AmerenUE
Callaway Plant

PO Box 620
Fulton, MO 65251

July 21, 2003

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop P1-137
Washington, DC 20555-0001

ULNRC-04876

Ladies and Gentlemen:

DOCKET NUMBER 50-483
Callaway PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2003-005-00

Gas binding of containment spray pumps due to valve testing.

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(i)(B) to report gas binding of both containment spray pumps due inadequate filling and venting of system piping after conducting surveillance valve testing.

Very truly yours,

Warren A. Witt

Warren A. Witt
Manager, Callaway Plant

WAW/ewh

Enclosure

JE22

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NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

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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	05000 483	1 OF 6

4. TITLE
Failure of both containment spray pumps due to air binding.

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
5	22	2003	2003	- 005 -	00	7	21	2003	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	1
10. POWER LEVEL	100

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

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

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Mark A. Reidmeyer	(573) 676-4306

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
A	BE	P	I075	Y					

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On 5/22/03, with Callaway Plant in Mode 1 at 100 percent power, surveillance testing was being performed involving "B" Containment Spray pump, PEN01B. Upon starting, the pump failed to develop normal discharge pressure and flow for approximately 5 minutes. The pump then developed pressure and the test was completed satisfactorily. Subsequent review determined the pump had been gas bound. Ultrasonic exams and dynamic venting demonstrated that PEN01B was water solid and operable. An extent of condition review revealed that Containment Spray pump, PEN01A had experienced a 2 minute gas binding event on 4/29/03. Ultrasonic exams and venting were conducted and verified that PEN01A was operable. It was determined that both pumps were gas bound due to an inadequate system venting configuration after Mode 5 valve testing on 3/30/03 resulting in both trains of Containment Spray being inoperable upon entering Mode 4 on 3/31/03 until PEN01A was run on 4/29/03, and "A" train was declared operable. This resulted in noncompliance with Technical Specification 3.6.6 for a period of time greater than allowed. Potential corrective actions being evaluated include installing additional vent valves, and procedure improvements to address dynamic venting.

I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

This event is reportable per 10CFR50.73(a)(2)(i)(B), an operation or condition prohibited by Technical Specifications.

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

Callaway Plant was in Mode 1 at 100 percent power.

C. STATUS OF STRUCTURES, SYSTEMS OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT

There were no structures, systems, or components inoperable at the time of the event that contributed to this event.

D. NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES

At 0210, 5/22/03, with Callaway Plant in Mode 1 at 100 percent power, surveillance testing was being performed on "B" Containment Spray Pump, PEN01B [IEEE component designator P]. Upon starting, initial pressure and flow indications were below normal. Locally, discharge pressure indication and noise levels also were below normal. After approximately 5 minutes, local pump noise levels increased and it was suspected that pump cavitation was occurring. PEN01B was secured and the local test gauge installation was checked for proper operation. At 0242, PEN01B was started for a second time and all indications were normal. Surveillance testing was completed satisfactorily and PEN01B was declared operable.

Subsequent review determined that PEN01B had experienced gas binding during the initial pump run at 0210 and PEN01B was declared inoperable starting at 0209, 5/22/03. Plant personnel vented the containment (ctmt) spray piping (Callaway system designator EN) [IEEE system designator BE] associated with PEN01B and 1 to 2 seconds of gas was vented from the suction supply line. Ultrasonic testing (UT) data was collected which revealed a void present in an associated eductor line. No other voids were found in the "B" train of the EN system. The pump and eductor line were dynamically vented for approximately 30 minutes. A post-run UT found that the void was no longer present. PEN01B was declared operable at 2134.

As part of an extent of condition review, the "A" train Ctmt Spray pump, PEN01A and associated piping, the Refueling Water Storage Tank (RWST) emergency core cooling system (ECCS) pump suction header and the Residual Heat Removal (RHR) pump return to the RWST header were also inspected via UT to determine if any of these lines contained voids. A void (smaller than that found in the "B" train) was found in the associated eductor recirculation line of the "A" train containment spray pump. Approximately 1 second of gas was vented from the suction supply line. The "A" pump and associated eductor line were dynamically vented and the void was removed. The RWST suction header and the RHR pump return line were also inspected and found to be water solid.

The extent of condition review revealed that on 4/29/03, a similar gas binding occurrence had occurred to PEN01A [IEEE component designator P] and went unrecognized. PEN01A was tested with approximately 2 minutes run time without discharge pressure and low motor current. Review of computer data shows the motor current was approximately 1/2 of the expected level for 132 seconds. The pumps discharge pressure did not reach the expected 250 psig for 166 seconds.

Flowserve, the pump vendor, was contacted regarding the gas binding issue. They determined that if no leakage from the pump seals existed and there were no significant changes in vibration or performance levels, no damage likely occurred and returning the pump(s) to service would be acceptable. As previously noted, additional testing

revealed no adverse performance from either pump.

The cause of the gas binding of PEN01A and PEN01B was determined to be an inadequate configuration to statically fill and vent the EN system piping following surveillance testing of valves ENHV0001 and ENHV0007 (Ctmt Recirc Sump to Ctmt Spray Pump A and B Control Valves respectively). During the Spring Reliability Outage (SRO), surveillance testing was scheduled for ENHV0001 and ENHV0007 which required draining parts of the EN system. The subsequent restoration of the EN system did not adequately fill and vent the EN system causing both trains of ctmt spray to have been incapable of meeting assumed Engineered Safety Feature (ESF) response time limits stated in Final Safety Analysis Report (FSAR) Table 16.3-2. The surveillance testing of ENHV0001 and ENHV0007 was performed with Callaway Plant in Mode 5, and the EN system is not required to be operable until Mode 4, thus the EN system did not become Inoperable until Mode 4 was entered at 0304, 3/31/03. Thus, both trains of ctmt spray were inoperable upon entering Mode 4 until when the next pump surveillance was successfully completed.

For containment spray, the maximum ESF response time limit is 32 seconds as documented in FSAR chapter 16 Table 16.3-2 and is measured from the receipt of a start signal until pump discharge pressure equals or exceeds 250 psig. The historical computer data has shown that once the pumps were operated for an extended period of time they swept the air from the system to the RWST and following the pump runs were capable of meeting all design requirements. However, since it took greater than 32 seconds for each of these pumps to completely prime themselves, they were incapable of meeting the ESF response time limits. Computer data for PEN01A documents that it took 166 seconds to achieve the required discharge pressure of 250 psig. Computer data for PEN01B documents that it took 339 seconds to achieve the required discharge pressure of 250 psig.

T/S Surveillance Requirement (S/R) 3.3.2.10 requires verification of ESF response times are within limits specified in FSAR Table 16.3-2, and neither Ctmt Spray pump was able to satisfy that time limit. S/R 3.0.1 states that a failure to meet a S/R is a failure to meet the T/S LCO, however for T/S 3.3.2, the gas binding of both Ctmt Spray pumps would not constitute a failure to comply with T/S 3.3.2 because T/S 3.3.2 LCO states "The ESFAS instrumentation for each Function in Table 3.3.2-1 shall be OPERABLE." and for the Ctmt Spray Function, the Ctmt pressure channels associated with the Ctmt Spray pumps were not affected nor disabled by the Ctmt Spray pump failures.

T/S 3.6.6 states "Two containment spray trains and two containment cooling trains shall be OPERABLE." Both Ctmt Spray pumps PEN01A and PEN01B were inoperable because they could not start and achieve a discharge pressure equal to or greater than 250 psig within 32 seconds. PEN01A was inoperable from 0304, 3/31/03 until 0432, 4/29/03 for a total time span of 29 days, 1 hour, 28 minutes. PEN01B was inoperable from 0304, 3/31/03 until 2123, 5/22/03 for a total time span of 52 days, 18 hours, 19 minutes. Both trains of Ctmt Spray were inoperable from 0304, 3/31/03 until PEN01A was declared operable at 0432, 4/29/03 for a total time span of 29 days, 1 hour, 28 minutes. T/S 3.6.6 Action F.1 states for two containment spray trains inoperable, to enter LCO 3.0.3 immediately which then requires that within 1 hour, initiate action to place the unit in Mode 3 within 7 hours; Mode 4 within 13 hours; and Mode 5 within 37 hours. Failure to complete the Actions for T/S 3.6.6 and T/S 3.0.3 constitutes a failure to comply with T/S and is reportable per 10CFR50.73(a)(2)(i)(B), an operation or condition prohibited by Technical Specifications.

After discovering that both trains of Ctmt Spray were inoperable, evaluations were performed to determine the effects on ctmt pressure of the delay in the Ctmt Spray pumps reaching 250 psig discharge pressure. The evaluations determined that maximum ctmt pressure would still peak below the ctmt design pressure. Thus, gas binding of the Ctmt Spray pumps and the resultant delay in achieving 250 psig discharge pressure would not result in a ctmt pressure greater than design pressure, ensuring that the EN system would be able to limit and maintain post accident conditions to less than the containment design values as stipulated in T/S Bases B3.6.6

E. METHOD OF DISCOVERY OF EACH COMPONENT, SYSTEM FAILURE, OR PROCEDURAL ERROR

The gas binding of PEN01B was discovered during surveillance testing on 5/22/03. A subsequent extent of condition review identified a similar gas binding event involving PEN01A on 4/29/03.

II. EVENT DRIVEN INFORMATION

A. SAFETY SYSTEMS THAT RESPONDED

Not applicable for this event.

B. DURATION OF SAFETY SYSTEM INOPERABILITY

Both trains of Ctmt Spray were inoperable due to gas introduced during surveillance testing of ENHV0001 and ENHV0007 in Mode 5. The time of Inoperability for both "A" and "B" Ctmt Spray systems started when Mode 4 was entered at 0304, 3/31/03. "A" train of the EN system remained inoperable until PEN01A was successfully tested and declared operable at 0432, 4/29/03. "B" train of the EN system remained inoperable until PEN01B was successfully tested and declared operable at 2123, 5/22/03.

This resulted in a total Inoperable time span of 29 days, 1 hour, 28 minutes for "A" train of EN system, a total Inoperable time span of 52 days, 18 hours, 19 minutes for "B" train of the EN system, and a total Inoperable time span of 29 days, 1 hour, 28 minutes for both trains of the EN system.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT.

Evaluations were performed to determine the impact of the delayed Ctmt Spray pump spin-up time. The topics covered included radiological consequences and ctmt pressure-temperature analyses.

The delay in the delivery of ctmt spray to the ctmt environment could have resulted in a delay in the initiation of the spray's removal of iodines from the ctmt atmosphere to the sump. This delayed spray would have only minimal appreciable impact on Low Population Zone (LPZ) doses. Exclusion Area Boundary dose could exceed FSAR reported values, but the increase would not represent a more than minimal increase. After accounting for the effects of the delay in spray initiation, the value for projected thyroid dose to Control Room personnel was still bounded by the FSAR reported value.

In the Pressure-Temperature evaluation, it was shown that the spray delay would cause calculated peak post-LOCA Ctmt pressure to exceed the current FSAR reported value for calculated peak post-accident pressure. The delay of spray would result in a peak calculated pressure of 50.33 psig, however, the Design Basis Limits for Fission Product Barriers is 60 psig. Peak post-accident pressure remains bounded by the 60 psig ctmt design pressure.

The impact of the increase in calculated pressure was reviewed for impact on Equipment Qualification. The equipment in ctmt that is required to operate during a LOCA and is qualified in accordance with NUREG 0588 was reviewed against the elevated LOCA pressure curve due to the Ctmt Spray pump slow start. This review determined that all the equipment in Ctmt remained qualified following an increase in pressure to 50.33 psig.

A probabilistic risk assessment was also performed and determined that this event was of very low/no risk significance.

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Callaway Plant Unit 1	05000483	2003	- 005 -	00	5 OF 6

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

III. CAUSE OF THE EVENT

The cause of the event was gas intrusion due to inadequate filling and venting after performing surveillance valve testing. Failure to recognize abnormal indications during pump operation and delayed documentation of those abnormal indications contributed to the event.

A formal Root Cause Analysis (RCA) team was assembled to investigate and determine the root cause(s) of the gas binding event and subsequent failure to identify this problem. The RCA concluded that there were 3 causal factors:

1. No vent valve was installed on the pump casing. This lack of vent valve prevents proper venting using only static fill and vent techniques.
2. No dynamic venting was performed.
3. A 1996 evaluation failed to recognize pump PEN01A casing voids.

IV. CORRECTIVE ACTIONS

Initial corrective actions taken by plant personnel involved static venting the containment (ctmt) spray piping (system designator EN) associated with PEN01B with 1 to 2 seconds of gas being vented from the suction supply line. Ultrasonic testing (UT) data was collected which revealed a void present in an eductor line. No other voids were found in the "B" train of the EN system. The pump and eductor line were dynamically vented for approximately 30 minutes. A post-run UT found that the void was no longer present. PEN01B was then declared operable at 2134, 5/22/03.

As part of an extent of condition review, the "A" train pump (PEN01A) and associated piping, the Refueling Water Storage Tank (RWST) emergency core cooling system (ECCS) pump suction header and the Residual Heat Removal (RHR) pump return to the RWST header were also inspected via UT to determine if any of these lines contained voids. A void (smaller than that found in the "B" train) was found in the eductor recirculation line of the "A" train containment spray pump. Approximately 1 second of gas was statically vented from the suction supply line. The "A" pump and associated eductor line were dynamically vented and the void was removed. The RWST suction header and the RHR pump return line were also inspected and found to be water solid.

Recommended corrective actions to prevent recurrence that are being evaluated include:

- Modification of the current seal piping of PEN01A and PEN01B plus install a vent valve for each pump to provide for proper static fill and vent capabilities.
- Revise plant procedures to provide instructions for optional dynamic venting of the system.
- Enhance plant procedures to include monitoring computer indication of motor currents in addition to pump parameters.

V. PREVIOUS SIMILAR EVENTS

NUREG 1022 requires a review of historical events within the last 3 years, however, none were identified.

A review of LERs within the last three years documents one other gas binding event. This was documented in LER 2002-001-00, in which foreign material caused the "A" Motor Driven Auxiliary Feedwater pump to become gas bound approximately 14 seconds after starting. Although this is a gas binding event, the gas binding is due to a different mechanism and not directly relevant to the containment spray pump event described in this LER.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

VI. ADDITIONAL INFORMATION

The system and component codes listed below are from the IEEE Standard 805-1984 and IEEE Standard 803A-1984 respectively.

System: BE

Component: P