David W. Neterer
Vice President - Nuclear Operations
Ameren Missouri
Callaway Energy Center
C 573.544.5402
F 573.676.4056
dneterer@ameren.com

August 6, 2015

ULNRC-06223

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 2014-005-01
ALL ECCS ACCUMULATOR ISOLATION VALVE OPERATOR BREAKERS CLOSED IN MODE 3 WITH RCS PRESSURE GREATER THAN 1000 PSIG

On January 16, 2015, Callaway Plant submitted Licensee Event Report (LER) 2014-005-00 in accordance with 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 a concurrent closure of power supply breakers for the motor operators for all emergency core cooling system (ECCS) accumulator isolation valves, thus constituting a single condition that resulted in inoperability of more than one (i.e., all) of the ECCS accumulators and which could have prevented fulfillment of the ECCS accumulator system safety function.

The enclosed supplemental LER, 2014-005-01, is submitted to update the causes and corrective actions for the same condition as well as to add additional information to the "Event Description" and "Assessment of Safety Consequences" sections of the LER.

This letter does not contain new commitments.

Sincerely,

David W. Neterer
Vice President Nuclear Operations

Enclosure

cc: Mr. Marc L. Dapas
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
1600 East Lamar Boulevard
Arlington, TX 76011-4511

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
Steedman, MO 65077

Mr. L. John Klos
Project Manager, Callaway Plant
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Stop O-8B1
Washington, DC 20555-2738

Index and send hardcopy to QA File A160.0761

Hardcopy:

Certrec Corporation
4150 International Plaza Suite 820
Fort Worth, TX 76109
(Certrec receives ALL attachments as long as they are non-safeguards and may be publicly disclosed.)

Electronic distribution for the following can be made via LER ULNRC Distribution:

F. M. Diya
D. W. Neterer
L. H. Graessle
B. L. Cox
T. E. Herrmann
S. M. Maglio
T. B. Elwood
Corporate Oversight
Corporate Communications
NSRB Secretary
Performance Improvement Coordinator
Resident Inspectors (NRC)
STARS Regulatory Affairs
Mr. John O'Neill (Pillsbury Winthrop Shaw Pittman LLP)
Missouri Public Service Commission

NRC FORM 366 (01-2014) | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0104 | EXPIRES: 01/31/2017

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 FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet 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.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Callaway Plant Unit 1	05000483	1 OF 7

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 -	01	08	06	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 the failure of Operations personnel to comply verbatim with the leak testing procedure. Requirements for verbatim compliance with Continuous Use procedures have been reinforced within the Operations Department. The leak testing procedure has been 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.

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.

NARRATIVE

At this point, Operations personnel deviated from the sequence of steps in OSP-BB-VL006 by concurrently unlocking and closing the breakers that supply power to the motor operators for the 'B', 'C' and 'D' ECCS accumulator isolation valves, thereby causing inoperability of all four of the ECCS accumulators. The Operations personnel involved in closure of the breakers did not recognize that the 'B', 'C' and 'D' had been made inoperable, and did not inform the on-shift Operations supervision of the deviation from OSP-BB-VL006.

These actions also caused an unplanned and unrecognized entry into TS 3.5.1 Condition D, "Two or more accumulators inoperable," with a Required Action to enter TS LCO 3.0.3 immediately. TS LCO 3.0.3 states in part:

"Action shall be initiated within 1 hour to place the unit, as applicable, in:
a. MODE 3 within 7 hours;
b. MODE 4 within 13 hours; and
c. MODE 5 within 37 hours."

TS LCO 3.0.3 also includes the provision, "where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required." As the plant was in Mode 3 at the time LCO 3.0.3 was entered, the completion time of 1 hour to place the unit in Mode 3 within 7 hours was met.

As previously noted, during performance of OSP-BB-VL006, the 'A' ECCS accumulator isolation valve was closed for IST, and was re-opened by 1807. At 1808, during continued performance of OSP-BB-VL006, the 'B' ECCS accumulator isolation valve was closed for IST, and was re-opened by 1857. At 1857, the 'C' ECCS accumulator isolation valve was closed for IST.

During Operations turnover at approximately 1900 on November 18, 2014, a Reactor Operator from the oncoming night shift crew questioned the closure of the breakers for all four ECCS accumulators. When the night shift Control Room Supervisor and Shift Manager were informed of this condition, they made a determination and declaration that that all four ECCS accumulators were inoperable. Operations immediately entered TS LCO 3.0.3, in accordance with the Required Actions and Completion Times for TS 3.5.1 Condition D. Restoration of the 'A', 'B' and 'D' ECCS accumulators to Operable status by locking the supply breakers open was completed by 1930. As TS 3.5.1 Condition D was exited within 1 hour and 56 minutes, completion of the remaining Actions for TS LCO 3.0.3 (i.e., to be in Mode 4 within 13 hours, and in Mode 5 within 37 hours) was not required.

Following the event, at approximately 0945, while Operations attempted to re-open the 'C' ECCS accumulator isolation valve, the supply breaker for the valve actuator tripped. The plant remained in TS 3.5.1 Condition B until 2048, after the 'C' ECCS accumulator isolation valve was manually opened, with its supply breaker in an open (i.e., tripped) condition. 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.

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. Compliance with the Required Actions and Completion Times of TS 3.5.1 Condition B was maintained for subsequent closures of the 'A', 'B', 'C' and 'D' ECCS accumulator isolation valves that were performed in accordance with OSP-BB-VL006.

4. ASSESSMENT OF SAFETY CONSEQUENCES:

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 provides replenishment of RCS inventory to provide cooling to the reactor core.

As previously noted, the event began with the unlocking and closure of all ECCS accumulator isolation valve supply breakers at 1734 on 11/18/2014, which was subsequently recognized to result in entry into TS 3.5.1 Condition D and TS LCO 3.0.3. The event ended at 1930 when the supply breakers for the 'A', 'B' and 'D' ECCS Accumulator isolation valves were re-opened.

The status of individual ECCS Accumulator isolation valves during 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 1930 (and remained closed until 2048).
- 'D' ECCS accumulator isolation valve remained open during the event.

Given the above, at any time during the entire one-hour and 56-minute event, the isolation valve for one of the four ECCS accumulators was intentionally closed for testing, which challenged its ability to perform its safety function. Furthermore, during this same period, a postulated spurious closure of another isolation valve was possible, thus challenging the capability of its associated ECCS accumulator to perform its safety function.

However, as described in Table 6.3.3 and Section 7.6.4 of the Final Safety Analysis Report (FSAR), ECCS accumulator isolation valves receive an automatic signal to open upon receipt of a Safety Injection Signal (SIS). Under the normal operating reactor coolant system (RCS) pressure and temperature conditions present during the event, an accident condition requiring the ECCS accumulators to function would have resulted in a SIS. Although not credited in the safety analysis, the signal to automatically open the ECCS accumulator isolation valves (i.e., with their power supply breakers closed) on a SIS provides reasonable assurance that the 'A', 'B' and 'D' ECCS accumulators would have performed their safety function in response to a postulated accident, even if closed for testing or as a result of a postulated spurious closure. The capability of each of these valves to open on a remote manual signal was demonstrated during the performance of OSP-BB-VL006. Since the 'C' ECCS accumulator isolation valve failed to open on a remote manual signal during the performance of OSP-BB-VL006, it is not reasonable to assume the 'C' ECCS accumulator would have been capable of performing its safety function when it was closed for testing, or in event of a postulated spurious closure.

Consequently, during 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 for a postulated LOCA. However, as explained below, 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.

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 38 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 basis 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. On this basis, the safety consequences of the event were very low.

Furthermore, 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. 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 potential consequences of the inability to inject to the RCS from more than three ECCS accumulators.

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 to inject to the RCS 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 incorrect decision by Operations personnel to deviate from the sequence of steps in the approved test procedure, OSP-BB-VL006, contrary to the requirements of APA-ZZ-00100, "Written Instructions Use and Adherence." APA-ZZ-00100 requires Continuous Use procedures, such as

NARRATIVE

OSP-BB-VL006, to be performed as written, step-by-step and in sequence, unless exceptions are specifically provided in the procedure. This incorrect decision was based in part on notes, cautions and steps presented in the procedure. Although OSP-BB-VL006 did not direct an incorrect action, it contained information which led 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. The Operations personnel who made the decision to deviate from the procedure did not involve supervision in their decision.

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 concurrent 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. Operations and Operations Training supervisors have also conducted face-to-face briefings with their subordinates to re-affirm the standards for procedure compliance and placekeeping. Accountability actions have also been implemented for the personnel involved with the decision to deviate from OSP-BB-VL006.

Additional actions to prevent recurrence included 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.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Callaway Plant Unit 1	05000483	2014	- 005 -	01	7 OF 7

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."