

Omaha Public Power District
444 South 16th Street Mall
Omaha, NE 68102-2247

August 10, 2010
LIC-10-0063

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


Reference: Docket No. 50-285

Subject: Licensee Event Report 2010-003, Revision 0, for the Fort Calhoun Station

Please find attached Licensee Event Report 2010-003, Revision 0, dated August 10, 2010. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73 (a)(2)(v)(B).

No regulatory commitments are contained in this submittal. If you should have any questions, please contact me.

Sincerely,



Jeffrey A. Reinhart
Site Vice President

JAR/epm

Attachment

c: E. E. Collins, NRC Regional Administrator, Region IV
L. E. Wilkins, NRC Project Manager
J. C. Kirkland, NRC Senior Resident Inspector
INPO Records Center

NRC FORM 366 (9-2007)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB: NO. 3150-0104		EXPIRES: 08/31/2010				
<h2 style="margin: 0;">LICENSEE EVENT REPORT (LER)</h2> <p style="margin: 5px 0;">(See reverse for required number of digits/characters for each block)</p>										
1. FACILITY NAME Fort Calhoun Station				2. DOCKET NUMBER 05000285		3. PAGE 1 OF 4				
4. TITLE Inadequate Margin Renders Auxiliary Feedwater Pump Inoperable										
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
04	06	2009	2010	- 003 -	00	08	10	2010	FACILITY NAME	05000
9. OPERATING MODE 1			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: <i>(Check all that apply)</i>							
			<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(i)(A) <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(iv)(A) <input checked="" type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> OTHER				
10. POWER LEVEL 100			Specify in Abstract below or in NRC Form 366A							
12. LICENSEE CONTACT FOR THIS LER										
FACILITY NAME Erick Matzke								TELEPHONE NUMBER <i>(include Area Code)</i> 402-533-6855		
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES <i>(If yes, complete 15. EXPECTED SUBMISSION DATE)</i> <input checked="" type="checkbox"/> NO						15. EXPECTED SUBMISSION DATE				
ABSTRACT <i>(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)</i>						MONTH DAY YEAR				
						On April 6, 2009, the Steam Driven Auxiliary Feedwater (AFW) Pump (FW-10) tripped off while performing OP-ST-AFW-0004 (Auxiliary Feedwater Pump FW-10 Operability Test). The pump tripped approximately one minute after it was successfully started. FW-10 discharge pressure switch (PS-1122) white indicating light was found lit on its control panel. This light indicates the pump tripped on high discharge pressure. Following the root cause analysis, it was determined that the pump had been inoperable since February 26, 2009. The root cause of this event was that Engineering Change (EC) 45105 (FW-10 Speed Limiting Governor Setting) and FDCR 45607 (Revise the Acceptance Criteria in EC 45105) reduced the discharge pressure margin to trip setpoint resulting in FW-10 becoming more susceptible to tripping on high discharge pressure. The corrective action was to increase the setpoint for the AFW Pump FW-10 High Discharge Pressure Shutdown Switch PS-1122 from 1450 pounds per square inch gage (psig) to 1600 psig.				

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NARRATIVE

BACKGROUND

Fort Calhoun Station (FCS) is a two-loop Combustion Engineering (CE) design reactor coolant system (RCS). Each loop has one steam generator (SG) and two reactor coolant pumps (RCPs). Each SG has one main feedwater (MFW) nozzle and one auxiliary feedwater (AFW) nozzle. The MFW nozzle is the normal path for feeding the SGs.

The AFW system is provided for storage, pumping and delivery of makeup water to the SGs in order to remove decay heat if the MFW system is not available. The AFW system consists of one emergency feedwater storage tank; one safety-related motor-driven AFW pump (FW-6); one safety-related turbine-driven AFW pump (FW-10); one non-safety-related, diesel-driven AFW pump (FW-54); one non-safety-related diesel fuel oil transfer pump with a day tank; non-safety-related fuel oil piping and valves; remotely operated flow control valves; interconnecting piping to the MFW system and piping to the AFW nozzles on the SGs. FW-54 is the startup AFW pump. FW-54 takes its suction from the non-safety related condensate storage tank and discharges to the normal feedwater header. FW-54 and its associated equipment are not safety-related.

The AFW system provides a redundant means of supplying one or both SGs with feedwater. Operation of the safety-related portion of the AFW system is automatically initiated on a low SG water level or manually initiated as follows:

- Automatic initiation via an auxiliary feedwater actuation signal (AFAS).
- Automatic start signals to the safety-related pumps (FW-6 and FW-10).
- Manual initiation from the control room.
- Manual initiation from alternate shutdown panel for FW-10 and the AFW injection valves and locally for FW-6.

The system is designed to add feedwater to either or both SGs under any condition, including the loss of all electrical power along with the loss of the MFW system and the loss of the main steam piping downstream of the main steam isolation valves. The AFW system fulfills both safety-related and non-safety-related functions.

Technical Specification (TS) 2.5, "Steam and Feedwater Systems," states, in part:

(1) Two AFW trains shall be OPERABLE when Tcold is above 300 (degrees) F.

- A. With one steam supply to the turbine driven AFW pump inoperable, restore the steam supply to OPERABLE status within 7 days and within 8 days from discovery of failure to meet the LCO.
- B. With one AFW train inoperable for reasons other than condition A, restore the AFW train to OPERABLE status within 24 hours.
- C. If the required action and associated completion times of condition A or B are not met, then the unit shall be placed in MODE 2 in 6 hours, in MODE 3 in the next 6 hours, and less than 300 (degrees) F without reliance on the steam generators for decay heat removal within the next 18 hours.

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EVENT DESCRIPTION

On April 6, 2009, FW-10 tripped off while performing Attachment 1 of OI-AFW-4 (FW-10 Turbine-Driven AFW Pump Operations) per OP-ST-AFW-0004 (Auxiliary Feedwater Pump FW-10 Operability Test). FW-10 tripped approximately one minute after it was successfully started. FW-10 discharge pressure switch (PS-1122) white indicating light was found lit on control panel AI-279 (Auxiliary Feedwater Pump FW-10 Discharge Overpressure Control Panel). This light indicates the pump tripped on high discharge pressure. In response to FW-10 tripping off, the control room operators entered TS 2.5(1)B which requires the inoperable pump to be restored to service within 24 hours. A troubleshooting plan was initiated to perform calibration of PS-1122 using IC-CP-01-1122 (Calibration of AFW Pump FW-10 High Discharge Pressure Shutdown Switch PS-1122) and to determine if calibration of the switch was within tolerance. The calibration verified the pressure switch was within tolerance, measuring 1464 pounds per square inch gage (psig) (acceptance criteria 1450 psig plus or minus 35 psig). Pump discharge pressure and speed were measured. The highest observed pump discharge pressure was approximately 1280 psig. The highest pump speed measured was 7927 revolutions per minute (rpm). The initial troubleshooting plan did not find the cause of the pressure switch actuation. Additional troubleshooting activities were performed, but the highest discharge pressure measured was less than 1290 psig, and steady state pressure was observed at 1240 psig. In addition, the pump's minimum recirculation valve FCV-1369 remained open during multiple pump starts.

On February 26, 2009, Facility Design Change Request (FDCR) 45607 (Revise the Acceptance Criteria in EC 45105) revised the acceptance criteria in Engineering Change (EC) 45105 (FW-10 Speed Limiting Governor Setting) to allow the discharge pressure to be increased beyond the 1170 to 1210 psig target range prescribed in the EC 45105. A new maximum pressure limit of 1280 psig was prescribed to ensure the typical minimum flow recirculation mode pressure was well below the surveillance test limit.

On April 6, 2009, it was concluded that the discharge pressure increase on February 26, 2009, may have contributed to this event, and it was recommended to increase the pressure switch setpoint from the current 1450 psig to 1600 psig. The setpoint was subsequently increased to 1600 psig on April 6, 2009. The event is documented in condition report (CR) 2009-1611.

During an NRC inspection the operability of FW-10 was questioned, during the period the speed limiting governor for FW-10 was increased until the discharge pressure trip was increased. Subsequently, on June 11, 2010, it was determined that FW-10 was inoperable from February 26, 2009, until April 6, 2009. The event was determined to be reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(B).

This event is being reported per 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(B).

CONCLUSION

The root cause of this event was that EC 45105 (FW-10 Speed Limiting Governor Setting) and FDCR 45607 (Revise the Acceptance Criteria in EC 45105) reduced the discharge pressure margin to trip setpoint resulting in FW-10 becoming more susceptible to tripping on high discharge pressure.

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On February 26, 2009, FDCR 45607 revised the acceptance criteria in EC 45105 to allow the discharge pressure to be increased beyond the 1170 to 1210 psig target range prescribed in the EC 45105. A new maximum pressure limit of 1280 psig was prescribed to ensure the typical minimum flow recirculation mode pressure was well below the surveillance test limit. It should also be noted that FDCR 45607 was implemented after maintenance adjusted the speed of the pump to approximately 7900 rpm. The 7900 rpm pump speed resulted in a steady state discharge pressure of approximately 1240 psig. Based on interview, it was decided that re-adjusting the speed to obtain a 1210 psig pressure would take too much TS limiting condition for operation (LCO) time. FDCR 45607 revised the maximum discharge pressure limit for FW-10 from 1210 psig to 1280 psig. This revised limit resulted in a 170 psig margin to the trip setpoint of 1450 psig (PS-1122 trip setpoint).

The reduction in the pressure margin to trip from approximately 290 psig (before EC 34435, June 2008) (1450 psig [PS-1122 setpoint] – 1160 psig [FW-10 discharge pressure before EC 34435]) to approximately 170 psig (1450 psig [PS-1122 setpoint] – 1280 psig [FW-10 discharge pressure after FDCR 45607]) after FDCR 45607 resulted in the pump tripping on April 6, 2009. The EC process did not identify or analyze this reduction as adverse because engineering personnel made the judgment that a 170 psig margin to trip was adequate. Engineers did not have the operational pressure data to conclusively determine if 170 psig was adequate.

CORRECTIVE ACTIONS

The setpoint for the AFW Pump FW-10 High Discharge Pressure Shutdown Switch PS-1122 was increased from 1450 psig to 1600 psig. Additional actions are being addressed by the station's corrective action system.

SAFETY SIGNIFICANCE

As previously described, any of the three auxiliary feedwater pumps are capable of supplying water to the steam generators to remove heat following potential accident scenarios at the station. For a short period of time the emergency power source for FW-6, Diesel Generator (DG)-1, was inoperable during routine surveillance testing. Had DG-1 been needed for operation it could have been quickly returned to service. Periodic testing of FW-10, by starting the pump, prior to, and after the failure, demonstrated that the pump was likely to start as designed.

In addition, FW-54, although not safety related, was functional and able to supply water to the steam generators if needed. Therefore this event had very little impact on the health and safety of the public.

SAFETY SYSTEM FUNCTIONAL FAILURE

This event does result in a safety system functional failure in accordance with NEI-99-02.

PREVIOUS SIMILAR EVENTS

No previous incidence of inadequate margin for the auxiliary feedwater pumps has occurred.