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Robert J. Murillo
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Waterford 3

W3F1-2010-0013

February 23, 2010

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

Subject: Licensee Event Report 2010-001-00
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) 2010-001-00 for Waterford Steam Electric Station Unit 3. This report provides the details associated with an unrecognized single failure vulnerability associated with the Spent Fuel Pool (SFP) level switch which supplies the low level trip function for both the SFP cooling pumps and the SFP purification pump.

This report contains no new commitments. Please contact Robert J. Murillo at (504) 739-6715 if you have questions regarding this information.

Sincerely,

For R Murillo

RJM/WJS

Attachment: Licensee Event Report 2010-001-00

IE22
NRR

cc: Mr. Elmo E. Collins, Jr.
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W3F1-2010-0013

Licensee Event Report 2010-001-00

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 8/31/2010

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 Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Spent Fuel Pool Cooling Single Failure

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
									NA	05000
1	13	2010	2010	- 001 -	00	2	23	2010	FACILITY NAME NA	DOCKET NUMBER NA

9. OPERATING 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 Robert Murillo	504-739-6715

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

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)

This licensee event report identifies an unrecognized single failure vulnerability associated with FS ILS2000 A2 (FUEL POOL WATER LOW LEVEL SWITCH). Spent Fuel Pool (SFP) Level Switch (FS ILS2000 A2) supplies the low level trip function for both Spent Fuel Pool cooling pumps and the SFP purification pump. The failure of the level switch or loss of power to the level switch will cause all three pumps to trip with no restart capabilities.

A temporary modification was created that would allow operations to defeat the level switch interlock and restore SFP cooling in the unlikely event of a failure or loss of power of this switch.

On January 13, 2010 as a result of continued evaluation of this condition, it was recognized that this condition is reportable under 10CFR50.73(a)(2)(ii) (Degraded or Unanalyzed Condition) and 10CFR50.73(a)(2)(vii) (Common Cause Inoperability of Independent Trains or Channels) due to one failure being able to disable the safety function of both SFP cooling pumps. The Updated Final Safety Analysis Report (UFSAR) and General Design Criteria (GDC) require the SFP cooling pumps to meet single failure independence. No actual FS ILS2000 A2 failure occurred, this design condition was identified during work preparation.

NARRATIVE

REPORTABLE OCCURRENCE

This condition meets two reporting criteria:
10CFR50.73(a)(2)(ii) and
10CFR50.73(a)(2)(vii)

On January 13, 2010 as a result of continued evaluation of the unrecognized single failure vulnerability associated with FS ILS2000 A2 (FUEL POOL WATER LOW LEVEL SWITCH) [LS], it was determined that this condition is reportable under 10CFR50.73(a)(2)(ii) (Degraded or Unanalyzed Condition) and 10CFR50.73(a)(2)(vii) (Common Cause Inoperability of Independent Trains or Channels) due to one failure being able to disable the safety function of both SFP cooling pumps [DA]. The Updated Final Safety Analysis Report (UFSAR) and General Design Criteria (GDC) require the SFP cooling pumps to meet single failure independence. No actual FS ILS2000 A2 failure occurred, this condition was identified during work preparation.

INITIAL CONDITIONS

This condition was identified during a work planning review. No failure of FS ILS2000 A2 occurred. This was a previously unrecognized single failure that could result in the loss of multiple SFP cooling pumps.

EVENT DESCRIPTION

Spent Fuel Pool Level Switch FS ILS2000 A2 supplies the low level trip function for both the Spent Fuel Pool (SFP) cooling pumps "A" and "B" and the SFP purification pump. Failure of the level switch or loss of power to the level switch will cause all three pumps to trip with no restart capabilities.

This condition is reportable under 10CFR50.73(a)(2)(ii) as described in NUREG-1022 (Event Reporting Guidelines) Section 3.2.4 (Degraded or Unanalyzed Condition).

NUREG-1022 Section 3.2.4 lists a reportable event as an unanalyzed condition that significantly degraded plant safety due to the discovery that a system required to meet the single failure criterion does not do so.

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NARRATIVE

EVENT DESCRIPTION CONTINUED

NUREG-0787 (Safety Evaluation Report related to the Operation of Waterford Steam Electric Station Unit No. 3) Section 9.1.3 has the following statement:

> The fuel pool pumps can be powered from redundant divisions of the emergency (Class 1E) power supplies. Thus, the requirements of GDC 44, "Cooling Water," are met.

10CFR50 Appendix A (General Design Criteria (GDC)) 44 Cooling Water lists the following requirements:

> A system to transfer heat from structures, system, and components important to safety, to an ultimate heat sink shall be provided. The system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions.
>
> Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming single failure.

UFSAR 9.1.3.1 states the following:

> The assumed single failure for a partial core discharge is the failure of a divisional electrical bus which takes out a redundant train of cooling water pumps.

The limiting single failure in calculation ECM98-067 (Limiting Single Failure Thermal Hydraulic Analysis of Waterford 3 Spent Fuel Pool) is the failure of a divisional electrical bus and is non conservative because the newly identified limiting single failure is more adverse.

Based upon the unrecognized single failure identified in the corrective action program condition report (CR-WF3-2009-4908), the requirements of GDC 44 are not met and the UFSAR 9.1.3.1 and ECM98-067 limiting single failures are non conservative. NUREG-1022 reportability criteria is met due to a system required to meet single failure criterion not meeting this requirement.

NARRATIVE

EVENT DESCRIPTION CONTINUED

The FS ILS2000 A2 failure mechanism is also reportable under 10CFR50.73(a)(2)(vii) as described in NUREG-1022 Section 3.2.8 (Common Cause Inoperability of Independent Trains or Channels).

NUREG-1022 Section 3.2.8 states:

> Trains or channels for reportability purposes are defined as those redundant, independent trains or channels designed to provide protection against single failures.
>
> Analysis of events reported under this part of the rule may identify previously unrecognized common-cause (or dependent) failures and system interactions. Such failures can be simultaneous failures that occur because of a single initiating cause (i.e., the single cause or mechanism serves as a common input to the failures); or the failures can be sequential (i.e., cascading failures), such as the case where a single component failure results in the failure of one or more additional components.

The 10CFR50.73(a)(2)(ii) discussion above provides the same details on why this condition meets the reportability criteria under 10CFR50.73(a)(2)(vii).

CAUSAL FACTORS

This was a latent issue that was present in the spent fuel pool cooling design. UFSAR Section 9.1.3.2.4.3(a) states that the fuel pool water level is monitored by a level switch. This switch actuates a high and a low alarm locally and in the main control room to warn the operator of a system malfunction and trips the pumps. This information has existed since the initial FSAR.

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NARRATIVE

CORRECTIVE ACTIONS

This condition and associated corrective actions have been entered and are being tracked in the Waterford 3 Corrective Action Program (CAP).

A temporary modification to jumper the FS ILS2000 A2 level switch was created such that the switch may be easily bypassed by operators if necessary to restore fuel pool cooling.

Operations procedure OP-901-513 (Spent Fuel Pool Cooling Malfunction) will be updated to include contingency steps to recover pumps by alternate means by using the temporary jumper to override the erroneous low level condition.

The temporary modification to jumper the FS ILS2000 A2 level switch will be evaluated to determine if it should be made a permanent modification and associated actions will be taken.

The engineering calculation ECM98-067 (Limiting Single Failure Thermal Hydraulic Analysis of Waterford 3 Spent Fuel Pool) and the UFSAR will be updated.

SAFETY SIGNIFICANCE

UFSAR 9.1.3.3 states the following:

> Although it is unlikely that all cooling could be lost to the spent fuel storage pool, it would take approximately 2.89 hours for the bulk pool temperature to rise from 152°F to 212°F. This is based on a full core offload discharged starting three days after reactor shutdown. The corresponding heat load is 51.5 x 10E6 Btu/hr. This time period allows sufficient time for the operators to intervene and line up an alternate source of replenishing the pool inventory and removing the decay heat.

The temporary modification provides a preplanned method to jumper FS ILS2000 A2 level switch which would ensure the UFSAR previously stated operator action to restore spent fuel pool cooling could be met.

The failure of the level switch from loss of power is extremely unlikely as it is powered from a static uninterruptable power supply.

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SAFETY SIGNIFICANCE CONTINUED

Prior to the temporary modification being completed, the FS ILS2000 A2 failure mechanism would not have prevented operations from replenishing and ensuring the spent fuel remained covered. Spent fuel pool cooling would have still been capable of being restored but the duration may have been longer than the limiting (full core offload) time of 2.89 hours but should have still been within the near term. The loss of both SFP cooling pumps caused by the failure of this level switch would generate an immediate alarm in the main control room and an additional control room alarm would be generated as fuel pool temperature increased. With the control room alarms, operations would enter their off normal procedure and take the actions needed to restore SFP cooling. Technicians are continually staffed and would have been available to assist in troubleshooting and installing jumpers around the SFP level switch.

If boiling were to occur in the SFP, SFP makeup would still ensure that spent fuel remained covered which would ensure the fuel clad temperatures remained within the design limits. Boiling temperatures are slightly above the SFP component design temperatures (refer to UFSAR Table 9.1-3) but for a short term transient is judged to still be able to perform their intended function once the SFP cooling pumps are returned to service. The other primary concern is associated with potential dose consequences due to boiling. With the spent fuel remaining covered and spent fuel pool cooling being restored in the near term, the potential event consequences are judged to remain bounded by the fuel handling accident (UFSAR Section 15.7.3.4). This condition is considered to have a low safety significance.

SIMILAR EVENTS

None

ADDITIONAL INFORMATION

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