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**Paul Wood**  
Manager, Regulatory Assurance

10 CFR 50.73

W3F1-2019-0046

July 15, 2019

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

Subject: Licensee Event Report (LER) 2019-005-00  
Automatic Reactor SCRAM due to Steam Generator #1 High Level Resulting  
from a Main Turbine Trip and Subsequent Reactor Power Cutback due to  
Failed Diode Modules within the Main Exciter

Waterford Steam Electric Station, Unit 3 (Waterford 3)  
NRC Docket No. 50-382  
Renewed Facility Operating License No. NPF-38

The enclosed report is being sent pursuant to 10 CFR 50.73.

This letter contains no new regulatory commitments.

If you have any questions or require additional information, please contact the Regulatory Assurance Manager, Paul Wood, at (504) 464-3786.

Respectfully

A handwritten signature in black ink, appearing to read "Paul Wood", is written over the word "Respectfully".

Paul Wood

PW/rd

Enclosure: Waterford 3 Licensee Event Report 2019-005-00


cc: NRC Region IV Regional Administrator  
NRC Senior Resident Inspector – Waterford Steam Electric Station, Unit 3  
NRR Project Manager

**ENCLOSURE**

**W3F1-2019-0046**

**Entergy Operations, Inc.**

**Waterford 3 Licensee Event Report 2019-005-00**

<b>NRC FORM 366</b> (04-2018)		<b>U.S. NUCLEAR REGULATORY COMMISSION</b>			<b>APPROVED BY OMB: NO. 3150-0104</b>		<b>EXPIRES: 03/31/2020</b>				
<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p><b>LICENSEE EVENT REPORT (LER)</b>            (See Page 2 for required number of digits/characters for each block)</p> <p>(See NUREG-1022, R.3 for instruction and guidance for completing this form  <a href="http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/">http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/</a>)</p> </div> <div style="font-size: small;">           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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to <a href="mailto:InfoCollects.Resource@nrc.gov">InfoCollects.Resource@nrc.gov</a>, 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.         </div> </div>											
<b>1. FACILITY NAME</b> Waterford Steam Electric Station, Unit 3					<b>2. DOCKET NUMBER</b> 05000382		<b>3. PAGE</b> 1 OF 3				
<b>4. TITLE</b> Automatic Reactor Scram due to Steam Generator #1 High Level Resulting from a Main Turbine Trip and Subsequent Reactor Power Cutback due to Failed Diode Modules within the Main Exciter											
<b>5. EVENT DATE</b>			<b>6. LER NUMBER</b>			<b>7. REPORT DATE</b>			<b>8. OTHER FACILITIES INVOLVED</b>		
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER	
05	16	2019	2019	- 005	- 00	07	15	2019	FACILITY NAME	DOCKET NUMBER	
<b>9. OPERATING MODE</b>		<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>									
1		<input type="checkbox"/> 20.2201(b)			<input type="checkbox"/> 20.2203(a)(3)(i)			<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
		<input type="checkbox"/> 20.2201(d)			<input type="checkbox"/> 20.2203(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
		<input type="checkbox"/> 20.2203(a)(1)			<input type="checkbox"/> 20.2203(a)(4)			<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)	
		<input type="checkbox"/> 20.2203(a)(2)(i)			<input type="checkbox"/> 50.36(c)(1)(i)(A)			<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)	
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)(v)(A)		<input type="checkbox"/> 73.71(a)(4)	
		<input type="checkbox"/> 20.2203(a)(2)(iii)			<input type="checkbox"/> 50.36(c)(2)			<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)	
		<input type="checkbox"/> 20.2203(a)(2)(iv)			<input type="checkbox"/> 50.46(a)(3)(ii)			<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)	
		<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)(D)		<input type="checkbox"/> 73.77(a)(2)(i)	
		<input type="checkbox"/> 20.2203(a)(2)(vi)			<input type="checkbox"/> 50.73(a)(2)(i)(B)			<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)	
					<input type="checkbox"/> 50.73(a)(2)(i)(C)			<input type="checkbox"/> OTHER		Specify in Abstract below or in NRC Form 366A	
<b>12. LICENSEE CONTACT FOR THIS LER</b>											
LICENSEE CONTACT Paul Wood - Manager, Regulatory Assurance								TELEPHONE NUMBER (Include Area Code) (504) 464-3786			
<b>13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT</b>											
CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX		
FE27	GEN	GENEEXC 3A	W	Yes							
<b>14. SUPPLEMENTAL REPORT EXPECTED</b>						<b>15. EXPECTED SUBMISSION DATE</b>		MONTH	DAY	YEAR	
<input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO								01	16	2020	
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)											
<p>On May 16, 2019, at 1348, Waterford 3 experienced an automatic reactor trip due to Steam Generator 1 high level, which occurred following a main turbine trip and reactor power cutback. The automatic reactor trip due to Steam Generator 1 high level was caused by feedwater control shifting to manual during reactor power cutback due to a deviation between Steam Generator level channels. Because feedwater control was in manual, the system could not lower feed water flow in response to rising Steam Generator level. Main Feedwater Isolation Valves #1 and #2 closed on high Steam Generator levels. Emergency Feedwater automatically actuated as expected for Steam Generator #1 and #2. Main Feedwater was restored to both Steam Generators by 1629. The cause of the Steam Generator level deviation is still under investigation.</p> <p>The main turbine trip was caused by a loss of excitation within the main generator field. The cause of the loss of excitation was determined to be a short between 2 diode modules within the rotating rectifier circuit of the Main Exciter. The Main Exciter was mechanically disassembled and the failed fuses and diode modules in the rotating rectifier wheel were replaced. The entire rotating rectifier assembly was refurbished and/or repaired as appropriate. The exciter control system was fully calibrated prior to startup.</p> <p>All required safety-related equipment responded as expected during this event.</p>											

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

(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>.)

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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto: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.

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Waterford Steam Electric Station, Unit 3	05000382	2019	- 005 -	00

**NARRATIVE****EVENT DESCRIPTION****A. Plant Status**

At the time of this event Waterford 3 was operating at 100% reactor power. No structures, systems or components were out of service that contributed to this event.

**B. Event Chronology**

On 05/16/2019 at 1344, Waterford 3 Plant Monitoring Computer (PMC) indicated that the GEN LOC 86 G1/G2 RLY (GOB, PMC point D58715) tripped followed by the 86G1 MN GEN FLD FAIL RLY 40S (PMC point D58703) tripping 0.03 seconds later. These relays actuate automatically, indicating a Main Generator loss of field. There was no work being performed on the Main Generator or Exciter at this time.

At 1345, reactor power cutback occurred due to the main turbine trip. This resulted in the rapid lowering of the Steam Generator (SG) levels due to shrink. Following the reactor power cutback a deviation greater than 7% occurred between the two level measurement channels on both Steam Generator #1 and #2. In response to this deviation, Feed Water Control forced the controllers for the Startup Feed Reg Valves 1 & 2, Main Feed Reg Valves 1 & 2, and both Feed Pumps to manual. Because feedwater control was in manual, the system could not lower feed water flow in response to rising Steam Generator level.

At 1348, reactor trip on Steam Generator #1 high level. Main feed isolation valves 1 and 2 closed on high level isolate. The automatic actuation of the Reactor Protection System (RPS) is a reportable condition pursuant to 10 CFR 50.73(a)(2)(iv)(A).

At 1419, Steam Generator #1 Emergency Feedwater automatically actuated. The automatic actuation of the Emergency Feedwater System (EFW) is a reportable condition pursuant to 10 CFR 50.73(a)(2)(iv)(A).

At 1425, Steam Generator #2 Emergency Feedwater automatically actuated. The automatic actuation of the Emergency Feedwater System (EFW) is a reportable condition pursuant to 10 CFR 50.73(a)(2)(iv)(A).

At 1611, Main Feedwater restored to Steam Generator #2

At 1629, Main Feedwater restored to Steam Generator #1

**C. Event Causes****Loss of Excitation:**

The direct cause of loss of excitation for the Main Generator Field was determined to be a short between 2 diode modules within the rotating rectifier circuit of the Main Exciter.

Since the installment of the fully overhauled Exciter in RF18 of 2012, routine outage preventative maintenance for the Main Exciter was not implemented in line with the intent of the scope provided in ME-004-003 or the PM. This procedure includes inspection as well as the full testing, and if necessary rebuild of the Exciter. This unclear scope in the PM resulted in the PM not being fully performed.

There was no specific Preventative Maintenance Task to detect and correct deficiencies in the Exciter enclosure and interior. This resulted in the direct cause by allowing a degraded condition of the Main Exciter housing interior (water leak) and seals which allowed dirt and debris into the exciter housing, and allowed a moist atmosphere to exist. This atmosphere packed debris on the diode wheel causing tracking (shorting) between diodes.

Work Order steps were not completed (N/A'd) without providing adequate justification in accordance with EN-HU-106 section 7.1.3 guidance. This resulted in the direct cause by allowing the rotating rectifier wheel to degrade without detection or correction. Fleet administrative procedure guidance for proper use of (N/A) during a procedure usage was not followed in order to N/A the steps of the ME-004-003 procedure during refuel PMs.

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**NARRATIVE****Steam Generator Level Deviation:**

The cause of the Steam Generator Level deviation is still under investigation. The cause and corrective actions will be included as a planned update to this LER.

**CORRECTIVE ACTIONS****A. Loss of Excitation:****Completed corrective actions include:**

- The Main Exciter rectifier wheel was disassembled, cleaned, repaired including replacement of failed diode modules, and reassembled.
- Failed diodes were sent offsite for failure analysis.
- Corrected cooling water leak and door seal degradation inside Main Exciter housing.

**Planned corrective actions include:**

- Revise Main Exciter Preventive Maintenance strategy to clearly outline the scope for Major and Minor PMs of the Main Exciter based on industry best practices and vendor recommendations.
- Develop a Will sheet targeting the N/A of steps in accordance with fleet administrative procedure guidance including the justification expected/required per the procedure.

**B. Steam Generator Level Deviation:****Completed corrective actions include:**

- An Emergent Issue Team established during the forced outage confirmed that the Feedwater Control System performed as expected based on receiving a level deviation in both Steam Generator 1 and 2. The level deviation was not an expected plant response following a Reactor Power Cutback. Based on discussions with the replacement Steam Generator vendor, this may be an effect related to the Replacement Steam Generators

**Planned corrective actions include:**

- Completing a vendor study to determine the cause of the Steam Generator Level Deviations following a Reactor Power Cutback. This study should also determine the appropriate corrective actions, with supporting documents that WF3 should implement. Once the study is completed a follow-up action to determine the appropriate corrective actions is to be initiated to track resolution of the condition adverse to quality.

**SAFETY EVALUATION**

The actual consequences as stated in the problem statement were low. There were no other actual consequences to safety of the general public, nuclear safety, industrial safety and radiological safety for this event. The potential consequence to safety of the general public, nuclear safety, industrial safety and radiological safety of this event, if the Automatic Reactor Trip on High Steam Generator Water Level was removed, is low. High Steam Generator Water Level in Steam Generator #2 would have also generated an automatic Reactor Trip. Failing that, the Operators would have initiated a manual Reactor Trip or taken manual control to restore Steam Generator Water Level.

Steam Generator overfill is modeled in the PRA only as it relates to success of the Emergency Feedwater A/B pump, not the Main Feedwater Pumps. The overfill modeled in these PRA sequences occurs post-trip and is based on Emergency Feedwater being established for plant conditions, therefore, this PRA assessment is qualitative in nature.

**PREVIOUS OCCURRENCES**

CR-WF3-2017-5842: (Reported under LER 2017-002-00 and Supplement 2017-002-01.)

A reactor power cutback occurred on July 17, 2017 following a main turbine trip initiated from Isophase Bus Duct failure. The same level deviations occurred in Steam Generators 1 and 2. However, this event did not result in Feed Water Control shifting to manual due to the subsequent reactor trip that was experienced (failure of Fast Dead Bus Transfer).