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Chester Fugate
Licensing Manager
Waterford 3

W3F1-2012-0104

December 31, 2012

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Subject: Licensee Event Report (LER) 2012-007-00
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Entergy is hereby submitting Licensee Event Report (LER) 2012-007-00 for Waterford Steam Electric Station, Unit 3 (Waterford 3). This report provides details associated with inoperability of a safety related valve due to backup air accumulator leakage.

Based on plant evaluation, it was determined that this condition is reportable under 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(ii)(B), and 10 CFR 50.73(a)(2)(v)(D).

This report contains no new commitments. Please contact Chester Fugate, Licensing Manager, at (504) 739-6685 if you have questions regarding this information.

Sincerely,

A handwritten signature in black ink that reads "Chester Fugate". The signature is fluid and cursive, with a long horizontal stroke at the end.

CF/WH

Attachment: Licensee Event Report 2012-007-00

cc: Mr. Elmo E. Collins, Jr., Regional Administrator
U.S. NRC, Region IV
RidsRgn4MailCenter@nrc.gov

NRC Project Manager for Waterford 3
Kaly.Kalyanam@nrc.gov

NRC Senior Resident Inspector for Waterford 3
Marlone.Davis@nrc.gov

Attachment to

W3F1-2012-0104

Licensee Event Report 2012-007-00

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (10-2010)				APPROVED BY OMB NO. 3150-0104				EXPIRES 10/31/2013											
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: 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 Section (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.									
1. FACILITY NAME						2. DOCKET NUMBER				3. PAGE									
Waterford 3 Steam Electric Station						05000 382				1 OF 4									
4. TITLE																			
Inoperability Of A Safety Related Valve Due To Backup Air Accumulator Leakage																			
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								
10	31	2012	2012	- 007	- 00	12	31	2012	FACILITY NAME		DOCKET NUMBER								
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)																
DEFUELED			<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(vii)																
			<input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(A)																
10. POWER LEVEL			<input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(4) <input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(viii)(B)																
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			<input type="checkbox"/> 20.2203(a)(2)(vi) <input checked="" type="checkbox"/> 50.73(a)(2)(i)(B) <input checked="" type="checkbox"/> 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)											
Waterford 3 Steam Electric Station Chester Fugate								(504) 739-6685											
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										
O	CC	SOL	A771	N															
14. SUPPLEMENTAL REPORT EXPECTED										15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR					
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO																			
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)																			
<p>On 10/31/2012 during refueling outage RF-18, a post-maintenance leak test was performed on the actuator for air operated valve CC MVA1134B (CC-134B), Dry Cooling Tower B Component Cooling Water (CCW) Bypass Valve. Although not part of the leak test, associated dual solenoid valve CC ISV0134B1/B2 was found to be leaking air through the solenoid valve exhaust vent port. Following replacement, the leaking solenoid valve was discarded prior to determining the cause or rate of leakage. Valve CC-134B is provided with a backup Instrument Air accumulator which is credited for operation to ensure meeting post tornado event functions on loss of the non-safety related Instrument Air system.</p> <p>On further evaluation, it was determined that the solenoid valve leakage could adversely affect the backup air accumulator inventory. As the leakage rate was never established prior to discarding the old solenoid valve, the backup accumulator could not be assumed to be capable of meeting the safety functions of valve CC-134B. This condition was discovered during RF-18 with the plant in a mode which did not require operability of the CCW system. CC-134B operability was restored. However, past operability was potentially affected back to RF-17 when the last accumulator leak test was conducted, a period of approximately 18 months.</p> <p>This condition is being reported pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(ii)(B), and 10 CFR 50.73(a)(2)(v)(D).</p>																			

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NARRATIVE

REPORTABLE OCCURRENCE

On 10/31/2012 during refueling outage RF-18, a post-maintenance leak test was performed on the actuator for air operated valve CC MVAAA134B (CC-134B), Dry Cooling Tower B Component Cooling Water (CCW) Bypass Valve. Although not part of the leak test for the maintenance performed, associated dual solenoid valve CC ISV0134B1/B2 was found to be leaking air through the solenoid valve exhaust vent port. Following replacement, the leaking solenoid valve was discarded prior to determining the cause or rate of leakage. Valve CC-134B is provided with a backup Instrument Air accumulator which is credited for operation to ensure meeting post tornado event functions on loss of the non-safety related Instrument Air system.

On further evaluation, it was determined that the solenoid valve leakage could adversely affect the backup air accumulator inventory. As the leakage rate was never established prior to discarding the old solenoid valve, the backup accumulator could not be assumed to be capable of meeting the safety functions of valve CC-134B. This condition was discovered during RF-18 with the plant in a mode which did not require operability of the CCW system. CC-134B operability was restored. However, past operability was potentially affected back to RF-17 when the last accumulator leak test was conducted, a period of approximately 18 months.

This condition is being reported pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B) (Operation Prohibited by Technical Specification), 10 CFR 50.73(a)(2)(ii)(B) (Unanalyzed Condition), and 10 CFR 50.73(a)(2)(v)(D) (Condition That Could Have Prevented Fulfillment of a Safety Function).

INITIAL CONDITIONS

During the time period of approximately 18 months from RF-17 to RF-18, Waterford Steam Electric Station Unit 3 (Waterford 3) was operating in Mode 1, stable at or near 100% power, for most of the operating cycle.

EVENT DESCRIPTION

Valve CC-134B actuator was rebuilt on 10/30/2012 under WO-00233391 (prior to solenoid valve replacement). A post maintenance pressure drop test was performed to ensure the actuator had no air leaks. The results of the drop test were satisfactory. However, I&C Technicians noted that the solenoid valve for CC-134B, which was outside of the leak test boundary, was venting air.

After the actuator rebuild (and prior to solenoid valve replacement), Operations performed interlock testing for CC-134B and CC-135B, Dry Cooling Tower B Component Cooling Water Isolation Valve. The test was completed satisfactory. No performance deficiencies were noted. This test shows that normal valve operation was not impacted by the solenoid valve leakage.

On 11/01/2012, dual solenoid valve CC ISV0134B1/B2 was replaced and discarded. Prior to the replacement, no information was gathered to quantify the leak rate from the solenoid valve. No conclusive failure analysis could be performed as the solenoid valve assembly was discarded after maintenance and was not retrievable.

This reported condition is entered into the site corrective action program as CR-WF3-2012-5991.

SYSTEM DESIGN

The Component Cooling Water System is a closed system supplying cooling water to various reactor auxiliaries. The system consists of dual independent trains of centrifugal pumps, heat source heat exchangers, and heat sink heat exchangers. Heat removed is dispersed to the atmosphere by Dry Cooling Towers (DCT) [HX] and by the CCW Heat Exchangers [HX], which are cooled by the Wet Cooling Towers (WCT)[CTW]. The dry and wet cooling towers make up the required ultimate heat sink. The safety related function of each CCW train is to remove and reject the heat from a Loss of Coolant Accident (LOCA) or a Main Steam Line Break (MSLB) inside the Containment. For normal plant operation, the function of CCW is to remove heat from mechanical components and heat exchangers (reactor auxiliaries).

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The DCTs are forced draft, dry type, cross flow heat exchangers providing 42,255 square feet of net heat removal surface area. Each tower consists of five separate cells, three of which are missile protected. Each cell consists of two 40 foot vertical cooling bundles containing finned tubes. The two cooling bundles in a cell are arranged in a V-shape. Each bundle is a four-pass heat exchanger with installed vent and drain valves. Each bundle has normally open manual butterfly isolation valves. The heat from the CCW flow passing through the tubes is dissipated to atmosphere by forcing air across the finned tubes using fans.

Each of the five cells contains three 40 Hp fans for a total of 15 fans per DCT. These fans run as required to remove heat from the system.

The DCT B Bypass Valve CC-134B is a 16 inch Jamesbury butterfly valve equipped with a Bettis T310B-12 double-acting (piston), air operated, fail-as-is actuator. The actuator is provided with an ASCO model NP8344B58E 4-way dual solenoid valve. An air accumulator is provided which is shared with valve CC-135B. Small system leaks between the accumulator's isolating check valve and the actuator (including the solenoid valve) are accounted for by testing every refuel outage using station procedures.

During normal operation, the DCT B inlet isolation valve CC-135B is full open with the bypass valve CC-134B completely closed. Valves CC-134B and CC-135B are interlocked to ensure full CCW header flow is maintained. Isolation valve CC-135B must be fully open before allowing closure of CC-134B. With the isolation valve CC-135B open, the bypass valve CC-134B may be opened or closed to any throttled position. The closed limit switches for CC-135B are wired to the Process Analog Computer (PAC) System to provide an interlock with the DCT B fans' starting and stopping sequence. The fan starting sequence can begin when the isolation valve CC-135B is not fully closed. Valves CC-134B and CC-135B are operated by switches located in the Control Room.

CAUSAL FACTORS

An apparent cause evaluation with failure modes analysis was performed to determine the cause of the failure.

The direct cause of solenoid valve CC ISV0134B1/B2 leakage is an unidentifiable failure potentially prohibiting the solenoid valve or internal valve shuttle from seating.

A failure of the CC ISV0134B1/B2 solenoid valve internals (especially seating surfaces) would result in unplanned venting. Since the solenoid valve removed from CC-134B was discarded after maintenance, further failure analysis could not be performed.

A review of the maintenance history of CC ISV0134B1/B2 found that the solenoid valve has been installed since 1994 (18 years) and has not challenged the accumulator leak rate tests that are performed every 18-months in accordance with plant procedures. In addition, the maintenance histories for components with similar solenoid operated valves were reviewed and found no adverse conditions.

CORRECTIVE ACTIONS

The apparent cause evaluation documented several corrective actions.

- Completed: Solenoid Valve CC ISV0134B1/B2 was replaced under WO-00233391.
- Completed: Operability restored to CC-134B.
- Completed: CR-WF3-2012-06288 was written identifying that solenoid valve CC ISV0134B1/B2 was discarded before failure analysis.
- Completed: STA-001-005 Leak Rate Testing (accumulator) performed satisfactorily under WO-00233391.
- Extent of Condition (EOC): Review the maintenance history and operating experience for normally de-

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energized ASCO NP8344 solenoid valves listed in the Extent of Condition. Once complete, determine if the solenoid valve PM frequency needs to be adjusted for PM optimization.

- Enhancement: Add instructions to the next ASCO NP8344 replacement PM to retain the removed solenoid valve and provide to the AOV Engineer for forensic analysis.

SAFETY SIGNIFICANCE

The limiting event is a design basis tornado strike which damages the two non-missile protected DCT cells, causing CCW leakage. Lowering level in the CCW Surge Tank is indicative of a leak in the system, which is assumed for the design basis tornado event. During the tornado event, a Loss of Offsite Power (LOOP) and failure of a single Emergency Diesel Generator (EDG) is assumed. On the operable train, the unprotected portions of the DCT are assumed damaged (up to 40%) by a missile strike, causing system leakage. A LO-LO level signal from the CCW Surge Tank will automatically close isolation valve CC-135B and open bypass valve CC-134B. Operators will then isolate the damaged DCT cells and place the operable DCT cells back into service within two hours. With the loss of IA, a backup IA accumulator is credited for operation of valves CC-134B and CC-135B to restore the DCT back to service in order to cool the plant auxiliary heat loads and eventually the shutdown cooling heat load. The accumulator is supplied directly from instrument air and has no backup after the accumulator air supply is depleted.

Plant operators will be alerted to the isolated DCT through Control Room annunciators such as CCW SURGE TANK LEVEL LO-LO and DRY COOLING TOWER ISOLATED. Plant off-normal procedures address DCT leakage and recovery. If operators are unable to operate CC-134B or CC-135B because of accumulator leakage, plant emergency operating procedures provide direction for restoration of IA to restore operation to CC-134B and CC-135B. Although IA is a non-safety related system, the IA compressors and controls are powered from the assumed running EDG during which an alternate IA compressor cooling source is provided.

While the DCT is isolated and bypassed, the Auxiliary Component Cooling Water (ACCW) [CCW] system with Wet Cooling Towers (WCT) is the cooling source for the CCW Heat Exchangers and remains available, but at reduced capacity because the same tornado strike is assumed to damage the associated WCT fans.

The Waterford 3 Final Updated Safety Analysis Report (UFSAR) documents the probability of a tornado striking the plant site within the Protected Area as approximately 6.3×10^{-4} per year or about once every 1585 years. Engineering calculations were performed using the NRC approved TORMIS methodology. These calculations determined that the probability of a tornado strike in a DCT location and damaging unprotected DCT cells is 6.8×10^{-7} per year.

The low probability of a tornado strike which damages unprotected DCT cells combined with the proceduralized actions for restoration of IA demonstrates that there is minimal impact to nuclear and radiological safety.

SIMILAR EVENTS

Corrective action program data for the past three years was searched for similar failures. No similar failures were found.

ADDITIONAL INFORMATION

Energy industry identification system (EIIS) codes are identified in the text within brackets [].