



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-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: ira_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name Callaway Plant Unit 1	2. Docket Number 05000483	3. Page 1 OF 4
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4. Title
Reactor Trip and AFW Actuation Following Spurious MFRV Closure

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
04	04	2020	2020	- 002	- 0	06	03	2020	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)			
1	<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)
	<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)
100	<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

14. Supplemental Report Expected <input checked="" type="checkbox"/> Yes (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> No	15. Expected Submission Date	Month	Day	Year
		09	30	2020

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

On April 4, 2020 at 0115, a reactor trip and auxiliary feedwater actuation occurred at Callaway Plant (Callaway) following malfunction of the "C" main feedwater regulating valve (MFRV). Following the reactor trip, the plant safety systems responded per design. The malfunction of the C MFRV was caused by a failure of the primary valve positioner. The primary positioners for the A, B, C, and D MFRVs were replaced prior to plant startup. The backup positioner for the C MFRV was verified to be functioning properly during troubleshooting activities.

Investigation into the cause and development of corrective actions to prevent recurrence of the positioner malfunction are ongoing, and have been hampered by the COVID-19 pandemic. A supplemental LER will be submitted following completion of the root cause investigation.



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CONTINUATION SHEET**

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Callaway Plant Unit 1	05000-483	YEAR 2020	SEQUENTIAL NUMBER - 002	REV NO. - 0

NARRATIVE

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

The main feedwater regulating valves (MFRVs) function to control feedwater flow to the steam generators and provide backup isolation of main feedwater (MFW) (EIS: SJ) flow in the event that a main feedwater isolation valve (MFIV) fails to close. One MFIV (EIS: ISV) and one MFRV (EIS: FCV) are located on each MFW line, outside of containment. If the single active failure postulated for a secondary pipe break is the failure of a safety grade MFIV to close, then credit is taken for closing the non-safety grade MFRVs.

Closure of the MFIVs or MFRVs terminates flow to the steam generators, in the event of a feedwater line break (FWLB) occurring upstream of the MFIVs or MFRVs. Since the MFIVs are located upstream of the point where the auxiliary feedwater lines connect to the main feedwater lines, which is in turn upstream of the main feedwater check valves (located in containment), closure of the MFIVs or the MFRVs ensures delivery of auxiliary feedwater to the steam generators for support of the auxiliary feedwater function in the event of a main feedwater line break in the turbine building (i.e., upstream of the MFIVs and MFRVs).

Similarly, the consequences of events occurring in the main steam lines or in the MFW lines downstream from the MFIVs will be mitigated by MFIV or MFRV valve closure. Closure of the MFIVs or MFRVs effectively terminates the addition of feedwater to an affected steam generator, limiting the mass and energy release for a steam line breaks (SLB) or FWLB inside containment, and reducing the cooldown effects for a SLB.

The MFIVs and MFRVs close on receipt of any safety injection signal, a Tav_g - Low coincident with reactor trip (P-4), a low-low steam generator level, or steam generator water level - high high signal.

The MFIVs and MFRVs provide the primary success path for events requiring feedwater isolation and isolation of non-safety-related portions from the safety-related portion of the system, so as to provide for auxiliary feedwater addition. Each MFRV actuator (skid-mounted at the valve) has two associated redundant actuation trains. The MFRV positioners serve no function to close a MFRV in response to a feedwater isolation signal. Thus, the malfunction of the 'C' MFRV positioner described in this LER had no impact on the capability of the 'C' MFRV to perform its specified safety function.

The specified safety function of the MFRVs is to provide a diverse backup function to the MFIVs for the potential failure of an MFIV to close, even though the MFRVs are located in the non-safety-related portion of the feedwater system.

2. INITIAL PLANT CONDITIONS:

Callaway was initially in MODE 1 at 100% rated thermal power at the time of this event.



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3. EVENT DESCRIPTION:

On April 4, 2020, at 0115 a reactor trip, a Feedwater Isolation Signal, and an Auxiliary Feedwater Actuation Signal to the motor-driven AFW pumps (MDAFAS) occurred due to a 'C' Steam Generator Water Level Low-Low signal. Callaway was initially in MODE 1 at 100% rated thermal power. Annunciator 126F, "Digital Feedwater Trouble," alarmed in the main control room at approximately 0113. The Balance of Plant Operator noted the 'C' steam generator level was lowering with full open demand on the 'C' MFRV. The Balance of Plant Operator took manual control of the 'C' MFRV and attempted to restore 'C' steam generator level. The inability to control level in the 'C' steam generator level was caused by a malfunction of the primary 'C' MFRV positioner. At approximately 0115, with 'C' steam generator level at approximately 30% narrow range (NR), the Control Room Supervisor directed the Reactor Operators to trip the reactor due to the inability to maintain 'C' Steam Generator Level. However, a reactor trip signal was automatically generated from Steam Generator Level Low-Low on 'C' Steam Generator level at approximately 17% NR level before the Reactor Operators were able to manually trip the reactor. Following the reactor trip the crew performed E-0, "Reactor Trip and Safety Injection," and transitioned to ES-0.1, "Reactor Trip Response," to stabilize the plant.

A Steam Generator Water Level Low-Low signal generates the following signals:

1. Reactor trip signal
2. Feedwater isolation signal (FWIS)
3. Motor-Driven Auxiliary Feedwater Actuation Signal (MDAFAS) (Low-Low Level signal present on one-out-of-four steam generators)
4. Turbine-Driven Auxiliary Feedwater Actuation Signal (TDAFAS) (Low-Low Level signal present on two-out-of-four steam generators)

The logic for the first three signals was satisfied, and subsequently, a reactor trip signal, FWIS, and MDAFAS were all generated. Subsequent to the start of the motor driven auxiliary feedwater pumps, (MDAFPs) level in the other steam generators lowered such that the start logic for the turbine driven auxiliary feedwater pump was satisfied. All auxiliary feedwater pumps started and ran in response to valid signals.

After the reactor trip, the plant safety functions responded as designed. One unexpected component response, which had no bearing on the AFW safety function, was an unexpected opening of ALHV0220, Hardened Condensate Storage Tank Isolation Valve to AFW, when both MDAFPs started on the AFAS. The unexpected opening of ALHV0220 is being evaluated under the station's corrective action program.

The primary valve positioners on all MFRVs were replaced following the reactor trip and noted actuations. Proper functioning of the backup positioner on the C MFRV was verified during troubleshooting activities. All valves were diagnostically tested prior to being released for operation. The station was then restarted in accordance with station procedures. It is noted that the MFRV backup positioners do not assume control automatically upon failure of the primary positioner and the transient event could not be mitigated manually in time to prevent the event reported in this LER.



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4. ASSESSMENT OF SAFETY CONSEQUENCES:

The event reported in this LER was a reactor trip and auxiliary feedwater actuation following a malfunction of a MFRV. The plant responded as designed with the exception of the opening of ALHV0220 described previously, and all safety functions were fulfilled in a manner consistent with the plant's safety analysis. The event reported in this LER does not represent an event that significantly degraded the plant's safety.

5. REPORTING REQUIREMENTS:

The event reported in this LER was an event that resulted in automatic actuation of the reactor protection system and the auxiliary feedwater system. This event is reportable as a Licensee Event Report per 10 CFR 50.73(a)(2)(iv)(A), which requires reporting any event or condition that resulted in manual or automatic actuation of any of the systems listed in 10CFR50.73(a)(2)(iv)(B). The reactor protection system and auxiliary feedwater system are both specified in 10 CFR 50.73(a)(2)(iv)(B).

6. CAUSE OF THE EVENT:

The root cause investigation associated with the positioner failure for this event has been hampered by the COVID-19 pandemic and is ongoing. Cause(s) and corrective actions will be provided in a supplement to this LER once the root cause process is complete. The cause(s) of the event will be identified as part of the root cause analysis process.

7. CORRECTIVE ACTIONS:

The root cause investigation for this event and development of corrective actions to prevent recurrence of the MFRV positioner malfunction are ongoing, and have been hampered by the COVID-19 pandemic. Following the reactor trip, all primary MFRV positioners were replaced. Proper functioning of the backup positioner for the C MFRV was verified during troubleshooting. All MFRVs were also diagnostically tested before being released to operations for plant startup. Investigation into the event is ongoing, cause(s) and corrective actions will be provided in a supplement to this LER once the root cause process is complete. The cause(s) of the event and corrective actions to prevent recurrence will be identified as part of the root cause analysis process.

Although root cause investigation and development of corrective actions are not complete at this time, it should be noted that the MFRVs are capable of performing their specified safety function of providing a diverse and redundant isolation of main feedwater flow following a postulated failure of a MFIV to close in response to a feedwater isolation signal.

8. PREVIOUS SIMILAR EVENTS:

During the previous three years, there have been no similar events involving spurious closure of a MFRV resulting in a reactor trip and auxiliary feedwater actuation.