was stable, the Inverse Count Rate Ratio (ICRR) measurement was performed. An alternate ICRR was performed using the plant computer which permits using the plot to ensure data points were taken at stable conditions. The ICRR using the alternate method predicted criticality for both source range instruments channels with the 'D' Control Bank at 60 steps. At approximately 2300, the 'D' Control Bank was withdrawn and reached a transient startup rate (SUR) of 0.5 decades per minute (dpm), at which time it was stopped at 45 steps. After observing lowering of the SUR, it was determined that criticality had not been achieved. At approximately 2301, the rods were withdrawn to 55 steps for the 'D' Control Bank. When the control room operators began to withdraw rods again, the SUR was approximately 0.2 dpm and lowering. The N31 and N32 SR instruments indicated approximately 4500 counts per second and approximately 9100 counts per second, respectively.

At 23:01:43, the rods in 'D' Control Bank at were stopped at 55 steps. The SUR was 0.7 dpm, which immediately dropped to 0.4 dpm and lowering. SR instruments N31 and N32 indicated approximately 6000 counts per second and approximately 13000 counts per second, respectively. Simultaneously, the P-6 bistable light lit. An informal announcement was made that P-6 was lit, which was heard by several control room operators. The SR count value was not observed after completing the rod withdrawal, and the control room operators were unaware they were approaching the SR Hi-Flux trip setpoint of 10E5 counts per second.



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At approximately 23:02:40, the control room operators began to perform the steps in the procedure to block the SR Hi-Flux trip. At 2303, the SR Hi-Flux reactor trip annunciator was received and the reactor tripped. The control room operators performed the required immediate actions and stabilized the unit in Mode 3.

Since feedwater was isolated in response to the reactor trip, concurrent with low RCS average temperature at 564F, the Balance-of-Plant Operator manually started both auxiliary feedwater pumps and established flow to all four steam generators due to lowering steam generator water levels. The control room operators then transitioned to Normal Unit Recovery Guideline Following Reactor Trip.

At the time of the trip, the reactor had not yet been declared critical. All systems responded as expected.

**4. ASSESSMENT OF SAFETY CONSEQUENCES:**

There were no actual nuclear, radiological, or personnel safety impacts associated with this event. The potential impact was on nuclear safety, with respect to challenging a reactor trip setpoint. All equipment functioned as designed, and the reactor automatically tripped (i.e., shutdown) per design when the SR Hi-Flux setpoint was reached.

**5. REPORTING REQUIREMENTS**

This LER is submitted pursuant to 50.73(a)(2)(iv)(A) to report a reactor protection system actuation during startup and an auxiliary feedwater actuation.

Specifically, 10 CFR 50.73(a)(2)(iv)(A) states in part, "The licensee shall report:

- (A) Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B) of this section...
- (B) The systems to which the requirements of paragraph (a)(2)(iv)(A) of this section are:
  - (1) Reactor protection system (RPS) including: reactor scram or reactor trip....
  - (6) PWR auxiliary or emergency feedwater system

The RPS was actuated on May 16, 2019, at 2303, during startup. This fulfills the reporting requirement of 10 CFR 50.73(a)(2)(iv)(A) by actuation of the system specified in 10 CFR 50.73(a)(2)(iv)(A)(1).

A valid auxiliary feedwater system actuation was manually initiated as a direct consequence of the lowering of the steam generator water levels (due to the main feedwater isolation that occurred in response to the reactor trip). This fulfills the reporting requirement of 10 CFR 50.73(a)(2)(iv)(A) by actuation of the system specified in 10 CFR 50.73(a)(2)(iv)(A)(6).

**6. CAUSE OF THE EVENT**

The following causes or contributing causes were identified that lead to this reactor trip:

1. The reactor operators did not have an appropriate strategy for monitoring SR detector count rate relative to other critical parameters that were being monitored.
2. The Control Room Supervisor was also fulfilling the role of Reactivity Management Senior Reactor Operator but became distracted from this primary function. The reactor startup procedure required going to several



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attachments and performing lower priority steps prior to actually blocking the SR Hi-Flux trip, thus delaying the performance of this action.

3. The reactor startup procedure did not support expeditious action to block the SR Hi-Flux trip.
4. Operators were not aware of the time constraints when blocking the SR Hi-Flux trip.

### 7. CORRECTIVE ACTIONS

Corrective actions to prevent recurrence are as follows:

1. Revise the reactor startup procedure to ensure the correct monitoring behaviors and to support expeditious actions for blocking the Hi-Flux trip by establishing a continuous action step for monitoring SR counts / blocking the SR Hi-Flux trip,
2. Revise the standard for the Reactivity Management Senior Reactor Operator to always require an additional Senior Reactor Operator who can focus solely on reactivity control.

### 8. PREVIOUS SIMILAR EVENTS

A review of similar events over the past 3 years indicated that no previous plant trips have occurred at Callaway due to automatic actuation of a reactor trip system function.