January 16, 2015

ULNRC-06171

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.
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2014-005-00
ALL ECCS ACCUMULATOR ISOLATION VALVE OPERATOR BREAKERS CLOSED IN MODE 3 WITH RCS PRESSURE GREATER THAN 1000 PSIG

The enclosed licensee event report is submitted pursuant to 10 CFR 50.73(a)(2)(v)(A), 10 CFR 50.73(a)(2)(v)(B), 10 CFR 50.73(a)(2)(v)(D), and 10 CFR 50.73(a)(2)(vii) due to concurrent closure of power supply breakers for the motor operators for all emergency core cooling system (ECCS) accumulator isolation valves, this being a single condition which resulted in inoperability of more than one (i.e., all) of the ECCS accumulators, and which in turn could have prevented fulfillment of the ECCS accumulator system safety function.

This letter does not contain new commitments.

Sincerely,

Barry L. Cox
Senior Director, Nuclear Operations

Enclosure

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LICENSEE EVENT REPORT (LER)

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

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4. TITLE

All ECCS Accumulator Isolation Valve Operator Breakers Closed in Mode 3 With RCS Pressure Greater Than 1000 PSIG

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
									N/A	N/A
11	18	2014	2014	- 005 -	00	01	16	2015	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OPERATING MODE

3

10. POWER LEVEL

0%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☒ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☒ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☒ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE 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	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	EB	BKR	W120	Y	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
N/A	N/A	N/A

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On 11/18/2014, leak testing was being performed on the Emergency Core Cooling System (ECCS) Accumulator isolation valves (EPHV8878A, EPHV8878B, EPHV8878C and EPHV8878D) while the plant was in Mode 3 with Reactor Coolant System (RCS) pressure above 1000 psig. During the testing, the supply breakers for all four of the isolation valve motor operators were closed at 1734. This action had the unintended result of rendering the four ECCS Accumulators inoperable. The condition was identified at 1900, and Condition D under the Limiting Condition for Operation (LCO) of Technical Specification (TS) 3.5.1 was immediately entered. Per Required Action D.1, TS LCO 3.0.3 was immediately entered. By 1930, three ECCS Accumulators had been restored Operable with their isolation valves open and power removed from the isolation valve motor operators, and TS LCO 3.0.3 was exited.

The cause of this event was an inadequate leak testing procedure, which resulted in the failure of Operations personnel to comply verbatim with the procedure. The leak testing procedure will be revised to clearly specify that removal of power from the isolation valve motor operator is required for Operability of each ECCS Accumulator during the Modes of applicability for TS LCO 3.5.1. Requirements for verbatim compliance with Continuous Use procedures have been reinforced within the Operations Department.

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

The ECCS is an engineered safety feature which is designed to directly mitigate the consequences of a design basis accident. The primary function of the ECCS is to provide emergency core cooling (i.e., decay heat removal) in the event of a loss of coolant accident (LOCA) resulting from a break in the RCS, or to provide emergency boration in the event of a steam/or feedwater break accident resulting from a break in the secondary steam system.

The ECCS accumulators are pressure vessels partially filled with borated water and pressurized with nitrogen gas. They are designed to passively inject into the RCS cold legs during a loss-of-coolant accident (LOCA) when RCS pressure decreases below the nitrogen cover gas pressure. Each injects its borated water through an open motor-operated isolation valve and two check valves into the RCS during a LOCA.

ECCS accumulator injection is credited in the accident sequences for several events that involve a reduction in primary coolant inventory, including large-break LOCA. Although no credit is taken in the LOCA ECCS thermal analysis for the boron content of the injection water or for insertion of control or shutdown rods, the insertion of negative reactivity by both reactor trip and borated water injection complements the formation of moderator voids following a large break LOCA in causing rapid reduction of power to the residual level corresponding to fission product decay heat (i.e., contributes to achieving and maintaining safe shutdown).

TS LCO 3.5.1 requires all four ECCS accumulators to be Operable in Modes 1 and 2, and in Mode 3 with RCS pressure greater than 1000 psig. In order for an ECCS accumulator to be considered Operable, among other requirements, its isolation valve must be open, with power removed from the valve's motor operator.

2. INITIAL PLANT CONDITIONS:

On 11/18/2014, the plant was preparing for startup from a refueling outage and in Mode 3 (Hot Standby) at normal operating temperature and pressure (i.e., with nominal values of 557° F average RCS temperature and 2235 psig RCS pressure). In order to assure compliance with TS LCO 3.5.1, which is applicable in Modes 1 and 2, and in Mode 3 with RCS pressure greater than 1000 psig, all ECCS accumulator isolation valves had been verified open, with power removed from the valve motor operators, at 0219 on 11/17/2014, prior to Mode 3 entry at 0232 on 11/18/2014.

3. EVENT DESCRIPTION:

At 1734 on 11/18/2014, about an hour before the Operations crew shift turnover, ECCS accumulator 'A' was taken out of service and made inoperable for planned performance of in-service testing (IST) per procedure OSP-BB-VL006, "RCS PRESSURE ISOLATION VALVES INSERVICE TESTS - IPTE." Step 6.6.3 of OSP-BB-VL006 had required the breaker for the 'A' ECCS accumulator isolation valve to be unlocked and closed in order to supply power to the valve motor actuator, and allow it to be closed. Accordingly, Operations declared entry into TS LCO 3.5.1 Condition B, "One ECCS accumulator inoperable for reasons other than Condition A," with a Required Action to restore the inoperable 'A' ECCS accumulator to Operable status within the specified Completion Time of 24 hours.

Contrary to the sequence of tasks described in OSP-BB-VL006, Operations personnel had also concurrently unlocked and closed the breakers that supply power to the motor operators for the 'B', 'C' and 'D' ECCS accumulator isolation valves, thereby rendering all four of the ECCS accumulators inoperable. The oncoming Operations crew identified the condition at 1900 on 11/18/2014, while performing step 6.8.24 of OSP-BB-VL006 to re-open the 'C' ECCS accumulator isolation valve, which had been closed in step 6.8.4. After the valve failed to open, Operations personnel observed that the power supply breaker for the 'C' accumulator isolation valve motor operator was tripped in the open position. While examining the tripped breaker, Operations personnel also observed that the power supply breakers for the 'A', 'B' and 'D' accumulator isolation valve motor operators had been closed. In response to discovery of the condition, Operations immediately declared entry into TS LCO 3.0.3 and took action to restore the ECCS accumulators to Operable status, in accordance with the Required Actions and Completion Times for TS 3.5.1 Condition D, "Two or more accumulators inoperable."

By 1930 on 11/18/2014, the 'A', 'B' and 'D' ECCS accumulators had been restored Operable by opening the breakers to their isolation valve motor operators, and Operations exited TS LCO 3.0.3 and TS 3.5.1 Condition D. (With the 'C' ECCS accumulator still inoperable, Condition B of TS 3.5.1 remained in effect.)

The duration of inoperability for more than one ECCS accumulator was one hour and 56 minutes. As the plant remained in Mode 3 during the event, the TS LCO 3.0.3 Required Action to be in Mode 3 within 7 hours was satisfied. Also, as TS LCO 3.0.3 was exited within one hour and 56 minutes, its Required Actions to be in Mode 4 within 13 hours and in Mode 5 within 37 hours were no longer applicable.

Following the event, Callaway Plant remained in TS 3.5.1 Condition B until 2048 on 11/18/2014, when the isolation valve for the 'C' ECCS accumulator was manually opened, with the power supply breaker for its motor operator remaining in its as-found tripped (i.e., open) position. The duration of inoperability for the 'C' ECCS accumulator was therefore three hours and 14 minutes. Accordingly, the Required Action for TS 3.5.1 Condition B to restore the inoperable accumulator to Operable status within 24 hours was satisfied. Compliance with the Required Actions and Completion Times of TS 3.5.1 Condition B was maintained for subsequent ECCS accumulator isolation valve closures performed in accordance with OSP-BB-VL006.

It should be noted that failure of the 'C' ECCS Accumulator isolation valve to open on demand during the event did not cause the event. The cause of the breaker trip that resulted in failure of the 'C' ECCS Accumulator isolation valve to open on demand could not be determined, as no ground fault was identified, and no recurrence of the breaker trip was experienced during multiple opening and closing strokes of the valve during troubleshooting. After troubleshooting, the valve was restored to its open position, with the motor operator's breaker locked open to assure Operability of the 'C' ECCS Accumulator.

4. ASSESSMENT OF SAFETY CONSEQUENCES:

The status of individual ECCS Accumulator isolation valves during and following the event was as follows:

- 'A' ECCS accumulator isolation valve was closed from 1734 to 1807.
- 'B' ECCS accumulator isolation valve was closed from 1808 to 1857.
- 'C' ECCS accumulator isolation valve was closed from 1858 to 2048.
- 'D' ECCS accumulator isolation valve remained open during the event.

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NARRATIVE

(As noted above, following the event, which lasted from 1734 to 1930 on 11/18/2014, the 'C' ECCS accumulator isolation valve was re-opened at 2048, in compliance with the Required Actions and specified Completion Times for TS 3.5.1 Condition B. Compliance with TS 3.5.1 Condition B was also maintained for subsequent closures of the 'A', 'B', 'C' and 'D' ECCS accumulator isolation valves that were performed in accordance with OSP-BB-VL006.)

Given the above, at any time during the entire one hour and 56 minute event, one of the four ECCS accumulators would have been unable to function due to closure of its isolation valve. In the absence of a spurious closure of another isolation valve, the other three ECCS accumulators would have remained available to perform their RCS injection function with their isolation valves open (despite being inoperable due to having power available to their motor operators while their power supply breakers were closed.)

As described in module 18 of the Westinghouse Accident Analysis Basis Document (AABD) for Callaway, the safety analysis for loss-of-coolant accident (LOCA) credits four ECCS accumulators being available to function to inject borated water into the RCS in event of a LOCA. For the limiting large-break LOCA case, the safety analysis assumes that the contents of one accumulator are spilled through the break, and that injection from the remaining three ECCS accumulators are credited for replenishment of RCS inventory to provide cooling to the reactor core. Accordingly, for the duration of the event, only two of the three ECCS accumulators that were available to function to inject to the RCS would have provided reactor core cooling.

The safety analysis for LOCA also credits one ECCS train, consisting of one ECCS centrifugal charging pump to provide active high head injection, one ECCS safety injection (SI) pump to provide intermediate head injection, and one residual heat removal (RHR) pump to provide low head injection to the RCS. However, during the event, both ECCS trains were Operable and available to function to provide injection to the RCS. The availability of RCS injection from a second ECCS train significantly mitigates the consequences of the inability to inject to the RCS from more than three ECCS accumulators.

Also, at the time of the event, the plant was in Mode 3 post refueling, at normal RCS operating temperature and pressure, and the plant had been subcritical for greater than 40 days. Additionally, 84 of the 193 fuel assemblies in the core had not been irradiated, and had no decay heat load at all. Given these initial conditions, decay heat loads during the event were substantially lower than the limiting licensing bases case, which considers the LOCA to occur at 100% power at end of core life. Under these conditions, during the first minute following a LOCA, the integrated heat load would be reduced by more than a factor of 40 compared to the LOCA safety analysis.

In consideration of the actual plant conditions at the time of the event, adequate core decay heat removal and RCS inventory replenishment would have been available to mitigate a postulated LOCA during the event. On this basis, the safety consequences of the event were very low.

In a probabilistic risk assessment (PRA) of the event, it was noted that the rate of occurrence for spurious operation of motor-operated valves was very low, on the order of 1E-8 per hour. However, for conservatism, the event PRA assumed all four accumulators were unavailable for the duration of the event. No credit was taken in the PRA for reduced heat loads during the event. Using these assumptions, the calculated incremental conditional core damage probability (ICCDP) of this event was a small fraction of the threshold value of 1E-6; therefore, this event was of very low risk significance.

5. REPORTING REQUIREMENTS:

This LER is submitted pursuant to 10 CFR 50.73 paragraph (a)(2)(vii) to report a single condition (i.e., restoration of power to all ECCS accumulator isolation valve motor operators) which resulted in inoperability of more than one (i.e., all) of the ECCS accumulators.

In addition, this LER is submitted pursuant to 10 CFR 50.73 paragraphs (a)(2)(v)(A), (a)(2)(v)(B) and (a)(2)(v)(D), as the inoperability of more than one ECCS accumulator satisfies the criteria provided in NUREG-1022 Revision 3 "Event Report Guidelines 10 CFR 50.72 and 50.73," for identification as a condition that could have prevented fulfillment of the ECCS accumulator system safety functions to maintain safe shutdown, remove residual heat and mitigate the consequences of an accident, respectively.

6. CAUSE OF THE EVENT:

The root cause of the event was an inadequate test procedure. Although OSP-BB-VL006 did not direct an incorrect action, it contained information which misled the Operators who performed the procedure into believing closure of breakers for ECCS accumulator isolation valve motor operators did not impact Operability of the affected accumulators. This resulted in Operators making an incorrect decision to deviate from the sequence of steps in the procedure, contrary to the requirements of APA-ZZ-00100, "Written Instructions Use and Adherence," which requires Continuous Use procedures, such as OSP-BB-VL006, to be performed as written, step-by-step and in sequence, unless exceptions are specifically provided in the procedure.

As a result of the failure to perform the procedure steps in sequence, Operators concurrently unlocked and closed the breakers for all four ECCS accumulator isolation valve motor operators. This human error was the major contributing cause of the unintended inoperability of all ECCS accumulators and the unintended entry into TS 3.5.1 Condition D and TS LCO 3.0.3.

7. CORRECTIVE ACTIONS:

To address the immediate issue of inoperability of more than one ECCS accumulator, the breakers for the 'A', 'B' and 'D' ECCS accumulator isolation valves were opened. To restore full compliance with TS LCO 3.5.1, the 'C' ECCS accumulator was also returned to Operable status by manually opening its isolation valve.

On 11/19/2014, an Operations department stand-down was conducted. During this stand-down, the actions associated with performance of OSP-BB-VL006 were discussed in detail. This discussion focused on how to prevent recurrence. In particular, the written instruction use and adherence standard and event prevention tools were discussed and reinforced.

Additional actions to prevent recurrence will include revision of OSP-BB-VL006 to clarify requirements for safety injection accumulator operability. In particular, precaution statements and notes will be added to the procedure that will draw attention to the inoperability of individual ECCS accumulators that occurs when the breakers for their isolation valve motor operators are closed.

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NARRATIVE

8. PREVIOUS SIMILAR EVENTS:

In May 2000, while in Mode 3 following a unit shutdown, Diablo Canyon Unit 1 experienced a similar inadvertent entry into TS LCO 3.0.3 due to personnel error that resulted in restoration of power to the motor operators for all ECCS accumulator isolation valves. The error rendered the ECCS accumulators inoperable until RCS pressure was reduced below 1000 psig. The event was described in Diablo Canyon Unit 1 LER 1-2000-005-00, "Entry into TS 3.0.3 When Power was Restored to Reactor Coolant System Accumulator Isolation Valves Due to Personnel Error."

In July 2011, Comanche Peak Unit 2 experienced a similar inadvertent entry into TS LCO 3.0.3 while in Mode 1 due to a human performance error that resulted in unintended restoration of power to the motor operators for all the Unit 2 [vice the intended Unit 1] ECCS accumulator isolation valves, and caused inoperability of all Unit 2 ECCS accumulators. The event was described in Comanche Peak Unit 2 LER 446/11-004-00, "Human Error Resulting in Inoperability of All Safety Injection Accumulators."