NRC FORM 366 (08-2020) U.S. NUCLEAR REGULATORY COMMISSION

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LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)

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1. Facility Name	2. Docket Number	3. Page
Callaway Plant Unit 1	05000483	1 OF 4

4. Title

Class 1E Electrical Air Conditioning System Thermal Expansion Valve Failure Resulted in Condition Prohibited by Technical Specifications

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
										05000
10	25	2022	2022	- 003 -	00	12	21	2022	Facility Name	Docket Number
										05000

9. Operating Mode	10. Power Level
1	100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(A)	**10 CFR Part 73**
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(4)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(1)(i)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(i)
☐ 20.2203(a)(2)(iii)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.77(a)(2)(ii)
☐ 20.2203(a)(2)(iv)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	
☐ 20.2203(a)(2)(v)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	

☐ **Other** (Specify here, in Abstract, or in NRC 366A).

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include Area Code)
T.B. Elwood, Supervising Engineer, Regulatory Affairs and Licensing	314-225-1905

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To IRIS	Cause	System	Component	Manufacturer	Reportable To IRIS
B	VI	V	ME34	Y					

14. Supplemental Report Expected	15. Expected Submission Date	Month	Day	Year
☐ No ☒ **Yes** (If yes, complete 15. Expected Submission Date)		02	23	2023

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

At 1530 on 10/25/22, a condition was identified for one of the two Class 1E Electrical Equipment Air Conditioning (Class 1E A/C) trains. Specifically, frost and condensation were observed on the equalizing line for the #1 thermal expansion valve (TXV) associated with the compressor on the "A" train's refrigeration unit, SGK05A [EIIS system: VI, component: ACU]. At that time, the unit was considered Operable but degraded. At 0947 on 10/27/22, however, SGK05A was discovered to be tripped due to high compressor exhaust temperature. The "A" Class 1E A/C train was declared inoperable.

Upon further review, it was determined that the condition observed on 10/25/22 was firm evidence of a malfunctioning TXV (#1), which caused inadequate refrigerant flow to the compressor. It was thus determined that SGK05A became inoperable at that time.

With one Class 1E A/C train inoperable, Required Action A.1 of TS 3.7.20, "Class 1E Electrical Equipment Air Conditioning (A/C) System," requires immediately taking action to implement mitigating actions. With Required Action A.1 not met, the plant must be in Mode 3 within 6 hours per Required Action B.1. Since SGK05A was not considered to be inoperable on 10/25/22, these Required Actions and Completion Times were not met, thus resulting in a condition prohibited by TS 3.7.20.

TXV #1 was replaced, and SGK05A was declared OPERABLE on 10/30/22 at 1420. Investigation of this event is in progress. A supplement to this LER is expected to provide additional information.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Callaway Plant Unit 1	05000-483	2022	- 003	- 00

NARRATIVE

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

The Class 1E electrical equipment air conditioning (Class 1E A/C) trains provide a suitable environment for the Class 1E electrical equipment trains. The Class 1E A/C system [EIIS system: VI] consists of two independent trains such that each train provides cooling of recirculated air in the rooms normally dedicated to that train. Each train consists of a prefilter, self-contained refrigeration unit (SGK05A/B) [EIIS system: VI, component: ACU] using normal service water or essential service water (ESW) [EIIS system: BI] as a heat sink, centrifugal fans, instrumentation, and controls to provide for electrical equipment room temperature control.

The Class 1E A/C trains have emergency operation functions and also operate during normal unit operation. Each train is normally aligned to cool only the equipment associated with its emergency load group. The Class 1E A/C trains are operated in a continuous recirculation mode to maintain the ESF switchgear [EIIS systems: EB, ED, and EJ, component SWGR] rooms, the battery [EIIS system: EJ, component: BTRY] rooms, and the DC switchboard [EIIS system: EJ] rooms to a temperature of less than or equal to 90 degrees F.

Additional recirculation capability is provided via the supplemental cooling system, which consists of two trains of standby fans and dampers that may be actuated via operator action. With a Class 1E A/C train inoperable, the additional recirculation capability (either train) may be utilized in conjunction with the remaining Class 1E A/C train to provide adequate area cooling for both trains of Class 1E electrical equipment during normal and accident conditions.

Requirements for the Class 1E A/C trains are specified in Technical Specification (TS) 3.7.20, "Class 1E Electrical Equipment Air Conditioning (A/C) System." Limiting Condition for Operation (LCO) 3.7.20 specifies that two Class 1E electrical equipment A/C trains shall be Operable during Modes 1, 2, 3 and 4. With one Class 1E electrical equipment A/C train inoperable, Condition A and its three Required Actions under LCO 3.7.20 apply. Required Action A.1 requires immediately initiating action to implement mitigating Actions; Required Action A.2 requires verifying room area temperatures less than or equal to 90 degrees F within 1 hour and once per 4 hours thereafter; Required Action A.3 requires restoring the inoperable Class 1E electrical equipment A/C train to Operable status within 30 days. With the Required Action(s) and Completion Time(s) not met, Condition B and its Required Actions under LCO 3.7.20 apply. Specifically, Required Actions B.1 and B.2 require the plant to be in Mode 3 (Hot Shutdown) within 6 hours and in Mode 5 (Cold Shutdown) within 36 hours, respectively.

2. INITIAL PLANT CONDITIONS:

Callaway Plant was in MODE 1 at approximately 100% rated thermal power at the time of discovery of this event. For the period of time during which it was determined that the affected Class 1E A/C train had been inoperable, the plant remained in Mode 1. No other contributing inoperable SSCs were identified during this event.

3. EVENT DESCRIPTION:

On 10/25/22 at 1530, frosting and condensation were observed on the equalizing line from the thermal expansion valve (TXV) #1 for the compressor on the "A" Class 1E A/C unit, SGK05A. TXV #1 is the first of four thermal expansion valves (for each A/C unit) that sequentially operate to regulate refrigerant flow to the unit's compressor. The identified frosting and condensation indicated that TXV #1 could be impeding refrigerant flow to the compressor. An Immediate Operability Determination (IOD) was performed, which concluded that SGK05A was Operable but degraded, as the associated ESF switchgear room temperature was still being maintained at approximately 67 degrees (i.e., within its normal day-to-day range), thus providing evidence that the A/C unit was providing adequate cooling at that time.

On 10/27/22 at approximately 0947, electricians investigating an elevated compressor head temperature on SGK05A noticed that the compressor was not running upon arrival. The thermostat was adjusted (downward) to attempt to start the compressor; however, SGK05A failed to start and was declared inoperable. The unit had tripped due to high compressor exhaust temperature and was thus declared inoperable. Plant operators logged entry into the applicable Condition and completed the Required Actions of TS LCO 3.7.20.

With a Class 1E A/C unit inoperable, LCO 3.7.20 Required Action A.1 requires starting a supplemental cooling train to provide additional recirculation capability. (As explained in the Bases for TS 3.7.20, starting and running the supplemental cooling train is the primary "mitigating Action" required for fulfilling Required Action A.1.) This action was implemented at 1035 on 10/27/22. LCO 3.7.20 Required Action A.2 requires verifying room area temperature is less than 90 degrees within 1 hour and at least once per 4 hours thereafter. This action was initially performed at 1030 on 10/27/22.

Based on subsequent investigation into this event, and as further described in the "Cause of Event" section of this LER, it has been determined that the period of SGK05A inoperability began when the frosting and condensation were first observed on TXV #1, which as stated above, was at 1530 on 10/25/22. Since the IOD determined SGK05A was OPERABLE at that time, the supplemental cooling system was not immediately inititated per TS LCO 3.7.20 Required Action A.1, and room temperatures were not verified per station procedures to be less then 90 degrees within the required time(s) for compliance with Required Action A.2. Thus, retrospectively, the Required Actions of TS LCO 3.7.20 were not entered and met when SGK05A actually became inoperable.

SGK05A was declared OPERABLE on 10/30/22 at 1420 after replacement of TXV #1 and completion of post-maintenance testing.

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 ensuring adequate area cooling for the potentially affected Class 1E electrical equipment. The temperature limit for the ESF switchgear rooms, the battery rooms, and the DC switchboard rooms is 87 degrees F. The room temperatures are constantly monitored, and control room annunciator 19F is designed to alarm if the room temperature reaches 83 degrees F. No control room log entries were made for this annunciator coming in during the timeframe of this event. All temperatures recorded locally in this timeframe were between 72.5 and 77.5 degrees F. This provides reasonable assurance that the Class 1E electrical equipment in the ESF switchgear rooms, battery rooms and DC switchboard rooms was not affected by the identified condition. However, there is not reasonable assurance that SGK05A itself would have been capable of performing its required cooling function for the entirety of its 30-day mission time in the event of a DBA during the noted timeframe.

During the timeframe of this event (10/25/22 at 1530 until 10/30/22 at 1420), the second train (i.e., the B train) of Class 1E A/C was OPERABLE and able to fulfill its mission time of 30 days. With a supplemental cooling system train capable of being placed into service and one train of Class 1E electrical equipment air conditioning OPERABLE, the capability to cool both trains of Class 1E electrical equipment was maintained.

5. REPORTING REQUIREMENTS:

This LER is submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) to report a condition prohibited by the Technical Specifications. As described above, it has been determined, retrospectively, that the SGK05A unit actually became inoperable at 1530 on 10/25/22. At that point, Required Action A.1 of TS 3.7.20 should have been entered such that action should have been

immediately taken "to implement mitigating actions" (i.e., to start the supplemental cooling train). With that Required Action not met, the plant should have then been placed in Mode 3 within 6 hours per Required Action B.1 of TS 3.7.20. With these Required Actions and their Completion Times not met (due to the unknown inoperability at the time), a condition prohibited by TS 3.7.20 occurred. That is, with the plant in Mode 1 throughout the time of the noted condition, the affected Class 1E A/C train was inoperable for a period of time longer than allowed by the Technical Specifications.

6. CAUSE OF THE EVENT:

The cause of this event was malfunctioning of thermal expansion valve (TXV) #1. Investigation has determined that the valve was not properly regulating flow when the valve was operating at or near its closed position, thus resulting in inadequate refrigerant flow to the compressor on SGK05A. This caused the compressor to run at an elevated temperature, as evidenced by the compressor's high head temperature, and subsequent trip of the unit.

Results from further investigation into the cause(s) of this event will be included in a supplement to this LER.

7. CORRECTIVE ACTIONS:

Upon declaring the SGK05A unit inoperable, the TXV valve was replaced, post-maintenance testing was completed, and the unit was restored to Operable status.

As noted above, evaluation of this event is still in progress. Additional information concerning the cause and other corrective actions will be provided in a supplement to this LER.

8. PREVIOUS SIMILAR EVENTS:

Failure of the SGK05A/B units was previously reported in LER 2013-001-00, as submitted to the NRC on February 15, 2013. In that case, the failure was due to refrigerant leakage. Compared to the currently reported event, the Technical Specification compliance aspect of the LER 2013-001-00 event was different because Technical Specification 3.7.20 was not incorporated into the Callaway Technical Specifications until 2019.