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10 CFR 50.73

W3F1-2013-0060

October 31, 2013

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

Subject: Licensee Event Report (LER) 2013-006-00
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) 2013-006-00 for Waterford Steam Electric Station, Unit 3 (Waterford 3). This report provides details associated with past inoperability of one train of a safety related system due to failure of a credited manual operator for an air operated valve.

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

This report contains no new commitments. Please contact Bryan J. Pellegrin, Licensing Manager - Acting, at (504) 739-6203 if you have questions regarding this information.

Sincerely,

BJP/WH

Attachment: Licensee Event Report 2013-006-00

cc: Mr. Marc L. Dapas, Regional Administrator
U.S. NRC, Region IV
RidsRgn4MailCenter@nrc.gov

U.S. NRC Project Manager for Waterford 3
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U.S. NRC Senior Resident Inspector for Waterford 3
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Attachment to

W3F1-2013-0060

Licensee Event Report 2013-006-00

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 10/31/2013

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Waterford 3 Steam Electric Station	05000 382	1 OF 6

4. TITLE

Failure of Credited Manual Operator for Air Operated Valve Causes Train Past Inoperability

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
09	04	2013	2013	- 006 -	00	10	31	2013	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

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)(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 Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (*Include Area Code*)
Waterford 3 Steam Electric Station Bryan Pellegrin	(504) 739-6203

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
D	CC	TCV	M120	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ **YES (If yes, complete 15. EXPECTED SUBMISSION DATE)** ☒ **NO**

15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

On September 4, 2013, personnel at Waterford 3 determined that the manual operator for a safety related air operated temperature control valve (ACC-126A) could not perform a full manual closure of the valve. Automatic operation was not affected. Manual closure is credited in safety analysis to preserve wet cooling tower inventory as part of the ultimate heat sink. The causal review determined that the cause, misalignment of the valve disc to the shaft, had occurred during planned maintenance in July of 2012. During this term of past inoperability, required systems and components in the redundant safety train were also inoperable for short periods of time for surveillance and planned maintenance reasons. The valve was repaired, retested successfully, and declared operable on September 5, 2013. There was no impact to nuclear safety due to this condition.

This condition is reportable under 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(ii)(B).

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NARRATIVE

INITIAL CONDITIONS
Waterford Steam Electric Station, Unit 3 (Waterford 3), was operating steady-state in Mode 1, at or near 100% power at the time of discovering the condition.

EVENT DESCRIPTION
On September 3, 2013, Condition Report CR-WF3-2013-04274 was initiated due to a degrading trend in Auxiliary Component Cooling Water system (ACCW) [BS] Train A High Point Header pressure. Engineering recommended testing the closure of valve ACC-126A (ACCW Header A Component Cooling Water (CCW) Heat Exchanger Outlet Temperature Control Valve) [TCV] using the manual operator to verify functionality of the credited manual operator in the event a compensatory measure was required.

On September 4, 2013, ACC-126A was closed using remote operation in preparation to manually operate the valve. A high point pressure of 16.8 psig was noted prior to transferring to manual control. Per design calculation, a minimum of 16.4 psig header pressure is required to ensure meeting the allowable leakage requirements. During transfer to manual control, high point pressure decreased to 0 psig and could not be increased by using the manual operator. Automatic control was restored to ACC-126A and high point header pressure recovered to 20.1 psig. While design header pressure could be maintained while aligned for automatic operation, the manual operator was unable to close the valve sufficiently to attain the required pressure.

A troubleshooting team was formed to determine the cause of the manual operator's inability to fully close ACC-126A. The manual operator was inspected with the following findings: no evidence of damaged or missing gear teeth, worm sector gear and worm were properly and adequately greased, and the close travel stop screw had approximately ¼ inch of adjustment remaining. The conclusion of the inspection was that the manual operator was misaligned to the shaft and required additional travel adjustment to ensure ACC-126A achieved full closure. Two adjustments were required to be made to obtain an acceptable high point header pressure: 1) the close stop screw was adjusted 1/4 inch out, and 2) the manual override mounting bolts were loosened to allow maintenance personnel to further rotate the manual operator relative to the valve shaft (approximately 1/8 inch). Once the adjustments were made, ACC-126A achieved a high point header pressure of 18.8 psig using the manual valve operator.

A review of past maintenance on ACC-126A determined that this condition had existed since a planned valve rebuild that occurred in July of 2012. During the rebuild, which replaced the valve shaft, the new valve shaft required drilling of the valve disc tapper pin holes to attach the manual valve operator. As the technical manuals did not address this, the hole locations were drilled using the old shaft as a guide. This resulted in a slight misalignment of the valve disc on the valve shaft that precluded tight manual closure of the valve seat. Automatic valve closure was not affected. This went unrecognized following maintenance because operation of the manual valve operator was not adequately retested.

On September 5, 2013, following maintenance and retest, ACC-126A was restored to operation and ACCW Train A was declared operable.

A brief timeline of events follows:

7/8/2012 to 7/27/2012	ACC-126A was rebuilt under WO-00320439. The valve shaft, bushings, packing, and t-ring were replaced. The replacement shaft was sent to vendor for machining as the valve shafts are procured without the valve disc tapper pin holes drilled. ACCW A high point header pressure reached approximately 25.8 psig when tested in automatic mode. Retest in manual mode not required or performed.
9/3/2013	CR-WF3-2013-04274 was initiated due to a degraded trend in ACCW A High Point Header pressure. Engineering recommended testing the closure of ACC-126A via the manual override to verify functionality in the event a compensatory measure was required.
9/4/2013	ACC-126A was closed in preparation to manually operate the valve in accordance with OP-002-001 (Auxiliary Component Cooling Water). A high point pressure of 16.8 psig was achieved prior to transferring to manual control. During transfer to manual control, high point pressure decreased to 0 psig and could not be increased by using the manual override. (CR-WF3-2013-04290)
9/4/2013	Engineering and maintenance formed a troubleshooting team to identify and correct the issue with ACC-126A.
9/4/2013	Manual override was inspected with no signs of damage. The travel stop on the manual override was adjusted and header pressure increased to 8 psig.
9/4/2013	Valve disc assembly was rotated approximately ¼ inch to obtain more travel from the manual override. Header pressure increased to 18.5 psig.
9/5/2013	ACC-126A was declared Operable after satisfactory retest under automatic and manual operations.
9/5/2013	CR-WF3-2013-04324 was initiated identifying that ACC-126A(B) had a safety function to close via the manual override while simultaneously maintaining a high point pressure of 16.4 psig.
9/5/2013	The manual override for ACC-126B (Train B) was tested. High point header pressure reached 18.8 psig.

REPORTABLE OCCURRENCE

Technical Specification (TS) 3.7.3 requires two independent trains of CCW [BS] and ACCW [BS] to be operable in Modes 1, 2, 3 and 4. TS 3.7.4 requires two independent trains of Ultimate Heat Sink (UHS) [BS] to be operable in Modes 1, 2, 3 and 4 with each train consisting of a Dry Cooling Tower (DCT) [BS] and a Wet Cooling Tower (WCT) [BS] and its associated water basin. Both specify an allowed outage time (AOT) of 72 hours.

As valve ACC-126A was unable to meet a specified safety function regarding its manual valve operator from July 2012 to September 2013 (past inoperable), the AOT was exceeded. This condition is reportable under the following criteria: 10 CFR 50.73(a)(2)(i)(B), Any operation or condition which was prohibited by the plant's Technical Specifications.

During the period from July 2012 to September 2013 when ACC-126A (Safety Train A) was past inoperable, there were several instances where Safety Train B required systems and components were also inoperable short periods of time for surveillance and maintenance reasons. This condition is reportable under the following criteria: 10 CFR 50.73(a)(2)(ii)(B), Any event or condition that resulted in

the nuclear power plant being in an unanalyzed condition that significantly degraded plant safety.

BACKGROUND – SYSTEM DESIGN

Waterford 3 is a Combustion Engineering design pressurized water reactor [AC] with two recirculating type steam generators [SG]. Safety related components and systems are comprised of redundant trains, A and B, each train capable of design accident mitigation.

The ACCW System is a redundant train system which supplements the heat removal of the Dry Cooling Towers (DCT) in cooling the Component Cooling Water (CCW) System by providing cooling water to the shell side of the CCW Heat Exchangers. The ACCW system removes heat load from the CCW system (at the CCW heat exchangers) and rejects the heat load to the atmosphere via Wet Cooling Tower (WCT). The ACCW system is designed to operate during normal operation and following a design basis event or accident. Upon receipt of a Safety Injection Actuation Signal (SIAS), the ACCW removes sufficient heat from the CCW to ensure that the CCW supply temperature does not exceed its design basis maximum temperature of 115 degrees F by providing sufficient flow through the CCW heat exchanger while minimizing the water consumption of the Wet Cooling Towers. ACCW Flow Control is facilitated by the throttling of valve ACC-126A via temperature control loop CC ITAC7070A.

ACC-126A is a 12 inch, Type 9211, Fisher butterfly valve that is capable of bubble tight closure. The valve is equipped with a Fisher double acting piston actuator. ACC-126A is a fail-as-is air-operated valve (AOV) and is provided with a backup nitrogen accumulator, if needed, to perform its safety related functions. The actuator accessories include two Fisher filter regulators, a Masoneilan I/P transducer and a Fisher positioner. The air supply for ACC-126A is supplied either by the Instrument Air system [LD] or Nitrogen Accumulator 1 [LK]. In the event ACC-126A is required to close to preserve WCT inventory margin post-accident, manual operation via the hand-wheel manual operator would be required and is credited in plant design basis documents and site procedures.

The control signal from temperature controller CC-ITIC7070A [TC] on CP-33 opens or closes ACC-126A to a desired flow control position utilizing CCW Heat Exchanger Outlet Temperature as the feedback. ACC-126A has a reverse acting fail-as-is piston actuator. When the positioner is provided a 3 psig signal, ACC-126A will fully open (approximately 90 degrees) and when provided a 15 psig signal, ACC-126A will fully close (approximately 0 degrees).

During normal operation ACC-126A is in the AUTOMATIC mode of operation. Typically the temperature setpoint on CP-33 is between 84 – 87 degrees F during the summer. The ACCW system is normally in standby during the winter months as the DCT handles the cooling during the winter months. ACC-126A is required to regulate flow through the shell side of the CCW Heat Exchanger such that constant outlet temperature is maintained. ACC-126A is controlled by temperature controller CC ITIC7070A on CP-33. The tube side outlet temperature (CC ITE7075A) [TC] of the CCW heat exchanger controls the valve. If the temperature exceeds the setpoint during normal operation the valve begins to control flow. Under accident conditions, ACC-126A is required to modulate this flow to the WCT until post-accident heat can be removed by the DCT's alone. (NOTE: The modulation position of ACC-126A is credited for reducing evaporative losses to maintain WCT water inventory for the entire accident.) ACC-126A is provided with a nitrogen accumulator to perform this function during a loss of instrument air.

On SIAS, the setpoint is automatically raised to 115 degrees F provided WCT Basin temperature is

above 74 degrees F. This change can be observed on the controller setpoint meter. Raising the setpoint preserves WCT Basin inventory during an accident to meet the 30 day post-LOCA (loss of coolant accident) requirements.

CAUSAL FACTORS
An apparent cause evaluation determined the following causal factors:

Direct Cause: Angular misalignment of the valve disc on the shaft was the direct cause of ACC-126A failing to fully close when using the manual operator. During the July 2012 rebuild, which replaced the valve shaft, the new valve shaft required drilling of the valve disc tapper pin holes to attach the manual valve operator. As the technical manuals did not address this, the valve disc tapper pin hole locations were drilled using the old shaft as a guide. This resulted in a misalignment of the manual operator on the valve shaft that precluded tight closure of the valve seat in manual mode. The cause did not affect closure operation of the valve in automatic mode.

Contributing Cause: Four different technical manuals are required when rebuilding ACC-126A. These technical manuals do not contain necessary links to one another to ensure proper valve setup (i.e. valve disc alignment onto valve shaft.) In addition, the work order instructions did not provide enough guidance to bridge the gaps within these technical documents.

Contributing Cause: Post maintenance testing less than adequate. In June 2012, interim measures were established to ensure that ACC-126A and ACC-126B would close sufficiently to maintain WCT inventory margin. High point header pressure surveillances, with each valve in automatic, were initiated. These surveillances are performed on a 2-month frequency per OP-903-068. However, based on CR-WF3-2013-4324, the safety function for ACC-126A and ACC-126B is to close post-accident to preserve WCT inventory margin using the manual override since all safety related air sources will be depleted. Therefore, the interim surveillances and thus post-maintenance testing were not adequate.

EXTENT OF CONDITION
An Extent of Condition was performed by reviewing all valves that require manual stroking within the In Service Testing (IST) Program. The population of IST valves reviewed included air operated, motor operated, hydraulically operated, and manually operated valves. The manual override for each valve type was reviewed against the apparent cause for vulnerability. The review concluded that the scotch yoke and rotary type manual overrides were susceptible to the direct cause. Surveillances have been verified established to test the manual override safety function on the susceptible valves.

CORRECTIVE ACTIONS
- Adjusted ACC-126A manual override to positively seat the valve. As-left high point header pressure was above 16.4 psig. (completed)
- Tested ACC-126B manual override as part of the operability input for CR-WF3-2013-04324. High point header pressure was above 16.4 psig. (completed)
- OP-903-118 (Primary Auxiliaries Quarterly IST Valve Tests) was updated to ensure adequate post-maintenance testing of the manual override is performed on ACC-126A and ACC-126B. (completed)
- Revise the maintenance notes for ACC-126A and ACC-126B to include a caution that the existing valve shaft tapered pin holes are not to be copied when replacing the shaft. (completed)

- Update applicable technical documents to provide adequate cautions, limitations, and guidance to ensure appropriate disc orientation when changing the valve shaft or disc. (planned CR-WF3-2013-4290)

SAFETY SIGNIFICANCE
Industrial Safety: There was no industrial safety significance associated with this issue.

Radiological Safety: There was no radiological safety significance associated with this issue.

Nuclear Safety: A nuclear safety evaluation was performed using actual meteorological data over the time period and concluded that the Ultimate Heat Sink was fully functional considering the identified condition and that significant water inventory margin was available for all analyzed events and accidents. There was no impact to nuclear safety.

SIMILAR EVENTS
A search was performed using the NRC's ADAMS search engine for other similar reported events at Waterford 3 and in the industry. No similar events were identified.

ADDITIONAL INFORMATION
Energy industry identification system (EIIS) codes and component function identifiers are identified in the text with brackets [ ].