

May 5, 2003

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

ULNRC-04842

Ladies and Gentlemen:



**DOCKET NUMBER 50-483
Callaway PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
LICENSEE EVENT REPORT 2003-002-00
EGHV0061 inoperable for a time period greater than allowed
by Technical Specifications.**

The enclosed licensee event report is submitted in accordance with 10CFR50.73(a)(2)(i)(B) to report containment isolation valve EGHV0061, inoperable for a time period greater than allowed by Technical Specifications. The inoperable condition was a result of the valve experiencing a hydraulic lock condition while stroking closed.

Very truly yours,

Warren A. Witt
Warren A. Witt
Manager, Callaway Plant

WAW/ewh

Enclosure

IE22

ULNRC-04842

May 5, 2003

Page 2

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LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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.

1. FACILITY NAME CALLAWAY PLANT UNIT 1	2. DOCKET NUMBER 05000 483	3. PAGE 1 OF 5
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4. TITLE
EGHV0061 Inoperable for a time period greater than allowed by Technical Specifications.

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
3	5	2003	2003	002	00	5	5	2003	05000	05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE 1	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)	
10. POWER LEVEL 100	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 Mark A. Reidmeyer	TELEPHONE NUMBER (Include Area Code) (573) 676-4306
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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
B	CC	ISV	V085	Y					

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

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

At 0148, 3/5/03, EGHV0061 was declared inoperable due to failing to stroke full closed during containment integrity surveillance, S704626. Technical Specification (T/S) 3.6.3 was entered and EOSL 10582 was written to track T/S time limits. EGHV0061 is a parallel sliding gate valve. Investigation revealed the valve failed to stroke to the full close position due to a hydraulic lock developing between the two valve discs. This was a repeat of a problem on 1/8/03. Actions taken in January involved valve disassembly and removal of a viscous film discovered on all areas where a no flow or low flow condition existed. Post maintenance testing indicated that cleaning resolved the problem. This was supported by testing performed under S539676 on 2/5/03.

Upon the second failure of EGHV0061, further investigations were conducted. Manufacturer Velan Valve Corporation recommended drilling a 0.25-inch hole in the upstream disc to relieve any pressure trapped between the discs. This modification was performed and testing demonstrated proper operation and stroke times. At 1418, 3/7/03, EGHV0061 was declared operable. This failure was caused by changing valve stroke length in RF12. The actual inoperable time span was from the last valve stroke in RF12 at 2116, 11/17/02, until proper restoration was completed at 1418, 3/7/03 for a total time span of 109 days, 17 hours, 2 minutes.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
		2003	- 002	- 00	

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

I. DESCRIPTION OF THE REPORTABLE EVENT

A. REPORTABLE EVENT CLASSIFICATION

This event is being reported under 10CFR50.73(a)(2)(i)(B), operation or condition prohibited by Technical Specifications.

B. PLANT OPERATING CONDITIONS PRIOR TO THE EVENT

Callaway Plant was in Mode 1 operating 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

None.

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

At 0148, 3/5/03, EGHV0061 [Component Cooling Water (CCW) from Reactor Coolant Pump (RCP) Thermal Barrier Outer Containment Isolation valve] was declared inoperable due to failing to stroke full closed during containment isolation valve surveillance, S704626. Technical Specification (T/S) 3.6.3.A.1 was entered and Equipment Out of Service Log (EOSL) entry 10582 was written to track T/S time limits. Since this was a repeat of the failure that occurred on 1/8/03, and was caused by the change in valve stroke length performed in RF12, the actual inoperable time span was from the last successful valve stroke performed in RF12 at 2116, 11/17/02, until proper restoration was completed at 1418, 3/7/03 for a total elapsed time span of 109 days, 17 hours, 2 minutes.

EGHV0061 is a 4-inch parallel sliding gate valve (component code ISV) manufactured by Velan Valve Corporation (manufacturer code V085). Troubleshooting revealed the valve failing to stroke to the full close position was due to a hydraulic lock developing between the two discs of the gate valve. This was a repeat of the problem that had occurred previously on 1/8/03. The actions taken for the January occurrence involved valve disassembly and removal of a viscous film discovered on all areas where a no flow or low flow condition existed. Post maintenance testing indicated that cleaning resolved the problem and was confirmed by subsequent testing performed under S539676 on 2/5/03.

Upon the second failure of EGHV0061, further investigations were conducted. Velan Valve Corporation was contacted and confirmed that the hydraulic lock problem had been identified before in other applications of their valves. The manufacturer recommended drilling a 0.25-inch hole in the upstream disc to relieve any pressure trapped between the valve discs. This modification was performed on the upstream disc and post modification testing demonstrated proper operation and stroke times. At 1418, 3/7/03, EGHV0061 was declared operable and returned to service.

A limited root cause evaluation was conducted and the conclusion was that the failure was due to valve design. During Refuel 12, the method for setting the valve CLOSED limit switch was changed. Prior to RF12, EGHV0061 was setup by seating the disc and then backing it out a set number (1-1/2) of hand wheel turns. This resulted in a disc to seat engagement of approximately 0.025 inch. This had been adequate for sealing the penetration, as previous Local Leak Rate Tests (LLRT) results had been acceptable. The change implemented in RF12 set the valve stroke by dimension. The valve disc is placed as far as possible into the seats and is then backed out approximately 1/32 inch. This resulted in an additional stroke length of 0.275 inch into the valve seats.

The resultant extra volume of stem being inserted into the water solid valve body results in increased pressure causing hydraulic locking of the valve. The reason this failure did not occur immediately after the change in RF12

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 5
		2003	- 002	- 00	

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

was due to an air pocket existing in the valve bonnet after the line was refilled. This air pocket is compressible and allowed the extra stroke to occur without excessive pressure buildup in the valve body.

Working with directions provided by Velan, a hole was drilled in the upstream disc of EGHV0061. This allows the pressure differential between the valve body and the system piping to equalize ensuring the valve will close. An extent of condition review determined that the following valves were of the same valve type:

- EGHV0062: CCW from Reactor Coolant System (RCS) inner containment isolation valve
- EGHV0132: CCW from RCS containment EGHV0062 bypass isolation valve
- EGHV0133: CCW from RCP thermal barrier EGHV0061 bypass isolation valve
- KCHV0253: fire protection loop to reactor building outer containment downstream isolation valve

This repair will also be implemented on EGHV0062, EGHV0132 and EGHV0133 per work documents W223047, W223048 and W223045, respectively. EGHV0062 and EGHV0132 do not require immediate modifications because they have larger valve actuators than EGHV0061 allowing them to generate sufficient closing torque. EGHV0133 is classified as a normally closed manual containment isolation valve and does not require immediate modification because when this valve is opened, an operator is stationed locally to ensure valve closure in accident conditions.

As for KCHV0253, this type of fix cannot be implemented due to the system's configuration. The KC valve has to seal flow in both directions. It is a normally closed valve which seals fire water from containment (i.e. dry pipe) when not in use. It also has a safety function to close on a CIS-A, isolating the containment atmosphere from the auxiliary building. RFR 22690C has been initiated to evaluate replacement of this valve with a design that is not susceptible to a hydraulic locking failure. Immediate modification is not required because as previously stated, this application is a normally dry pipe configuration and there is no liquid present to facilitate a hydraulic lock condition.

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

The failure to stroke full closed was discovered while performing surveillance, S704626, when the valve failed to achieve proper closed indication.

II. EVENT DRIVEN INFORMATION

A. SAFETY SYSTEMS THAT RESPONDED

None were required for this event.

B. DURATION OF SAFETY SYSTEM INOPERABILITY

EGHV0061 was declared inoperable from 0148, 3/5/03 to 1418, 3/7/03 for an elapsed time span of 60 hours 30 minutes. Since this was a repeat of the failure that occurred on 1/8/03, and was caused by the change in valve stroke length performed in RF12, the actual inoperable time span was from the last successful valve stroke performed in RF12 at 2116, 11/17/02, until proper restoration was completed at 1418, 3/7/03 for a total elapsed time span of 109 days, 17 hours, 2 minutes.

C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT.

EGHV0061 was in a degraded condition which caused it to trip on torque before it reached it's closed limit switch setting thus giving the control room dual indication. However, EGHV0061 was closing far enough to isolate the penetration. The root cause team found that for the failure to occur, the valve must be closed and be sealing the process fluid between the valve seats (i.e. isolating). The increase in stroke length is causing an increase in the internal pressure of the valve (e.g. hydraulic loading). For the internal pressure to increase, the valve must be closed

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
Callaway Plant Unit 1	05000483	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 5
		2003	- 002	- 00	

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

and have an adequate seal to prevent leakage back past the seats. Therefore, the valves are not stopped in an intermediate, non-closed position and the penetration is isolated. Therefore, EGHV0061 was capable of performing its safety-function (penetration isolation) during the time that the degraded condition existed. Thus, there was no increase in core damage risk or large early release risk.

III. CAUSE OF THE EVENT

During the investigation for the root cause of failures of EGHV0061, the following causal factors were identified:

- Causal Factor 1 (CF1): Change in valve "CLOSED" limit set point.
- Causal Factor 2 (CF2): Incorrect cause determination for the January 2003 event.

CF1: Change in valve "CLOSED" limit set point.

Prior to Refuel 12 (RF12) valve position limit switches were set with a process involving using the valve handwheel to position the valve disc relative to the valve seat. Post job critiques indicated that this was not an easily repeatable process and resulted in RFR 20278A, which approved a change in the method for establishing stroke limit set points. This change was implemented in RF12. Prior to changing the closed position of these valves, it was not recognized that this change would affect the operation of the valves. It should be noted that this type of change has been made to other valves in the plant without incident.

Prior to RF12, EGHV0061 was setup by seating the disc and then backing it out a set number (1-1/2) of hand wheel turns. This resulted in a disc to seat engagement of approximately 0.025 inch, which had been adequate for sealing the penetration, as LLRT results were satisfactory. The change implemented in RF12 sets the valve stroke by dimension. The valve disc is placed as far as possible into the seats and is then backed out approximately 1/32 inch. This has resulted in an additional stroke of 0.275 inch into the seats. The resultant extra volume of stem being inserted into the water solid valve body results in increased pressure causing hydraulic locking of the valve. This failure did not occur immediately after the initial change due to an air pocket existing below the valve bonnet after the line was refilled. The air pocket is compressible and allows the extra stroke length to occur without excessive pressure buildup in the valve body.

Also in support of this, after the January event, it was discovered that an additional 1-1/4 turns of the hand wheel was required to eliminate the dual indication in the control room. This indicates that valve closure was stopping at almost the same position as the pre-RF12 setup.

The root cause of these failures was found to be the design of the valve. As discussed below, Velan now supplies this style of valve with a pressure relief path (i.e. a hole in one disc) to prevent this failure. This failure only manifested itself as a result of the valve setup changes made during RF12.

CF2: Incorrect cause determination for the January 2003 event.

In the January event, a gelatinous substance was discovered on the valve internals. This was determined to be the root cause for the January 2003 failure. With a gelatinous substance trapped between the discs, it was believed that an observed cam action of the discs within the carrier (in a training valve of similar construction) during the closing stroke was causing an excessive pressure buildup between the discs. This pressure resulted in excessive frictional force between the discs and seats. This force was thought to be high enough that the torque limit was reached causing failure to fully close. This theory was flawed for the following reasons:

The cam action was taking place at approximately 75 percent stroke of the valve in the closed direction and the cam action stopped (i.e. the discs were completely parallel) approximately 0.9 inch before the valve reached the fully seated position. This position was verified by the number of hand wheel turns required to completely close the valve.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Callaway Plant Unit 1	05000483	2003	- 002	- 00	5 OF 5

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

This gelatinous substance was not found in the valve during investigation of the March 2003 failure. This verified that the substance was not the primary cause of the January event.

During the January investigation, initial contact with Velan did not provide sufficient information. During the March investigation, when questioned for additional information and assistance, they acknowledged that this type of problem could occur and provided the corrective action of drilling a hole in the upstream disc. Velan now supplies this type of valve with a hole in one of the discs to alleviate the hydraulic locking problem. Another manufacturer's representative stated that their valve of similar design could be supplied with pressure relieving methods, and both stated that hydraulic locking was a plausible cause for the EGHV0061 failure.

IV. CORRECTIVE ACTIONS

After further discussions with Velan, RFR 22690 was approved to allow drilling a hole in the upstream disc of EGHV0061. This allows the pressure differential between the valve body and the system piping to equalize ensuring the valve will close. An extent of condition review determined that EGHV0062, EGHV0132, EGHV0133, and KCHV0253 were the same valve type. This repair will also be implemented on EGHV0062, EGHV0132 and EGHV0133 per work documents W223047, W223048 and W223045, respectively.

As for KCHV0253, this type of fix cannot be implemented due to the systems configuration. The KC valve has to seal flow in both directions. It is a normally closed valve which seals fire water from containment (i.e. dry pipe) when not in use. It also has a safety function to close on a CIS-A, isolating the containment atmosphere from the auxiliary building. RFR 22690C has been initiated to evaluate replacement of this valve with a design that is not susceptible to a hydraulic locking failure.

A discussion of the modification schedules for EGHV0062, EGHV0132, EGHV0133, and KCHV0253 is detailed in section 1(D) of this LER.

V. PREVIOUS SIMILAR EVENTS

None.

VI. ADDITIONAL INFORMATION

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

System: CC

Component: ISV