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Waterford 3

10 CFR 50.73

W3F1-2015-0014

February 16, 2015

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

Subject: Licensee Event Report (LER) 2014-004-01
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) 2014-004-01 for Waterford Steam Electric Station, Unit 3 (Waterford 3). This is an interim report associated with a condition that could have impacted the past operability of both trains of the Emergency Diesel Generator Fuel Oil Feed Tanks and subsequently both trains of the Emergency Diesel Generators.

Based on plant evaluation, this condition is reportable pursuant to 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(v)(D), and 10 CFR 50.73(a)(2)(vii).

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,

JPJ/LEM

Attachment: Licensee Event Report 2014-004-01

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

U.S. NRC Project Manager for Waterford 3
Michael.Orenak@nrc.gov

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

W3F1-2015-0014

Licensee Event Report 2014-004-01

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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 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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Emergency Diesel Generators Rendered Inoperable By Potential Water Intrusion Into Diesel Fuel Oil Feed Tanks

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
										05000
10	22	2014	2014	- 004 -	01	02	05	2015	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	☐ 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)
10. POWER LEVEL	☐ 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)
100	☐ 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
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
John Jarrell	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
C	EK	TK	B515	Y					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO		05	15	2015

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

During a walkdown of the Emergency Diesel Generator Feed Tank A and B vent lines on October 22, 2014, an NRC Component Design Basis Inspection inspector identified corrosion on the Emergency Diesel Generator Feed Tank A and B vent lines where the vent lines pass through the roof. A visual inspection was performed and revealed that the corrosion had created through wall holes that could allow water into both the train A and B Emergency Diesel Generator Feed Tanks.

Follow up analysis has determined that some rainfall amount less than the postulated Probable Maximum Precipitation event could have resulted in water intrusion into the Emergency Diesel Generator A and B Feed Tanks that exceeds the 0.1 percent water content allowed by the vendor technical manual. This could have potentially affected the operability of both the A and B Train Emergency Diesel Generator Feed Tanks and subsequently both trains of the Emergency Diesel Generators. It is unknown how long this corrosion has existed. Compensatory measures were put in place to prevent water ingress should a large rainfall event occur.

This condition is reportable under the following criteria: 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(v)(D), and 10 CFR 50.73(a)(vii).

NARRATIVE

INITIAL CONDITIONS

On October 22, 2014, Waterford Steam Electric Station Unit 3 (Waterford 3) was in Mode 1 at approximately 100% power.

EVENT DESCRIPTION

On October 22, 2014, a walkdown of the Emergency Diesel Generator (EDG) [EK] was conducted as part of the NRC Component Design Basis Inspection (CDBI). An NRC inspector identified corrosion on the EDG Feed Tank [DC][TK] vent lines where the vent lines pass through the roof. Visual inspection revealed the corrosion was through wall. It is unknown how long this corrosion has existed.

Follow up analysis has determined that some amount of rainfall less than the postulated Probable Maximum Precipitation (PMP) event could have resulted in sufficient water ponding on the Reactor Auxiliary Building (RAB) [NF] roof to allow water intrusion into the EDG A and B Feed Tanks that could exceed the 0.1 percent water content allowed by the vendor technical manual. This could have affected the operability of both the A and B Train Emergency Diesel Generator Feed Tanks and Emergency Diesel Generators.

System Description:

Waterford 3 is a Combustion Engineering design pressurized water reactor [AC] with two recirculating type steam generators [SG].

The EDG engines are started by means of compressed air, which is admitted to the cylinders in sequence. The air is supplied by the starting system and is admitted to the engine through one or two air operated valves. The valves are opened by the control system in response to either an automatic or manual control signal. The engine will start to turn over and will accelerate under the pressure of the starting air.

When sufficient engine speed is reached, fuel oil will be injected, and the engine will begin to operate as a diesel and will accelerate to a speed at which the starting air will be cut off. Further acceleration will bring the unit to its rated speed.

The engine speed is controlled by the governor, which regulates the fuel oil supply to the engine injectors. Fuel is pumped from the feed tank to the engine fuel headers and injector pumps by an engine driven pump. The storage tank contains the bulk of the fuel supply, and a transfer pump automatically supplies fuel to the feed tank to maintain the level in the feed tank.

Fuel is supplied to each engine by gravity flow from its feed tank. Each feed tank is kept full by transferring oil from the fuel storage tank as required by means of the transfer pump. The pump is started and stopped by level switches on the feed tank.

Fuel from the feed tank is supplied through either of two parallel connected strainers and either of two parallel connected filters to the engine fuel oil supply header. Booster pumps are provided at the engine to ensure that the header pressure is sufficient for satisfactory operation of the engine at all loads.

The booster pumps are of the positive displacement type, delivering a constant volume of fuel. Surplus fuel in excess of engine load requirements is returned to the feed tank via relief valves.

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A DC motor driven booster pump is provided to ensure that as the engine is started, the fuel header is primed for prompt firing as the engine speed increases. When the speed is sufficient, an engine driven pump will develop sufficient head for continued operation of the engine, and the DC motor driven pump is automatically shut down. Check valves are provided in parallel with each pump so that the fuel can flow past an idle pump.

Fuel is injected into the cylinders at the correct point in the cycle by cam operated injector pumps, which supply a metered quantity of fuel to the corresponding injection nozzles on the engine. The amount of fuel is controlled by the engine governor.

The unavoidable leakage from the injectors, caused by the high oil pressure and small but necessary clearances in the moving parts, is collected by drains and returned by gravity to the storage tank.

Each Feed Tank has a vent and flame arrestor.

TIMELINE

Engineering review of the available meteorological tower data shows peak rain rates of 3.8 inches per hour have been experienced at the site in in the last two years. Based on the follow-up evaluation, these rainfall rates could have potentially resulted ponding on the RAB roof that would allow in water ingress into the EDG Feed tanks. These rain events have been followed by successful EDG monthly tests.

The monthly EDG operability surveillance is performed in accordance with Operations procedure OP-903-068. Part of this procedure requirement is to visually inspect and drain any accumulated water from the EDG Feed Tank.

Based on periodic review of the EDG surveillance date, no water has been observed or drained from the EDG Feed Tanks.

REPORTABLE OCCURANCE

Technical Specification (TS) 3.8.1.1 requires, in part, two separate and independent diesel generators. This requirement is applicable in Modes 1, 2, 3, and 4. An allowed outage time (AOT) of up to 72 hours is specified, or be in at least Hot Standby (Mode 3) within the next 6 hours and in Cold Shutdown (Mode 5) within the following 30 hours. The requirement for restoration to operable status within 72 hours may be extended to 10 days if a temporary emergency diesel generator is verified available.

Additionally, the two separate and independent diesel generators will each have diesel oil feed tanks containing a minimum volume of 339 gallons of fuel, a separate diesel generator fuel oil storage tank, and a separate fuel transfer pump. If these criteria cannot be met, operability of the remaining A.C. circuits must be tested within 1 hour and at least once per 8 hours after. An AOT of 72 hours is specified or be in at least hot standby (Mode 3) within the next 6 hours and cold shutdown (Mode 5) within the following 30 hours. The requirement for restoration to operable status within 72 hours may be extended to 10 days if a temporary emergency diesel generator is verified available.

T.S. Surveillance Requirement (SR) 3.8.1.1.2.b requires at least once per 31 days and after each operation of the diesel where the period of operation was greater than or equal to 1 hour that accumulated water from the diesel oil feed tanks be checked for and removed.

Engineering evaluated this condition and determined that rain rates within the design basis rainfall will cause ponding on the RAB roof that would potentially allow in water ingress into EDG Feed Tanks A and B. Rain rate history was reviewed and determined that peak rain rates of 3.8 inches per hour had been experienced within the last two years at the Waterford 3 site. A rain rate of this intensity for the measured

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duration could have resulted in a water intrusion percentage above the 0.1 percent allowed by the vendor technical manual in both the EDG A and B Feed Tanks. If required to operate after a Design Basis rainfall event over the past 3 years both the train A and B EDGs could have been inoperable due to water intrusion into the EDG Feed Tanks through the corroded holes.

This condition is reportable under 10 CFR 50.73(a)(2)(i)(B) because the corrosion, and therefore the potential for water intrusion greater than that allowed by the vendor technical manual, has existed for longer than the AOT of the applicable TSs. This condition is also reportable under 50.73(a)(2)(v)(D) and 10 CFR 50.73(a)(vii)because the corrosion was found on the vent lines for both trains of EDGs.

CAUSAL FACTORS

An Apparent Cause Evaluation has been completed for this condition, however, based on the preliminary safety significance, a Root Cause Evaluation is in progress. The planned update for this LER will include the results of the Root Cause Evaluation.

The Apparent Cause Evaluation determined that the direct cause of the event was failure to identify the location where the EDG Feed Tank Vent lines are as an accessible area that was required to be included in the system engineering walkdown plan. The apparent cause identified is a latent organizational weakness in the walkdown plan for the EDG System. Due to overconfidence of the system engineer and the over-reliance on turnover from previous system engineers, the scope of the walkdown was not re-validated between engineers. The EDG Feed Tank Vents are not in a location that is normally travel by Operations and maintenance is not performed on the EDG Feed Tank Vent flame arrestors, therefore the only opportunity left to identify the degraded component prior to failure was the system engineering walkdown.

An apparent violation of 10 CFR 50 Appendix B, Criterion 16 was issued for failing to identify and correct through-wall corrosion on the Emergency Diesel Generator A and B Feed Tank Vents, a condition adverse to quality.

CORRECTIVE ACTIONS

As an interim action, a stainless steel pipe clamp with a rubber liner was installed around EDG Feed Tank vent pipe to prevent water intrusion. In addition, concrete grout pads were installed upstream of each pipe to divert rain water away from the pipes. Work packages to repair the piping are being planned and scheduled for implementation. Follow up evaluation is also still in progress.

A memo was issued to Systems Engineering re-enforcing the requirements to perform system walkdowns of all accessible areas as procedurally required.

Walkdowns were conducted of other roof areas to identify any additional corrosion. Actions were issued to review systems walkdown plans and ensure that all remote/infrequently accessible equipment and locations (including equipment/components external to the plant) are periodically inspected in accordance with fleet procedures.

SAFETY SIGNIFICANCE

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

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

Nuclear Safety: The safety significance was preliminary determined to be of greater than very low safety significance (greater than Green.) There are two areas of significance uncertainty in this determination: 1) the conditional probability of a loss of off-site power given a rain event of 5 inches per hour or more, and (2) the sensitivity of the station's diesel generators to water in the fuel stream. Additional information is currently being prepared to be presented for consideration at a scheduled regulatory conference.

Evaluation of the safety significance is still ongoing and will be included as a planned update to this licensee event report.

SIMILAR EVENTS

No similar events at Waterford 3.

ADDITIONAL INFORMATION

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