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10 CFR 50.73

W3F1-2014-0060

October 17, 2014

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

Subject: Licensee Event Report (LER) 2014-003-00
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) 2014-003-00 for Waterford Steam Electric Station, Unit 3 (Waterford 3). This report provides details associated with an event or condition that could have prevented fulfillment of a Safety Function in that a planned system outage for train B Ultimate Heat Sink (UHS) with an unexpected trip for train A Wet Cooling Tower (WCT) Fan left both UHS trains inoperable.

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

This report contains no new commitments. Please contact John P. Jarrell, Regulatory Assurance Manager, at (504) 739-6685 if you have questions regarding this information.

Sincerely,

A handwritten signature in black ink, appearing to read "JPJ/LLB", is written over a circular stamp that contains the text "JPJ/LLB".

Attachment: Licensee Event Report 2014-003-00

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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Attachment to

W3F1-2014-0060

Licensee Event Report 2014-003-00

**LICENSEE EVENT REPORT (LER)**

(See Page 2 for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory 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 and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollections.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

Waterford 3 Steam Electric Station

2. DOCKET NUMBER

05000382

3. PAGE

1 OF 5

4. TITLE

Unexpected Loss of Wet Cooling Tower fan results in both trains of Ultimate Heat Sink 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	
08	18	2014	2014	- 003	- 00	10	17	2014	FACILITY NAME	DOCKET NUMBER 05000	
9. OPERATING MODE											
11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)											
1			<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)
			<input type="checkbox"/> 20.2203(a)(1)			<input type="checkbox"/> 20.2203(a)(4)			<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)
			<input type="checkbox"/> 20.2203(a)(2)(i)			<input type="checkbox"/> 50.36(c)(1)(i)(A)			<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)
10. POWER LEVEL 100			<input type="checkbox"/> 20.2203(a)(2)(ii)			<input type="checkbox"/> 50.36(c)(1)(ii)(A)			<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)
			<input type="checkbox"/> 20.2203(a)(2)(iii)			<input type="checkbox"/> 50.36(c)(2)			<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)
			<input type="checkbox"/> 20.2203(a)(2)(iv)			<input type="checkbox"/> 50.46(a)(3)(ii)			<input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)
			<input type="checkbox"/> 20.2203(a)(2)(v)			<input type="checkbox"/> 50.73(a)(2)(i)(A)			<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> OTHER
			<input type="checkbox"/> 20.2203(a)(2)(vi)			<input 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

LICENSEE CONTACT

John Jarrell

TELEPHONE NUMBER (Include Area Code)

5047396685

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	KE	BLO	A106	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)

During a planned system outage of train B Component Cooling Water (CCW), which rendered train B Ultimate Heat Sink (UHS) inoperable, there was an unexpected trip of train A Auxiliary Component Cooling Water (ACCW) Wet Cooling Tower (WCT) fan, which rendered the train A UHS also inoperable. This resulted in both trains of the UHS system inoperable for approximately 83 minutes.

The ACCW WCT Fan 6A tripped at approximately 0853, rendering the redundant train A UHS inoperable, causing entry into 1 hour TS LCO 3.7.4 ACTION (b), which requires restoring at least one UHS train to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours. Then at approximately 0948 the WCT Fan 6A electric motor thermal overload relays were reset, the fan restarted, and operated properly. At 1016, CCW train B had been restored from the planned maintenance and was declared operable, exiting TS LCO 3.7.4 ACTION (b).

The direct cause to the WCT fan 6A trip was due to localized heating at the motor starter T-lead connection on the thermal overload. Technicians found the lug was tight (galled) but the motor T-lead showed looseness when moved. The lug was replaced. The cause was determined to be the procedure contained insufficient detail on how to verify successful implementation for tightening a mechanical lug, and corrective action is planned to add the appropriate detail.

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Waterford 3 Steam Electric Station	05000382	2014	- 003	- 00	2 OF 5

NARRATIVE**INITIAL CONDITIONS**

On 8/18/2014 at 0820, Waterford Steam Electric Station Unit 3 (Waterford 3) was in Mode 1 at approximately 100% power. Component Cooling Water (CCW) [CC], Auxiliary Component Cooling Water (ACCW) [KE] and Ultimate Heat Sink (UHS) [BS] train A were operable. Planned system outage had CCW train B inoperable, which resulted in supported systems inoperable by cascading Technical Specification (TS) 3.7.3 Limiting Condition for Operation (LCO) for CCW and ACCW Systems, including the Ultimate Heat Sink (UHS) TS 3.7.4 LCO, 72 hour ACTION (a) to restore the inoperable train (A) UHS to operable.

EVENT DESCRIPTION

On 8/18/14, at approximately 0853, the A Train ACCW Wet Cooling Tower (WCT) [CTW] Fan [BLO] 6A tripped, rendering the redundant train A UHS inoperable, causing an unplanned entry into the 1 hour TS 3.7.4 ACTION (b), as the plant was already in TS 3.7.4 ACTION (a) for planned maintenance and cascading on CCW Train B that had already rendered the train B UHS inoperable. TS LCO 3.7.4 ACTION (b), which requires restoring at least one UHS train to OPERABLE status within 1 hour or be in at least HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours.

At approximately 0948 CDT the WCT Fan 6A electric motor thermal overload relays were reset, the fan restarted, and operated properly; but, not yet declared operable. At 1016, CCW train B had been restored from the planned maintenance and was declared operable, exiting the 1 hour and 6 hour TS LCO 3.7.4 ACTION (b), and re-entering the 72 hour TS LCO 3.7.4 ACTION (a).

Waterford 3 maintenance determined that WCT Fan 6A motor amperage readings were within specification (~33 amps per phase, with nameplate 39 full load amps). The thermography technician found and recorded a 22 degrees Fahrenheit temperature delta at A phase thermal overload to motor termination, with a 0 degrees Fahrenheit reading delta on the other two phases, indicating a high resistance associated with A phase connection [CON]

Maintenance checked for loose connections in the Motor Control Center [MCC] MCC-315A WCT fan 6A starter (ACCEOL315A-12M RELAY) [MSTR] and found the center phase A thermal overload-to-motor T-lead termination was loose inside the mechanical lug. Technicians noted the phase A mechanical lug was tight (galled) and could not be tightened further; but, the motor T-lead showed looseness when moved. The phase A mechanical lug was replaced. All three phases of thermal overloads were tested and found to be within tolerance. The thermal overloads for all three phases were replaced with spares that were tested successfully prior to installation.

Review of equipment database shows the mechanical lug is from original construction and has not been replaced since then, approximately 30 years.

Thermography was performed on the WCT train A associated Motor Control Center (MCC 315A) on 10/7/2014, which identified elevated temperatures on the load side of the starter at the mechanical lug and motor T-lead connections associated with 3 WCT fans (3A, 4A, & 8A), which were subsequently tightened over the next two days. Subsequently, thermography was performed on DCT A Fans 1-15, with readings satisfactory. (CR-WF3-2014-5157)

The timeline (below) indicates wiring connections were not loose when MCC-315A connections were checked during preventive maintenance on 4/24/14 based on thermography taken with motors running detected no

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Waterford 3 Steam Electric Station	05000382	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 5
		2014	- 003	- 00	

NARRATIVE

anomalies when performed on 6/4/14. The condition of the loose wire terminal connection, which caused the thermal overload trip from the elevated temperature at A phase motor T-lead termination, was determined a recent development.

System Description:

The Wet Cooling Towers (WCTs) are located outside the Reactor Auxiliary Building on the east and west sides. Two 100% capacity, evaporative, wet type cooling towers are provided to assist the CCW system whenever the heat rejection capacity of the CCW system is exceeded. Each tower is capable of dissipating the maximum heat load from the CCW Heat Exchanger plus an Essential Chiller.

The WCTs are next to the DCTs in the floating chambers of the Nuclear Plant Island Structure. Each WCT consists of a Wet Tower Basin, ACCW spray headers and nozzles, and eight fans. Each wet tower is constructed of two adjacent cells. Each cell houses four of the eight fans. The basin is common to both cells.

Timeline:

04/24/14	MCC connections checked tight during preventive maintenance per ME-004-151, "480 VAC MOTOR CONTROL CENTER (MCC)" under WO- 52370262 during RF-19.
06/04/14	Semi-annual Thermography of MCC-315A cubicles performed under WO-52530534.
08/18/14 0820	Declared Component Cooling Water (CCW) [CC] Train B Inoperable for maintenance to replace relay EG EREL2392-Q-RELAY ((TIMING REL) DGB SEQUENCER-SIX8 REL).
08/18/14 0853	Received Annunciator B0509, Wet Cooling Tower "A" Fan Power Lost. PMC PID D46217, WET CLG TWR A FAN MTR OVERLD, indicated "detected".
08/18/14 0948	Operations shift NAO's reset the thermal overloads for WCT Fan 6A. Fan was verified operating properly.
08/18/14 1016	PME performed independent verifications for EG EREL2392-Q-RELAY and the relay was bench tested SAT under WO-371879. The shift crew exited TS 3.7.4.b due to declaring CCW Train B operable.
08/18/14 1402	Swapped protected trains. The protected train is now Train B.
08/18/14 1800	PME Troubleshoot Wet Cooling Tower fan 6A and replaced "A" phase T-lead mechanical lug. Thermography technician found and recorded a 22 degrees Fahrenheit temperature delta at "A" phase thermal overload to motor T-lead termination. Technicians noted the "A" phase mechanical lug was tight (galled) but the motor T-lead showed looseness when moved.
08/18/14 1938	Completed OP-903-118 Attachment 10.16, Cooling Tower A Fans Operability, for retest of Wet Cooling Tower Fan 6A after completion of maintenance. Declared Wet Cooling Tower Fan 6A operable. Exited TS 3.7.4 action (a).
10/07/2014	EOC Thermography performed on MCC-315A finds Elevated temperature on three more WCT Fan motors (CR-WF3-2014-5157)
10/8/14	Maintenance technicians wiggled the suspect wire under WO-395657 for WCT Fan 8A starter T-lead connection and found "B" phase wire loose and connector was tightened 1/2 turn.
10/9/14	Maintenance technicians wiggled the suspect wire under WO-395629 for WCT Fan 3A starter T-lead connection and found "B" phase wire loose and connector was tightened 3/8 turn. Also, the maintenance technicians wiggled the suspect wire under WO-395656 for WCT Fan 4A starter T-lead connection and found "C" phase wire loose and connector was tightened 3/8 turn. (CR-WF3-2014-5205)

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Waterford 3 Steam Electric Station	05000382	YEAR	SEQUENTIAL NUMBER	REV NO.	4 OF 5
		2014	- 003	- 00	

NARRATIVE

CAUSAL FACTORS

The loose wire resulted in a trip of the WCT fan 6A associated thermal overload (time over current), which resulted in the loss of WCT Fan 6A and entry into one hour shutdown action per TS 3/4.7.4 ACTION (b) (due to a concurrent CCW Train B out of service), resulting in both trains of Ultimate Heat Sink [BS] to be inoperable. Subsequently, WCT Fan 6A could not be restored operable status without reworking the loose wiring connection. Thermography technician found and recorded a 22 degrees Fahrenheit temperature delta at A phase thermal overload to motor T-lead termination.

The direct cause to the WCT fan 6A trip was due to localized heating at the motor starter T-lead connection on the thermal overload because a galled connection on the mechanical lug resulted in degraded clamping force, over time, on the A phase conductor. Technicians noted that the A phase mechanical lug was tight (galled) but the motor T-lead showed looseness when moved. The cause was determined to be the procedure ME-004-151 contained insufficient detail on how to verify successful implementation for tightening a mechanical lug, and corrective action is planned to add the appropriate detail.

CORRECTIVE ACTIONS

CCW [CC] (Component Cooling Water) train B had been restored from the planned maintenance and was declared operable, exiting TS LCO 3.7.3 and associated cascading TSs on Train B at 1016 on 8/18/2014.

The event was entered into the Waterford 3 corrective action program as Condition Report CR-WF3-2014-4430, in which contains the following corrective actions (CA):

Completed Actions:

- Operability of WCT Fan 6A was restored after maintenance replaced A phase T-lead mechanical lug and operations completed post maintenance testing, at 1938 on 8/18/2014.
- Thermography was performed on the WCT train A associated Motor Control Center (MCC 315A) on 10/7/2014, which identified elevated temperatures at connections associated with 3 WCT fans (3A, 4A, & 8A), which were subsequently tightened over the next two days. Subsequently, thermography was performed on DCT A Fans 1-15, with readings satisfactory. These actions were completed 10/9/2014 under work order (WO) 392074.

Planned Actions:

- Revise Electrical Maintenance procedure ME-004-151, 480-VAC Motor-Control Center (MCC), to add a step to verify successful implementation for tightening a motor T-lead mechanical lug connection (i.e. "Wiggle" wire at the motor starter T-lead connection to ensure connector and wire is tight.). This additional detailed step is expected to identify and prompt correction of loose connections resulting from the effects of those similar to galled threads by checking resistance to applied force on connection terminal lead. (CA-15)
- Perform, and track the performance of, thermography of the WCT A and WCT B fans MCC cubicles, WO 392074 and WO 392075. The performance of these work orders supports an extent of condition review. WO 392074 is associated with MCC-315A thermography related to WCT and DCT fan motor electrical connections on train A, which has been completed (see above). WO 392075 is associated with MCC-315B thermography related to WCT and DCT fan motor electrical connections on train B. (CA-10 and CA-08)

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Waterford 3 Steam Electric Station	05000382	YEAR	SEQUENTIAL NUMBER	REV NO.	5 OF 5
		2014	- 003	- 00	

NARRATIVE

- Discuss condition report lessons learned for connector failure mode with Electrical Maintenance technicians to heighten awareness of connector issues during Motor Control Center (MCC) maintenance activities. (CA-11)
- Verify WCT A fan motor starter T-lead connection mechanical lugs are tight. Reference: WO-395960 (WCT Fan 1A), WO-395961 (WCT Fan 2A), WO-395962 (WCT Fan 5A) and WO-395963 (WCT Fan 7A). Note that these 4 referenced train A UHS (WCT and DCT) fans are those that had thermography results not indicating the need for their associated connections to be physically verified tight. (CA-16)
- Perform a needs analysis using the Systematic Approach to Training (SAT) process to determine training requirements related to Electrical Worker Practices and ME-004-151 Procedure contained insufficient detail on how to verify successful implementation for tightening a mechanical lug. Upon completion of the needs analysis, issue additional corrective actions as necessary to document completion of required training.

SAFETY SIGNIFICANCE

A review of the event determined that the safety significance is minimal for the following reasons:

- It was for a very short duration that the condition existed with the inoperability of both trains of UHS, approximately 83 minutes.
- The loss of one WCT fan is reasonably comparable to other conditions allowed by Technical Specification (TS), such as the loss of a single Dry Cooling Tower (DCT) fan, or less. Each train of the UHS system has 8 WCT fans and 15 DCT fans. With ambient temperatures at the time (0853 – 1016 on 8/18/2014) not exceeding 87 degrees Fahrenheit, Waterford 3 TS 3.7.4 would have allowed up to 3 DCT fans to be inoperable without entering a restoration or shutdown action. At the time, none of the 15 DCT fans were inoperable. It is reasonable to conclude that the heat removal capacity from losing the single WCT fan (6A) is less than the heat removal capacity of the TS supported allowance for loss of 1, 2 or 3 DCT fans, at the given ambient temperatures for the timeframe, and therefore, having no safety significance.

SIMILAR EVENTS

There were no similar events at Waterford 3 identified.

ADDITIONAL INFORMATION

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