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Waterford 3

10 CFR 50.73

W3F1-2011-0086

December 19, 2011

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

Subject: Licensee Event Report 2011-005-00
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) 2011-005-00 for Waterford Steam Electric Station Unit 3. This report provides details associated with a plant equipment failure.

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

This report contains no new commitments. Please contact William J. Steelman at (504) 739-6685 if you have questions regarding this information.

Sincerely,

 for WILLIAM J. STEELMAN
MICHAEL E. MASON

WJS/WH

Attachment: Licensee Event Report 2011-005-00

IE22
NR

cc: Mr. Elmo E. Collins, Jr.
Regional Administrator
U. S. Nuclear Regulatory Commission
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INPO Records Center

lerevents@inpo.org

Attachment to

W3F1-2011-0086

Licensee Event Report 2011-005-00

(This attachment contains 4 pages)

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (10-2010)				APPROVED BY OMB NO. 3150-0104 EXPIRES 10/31/2013 <small>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.</small>																																											
LICENSEE EVENT REPORT (LER) <small>(See reverse for required number of digits/characters for each block)</small>																																															
1. FACILITY NAME Waterford 3 Steam Electric Station				2. DOCKET NUMBER 05000 382		3. PAGE 1 OF 4																																									
4. TITLE Loss of Essential Chiller B Caused Less Than 100% Emergency Feedwater Supply Capability																																															
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED																																						
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9. OPERATING MODE <div style="text-align: center; font-size: 24pt;">1</div>			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) <table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td>Specify in Abstract below or in NRC Form 366A</td> </tr> </table>									<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)	<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 type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A
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FACILITY NAME Waterford 3 Steam Electric Station William Steelman								TELEPHONE NUMBER (Include Area Code) (504) 739-6685																																							
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT																																															
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)																																															
<p>At 08:00 CDT on 10/20/2011, Essential Chilled Water Loop B was declared inoperable due to equipment failure while turbine driven Emergency Feedwater (EFW) Pump AB was out of service for planned maintenance. Operability of Essential Chilled Water Loop B was restored at 08:50. During this time period, the application of cascading technical specifications rendered motor driven EFW Pump B inoperable. The remaining operable EFW Pump A is a design rated 50 percent pump; therefore, this event could have prevented fulfillment of the residual heat removal safety function. Offsite power and Train A safety related equipment and systems were verified operable.</p> <p>Essential Chilled Water Loop B was declared inoperable because Essential Chiller B failed to automatically restart from a load recycle. The Operations crew took immediate action to align Essential Chiller AB to restore operability to Essential Chilled Water Loop B. Restoration of operability to Essential Chilled Water Loop B concurrently restored operability to EFW Pump B.</p> <p>No plant transient or safety system actuations occurred. Stable plant operation continued at 100 percent power.</p>																																															

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CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Waterford 3 Steam Electric Station	05000382	YEAR	SEQUENTIAL NUMBER	REV NO.	2 OF 4
		2011	- 005	- 00	

NARRATIVE

REPORTABLE OCCURRENCE

With turbine driven Emergency Feedwater (EFW) Pump AB [P] out of service for preplanned maintenance, Essential Chiller B [CHU] failed to automatically restart from a load recycle, causing the unplanned inoperability of Essential Chilled Water (CHW) Loop B. The application of cascading technical specifications rendered motor driven EFW Pump B inoperable. The remaining operable motor driven EFW Pump A [P] is a design rated 50 percent pump; therefore, this event could have prevented fulfillment of the residual heat removal safety function.

This event is reportable as a Licensee Event Report (LER) under reporting criteria 10CFR50.73(a)(2)(v)(B): Event that could have prevented the fulfillment of the safety function of structures or systems that are needed to ... remove residual heat.

This event was initially reported as an 8 hour notification to the NRC Headquarters Operations Center (HOC) as EN # 47361.

INITIAL CONDITIONS

On October 20, 2011, Waterford Steam Electric Station Unit 3 (W3) was operating in Mode 1, stable at 100% power. Maintenance was occurring which made the turbine driven EFW Pump AB [P] unavailable causing a planned entry into a 72 hour Limiting Condition For Operation (LCO) action. All other relevant safety related equipment supporting the safety function of structures or systems was operable.

EVENT DESCRIPTION

As designed, the CHW system consists of three centrifugal chillers (A, B, and AB) and two chilled water loops (A and B). However, only two chillers are operated at the same time. The third chiller (AB) can replace either of the other two chillers, although its operability is dependent on the alignment of the swing electrical safety bus. The chillers cool water that is pumped to the cooling coils of the air handling units located throughout the plant. The chillers facilitate the transfer of heat from chilled water to the Component Cooling Water (CCW) system and the Ultimate Heat Sink (UHS) while lowering the discharge temperature of the chilled water below the supply temperature of the CCW. The chilled water loads are separated into two loops. CHW Loops A and B are safety related. Following a Safety Injection Actuation Signal (SIAS) or Loss of Offsite Power (LOOP), the two chillers aligned for operation and their associated chilled water pumps are automatically started if they are not already running. Each chiller and chilled water pump will supply one of the two safety related chilled water loops.

The Operations crew noted that Essential Chiller B [CHU] had secured as designed on load recycle due to low chilled water temperature. The crew continued monitoring CHW Loop B temperature to ensure the expected automatic restart would occur as loop water temperature rose. When loop water temperature was noticeably above the restart setpoint, the crew noted that Essential Chiller B [CHU] had not restarted.

Essential Chiller B [CHU] was declared inoperable at 08:00 CST and the Operations crew entered the 72 hour action of Technical Specification (TS) 3.7.12 for CHW Loop B. As required by procedure OP-100-014 (Technical Specification and Technical Requirements Compliance), EFW Pump B [P] was declared inoperable and TS 3.7.1.2 action f was entered as a cascaded TS. Offsite power and Train A safety related equipment and systems were verified operable.

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NARRATIVE

As designed, the EFW System consists of three pumps which take a common suction from the Condensate Storage Pool, discharge to a common header, and supply water to either of two Steam Generators through flow control and isolation valves. EFW Pumps A and B are 50% capacity motor driven pumps. EFW Pump AB is a 100% capacity steam turbine driven pump. All three EFW pumps automatically start on Emergency Feedwater Actuation Signal (EFAS) and act, along with flow control and isolation valves, to automatically maintain water level in the non-faulted steam generators to provide an adequate heat sink for residual heat removal post-trip.

Although EFW Pump B [P] had been declared inoperable due to cascading TSs, it remained aligned and available for automatic response.

With only EFW Pump A [P] operable, TS 3.7.1.2 action f states: With the EFW system inoperable and unable to deliver at least 100% combined flow to the steam generators, immediately initiate action to restore the ability to deliver at least 100% combined flow to the steam generators. LCO 3.0.3 and all other LCO ACTIONS requiring MODE changes are suspended until the EFW system is capable of delivering at least 100% combined flow to the steam generators.

To mitigate the condition, the Operations crew took immediate action to align Essential Chiller AB [CHU] to replace B. When completed at 08:50, this action restored operability to CHW Loop B. The restoration of operability to CHW Loop B concurrently restored operability to EFW Pump B [P]. This restored the ability to deliver at least 100% combined EFW flow from operable pumps to the steam generators. The total duration of the event was 50 minutes.

The identified condition is entered into the site corrective action program as CR-WF3-2011-7166.

CAUSAL FACTORS

Subsequent troubleshooting of Essential Chiller B [CHU] found the K2 relay [RLY] had failed. One of its functions is to allow the chiller guide vanes to close and remain closed following a low load recycle trip. Once the guide vane is fully closed, a limit switch is reset. This in turn allows the chiller to restart once the inlet chilled water temperature reaches 46 degrees.

CORRECTIVE ACTIONS

The corrective action to replace the K2 relay and return Essential Chiller B to operable status is complete. A corrective action is in place to determine the cause of the K2 relay failure.

SAFETY SIGNIFICANCE

The identified condition credits EFW Pump A [P] as the only operable EFW pump. As designed, EFW Pump A is a 50% capacity pump. This base condition has an adverse effect on the ability to meet the residual heat removal safety function.

One mitigating factor is that the cause of losing operability of EFW Pump B [P] can be alleviated in a moderately short time frame by manually aligning Essential Chiller AB [CHU] to replace B per established plant procedures. Plant experience has shown repeated ability to accomplish the alignment within an hour. This capability exists even during a LOOP.

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NARRATIVE

The risk associated with this condition was evaluated using the Waterford 3 Probabilistic Risk Analysis (PRA) model with the Equipment Out Of Service (EOOS) monitor. The particular condition of concern is the 50 minute window when 1) the turbine driven EFW pump was out of service for planned maintenance, 2) Essential Chiller B [CHU] failed, thus rendering EFW B inoperable, and 3) Chiller AB [CHU] was not yet aligned to Chilled Water Loop B. The risk evaluation resulted in an incremental conditional core damage probability (ICCDP) of 2.45E-08 during the period prior to restoration of operability to Chilled Water Loop B. It should be noted that the PRA model conservatively assumes catastrophic failure of the EFW-B pump [P] as soon as room cooling is lost. This is a very conservative assumption since 1) a room will gradually heat up when room cooling fails, and 2) a pump will function for some amount of time after design temperatures are exceeded.

SIMILAR EVENTS

Corrective action program data for past five years was searched for K2 relay failures associated with the essential chillers. No similar events for W3 were found.

ADDITIONAL INFORMATION

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