

David Ellis Acting Manager, Regulatory Assurance Grand Gulf Nuclear Station Tel. (601) 437-2489

GNRO-2017/00010

June 29, 2017

Entergy

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

SUBJECT: Licensee Event Report (LER) 2016-007-01, Technical Specification Shutdown because of the Loss of the Residual Heat Removal Pump Grand Gulf Nuclear Station, Unit 1 Docket No. 50-416 License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2016-007-01, a supplement to LER 2016-007-00, which was submitted to the US Nuclear Regulatory Commission (NRC) on November 7, 2016. The original LER reported that on September 8, 2016, Grand Gulf Nuclear Station (GGNS) experienced a Technical Specification shutdown because a Residual Heat Removal (RHR) pump failed to meet its flow and differential pressure requirements.

Because the Apparent Cause Evaluation had not been completed at the time the original LER was submitted, this supplement is being submitted in accordance with NUREG-1022, revision 3, Section 5.1.5, "Supplemental Information and revised LERs." It contains the final causes and corrective actions as determined by the Apparent Cause Evaluation.

This letter contains no new Regulatory Commitments.

If you have any questions or require additional information, please contact David Ellis at (601) 437-2489.

Sincerely, lu

DRE/sas

Attachment: Licensee Event Report (LER) 2016-007-01

GNRO-2017/00010 Page 2 of 2

cc: U.S. Nuclear Regulatory Commission ATTN: Mr. Siva Lingham Mail Stop OWFN 8 B1 Rockville, MD 20852-2738

> U.S. Nuclear Regulatory Commission ATTN: Mr. Kriss M. Kennedy (w/2) Regional Administrator, Region IV 1600 East Lamar Boulevard Arlington, TX 76011-4511

Mr. B. J. Smith (w/2) Director, Division of Radiological Health Mississippi State Department of Health Division of Radiological Health 3150 Lawson Street Jackson, MS 39213

NRC Senior Resident Inspector Grand Gulf Nuclear Station Port Gibson, MS 39150

Attachment to GNRO 2017/00010 Licensee Event Report (LER) 2016-007-01

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION						APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2018										
(06-2016) LICENSEE EVENT REPORT (LER) (See Page 2 for required number of digits/characters for each block) (See NUREG-1022, R.3 for instruction and guidance for completing this form								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 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 of an information and regulatory								
http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)								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 Grand Gulf Nuclear Station, Unit 1								2. DOCKET NUMBER 05000416				3. PAGE	3. PAGE 1			
4. TITLE																
Technical Specification Shutdown because of the Loss of the Residual Heat Removal Pump 5. EVENT DATE 6. LER NUMBER 7. REPORT DATE 8. OTHER FACILITIES INVOLVED									VED							
MONTH	DAY	YEAR	YEAR SEQUENTIAL F			REV MONTH DAY			YEAR	FACILITY NAME N/A				DOCKET NUMBER 05000 N/A		
9	8	2016	2016	007	, (01	6	29	2017	FAC	CILITY NAME			DOCKET NUMBER		
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(50.73(a)(2)(ii)(A)			50	50.73(a)(2)(viii)(A)			
			20.2	201(d)			20.2203(50.73(a)(2)(ii)(B)			50	50.73(a)(2)(viii)(B)			
			20.2	203(a)(1)			20.2203(50.73(a)(2)(iii)			50	50.73(a)(2)(ix)(A)			
			20.2203(a)(2)(i)			50.36(c)(50.73(a)(2)(iv)(A)			50	50.73(a)(2)(x)				
10. F	OWER	LEVEL	20.2	203(a)(2)	((1)	님	50.36(c)(50.73(a)(2)(v)(A)				73.71(a)(4)			
100%			□ 20.2203(a)(2)(iii)			片님	50.30(C)(2) '3\/ii)		片	50.73(a)(2)(v			71(a)(
							50.40(a)(50.73(8)(2)(V)(C)			$\Box 73.77(a)(1)$				
			20.2	203(a)(2)	(vi)		50.73(a)(2)(i)(B)		h	50.73(a)(2)(v	<u>,,,,,</u> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	173	73.77(a)(2)(i)		
							50.73(a)(OTHER Specify in Abstract below			w or in NRC F	v or in NRC Form 366A			
					<u></u>	12	LICENS	EE CON	ITACT FO	R TH	IIS LER				······	
LICENSEEC	ONTACT	ſ				i						TELEPHON	E NUMBER (nclude A	rea Code)
James	Nade	eau / Mana	ager, Re	gulato	y Assi	uran					EDECONDER	601-43	7-2103			
CALIE	- 1	OVETEN	13.		MAN	U-	REPORT	TABLE			EVETCH		MANL	-	AEF	ORTABLE
CAUS	CAUSE SYSTEM			ONENT	FACTURER										TO EPIX	
N/A	1	N/A	IN/A				N/A		IN/A		IN/A		N/A			
14. SUPPLEMENTAL REPORT EXPECTED										(PECTED	MONTH	D	AY	YEAR		
YES (If yes, complete			te 15. EXPECTED SUBMIS			SSION	SION DATE)		NC 🛛			ATE	N/A	N/A N/A		N/A
ABSTRA	CT (Lin	nit to 1400 spa	ces, I.e., ap	proximatel	y 15 singl	o s pac	ed typewrit	ten lines)							I	
On September 4, 2016 at 02:58, Grand Gulf Nuclear Station entered three TS LCO Action Statements because RHR 'A' pump was declared inoperable.																
LCO Action Statements entered:																
 3.5.1 for one low pressure ECCS injection/spray subsystem, 3.6.1.7 for one RHR containment spray subsystem, and 3.6.2.3 for one RHR suppression pool cooling subsystem. All have 7 day Completion Times. 																
A decision was made to shutdown the plant to repair the RHR 'A' pump because, based on the troubleshooting and testing plan, the pump could not be repaired and returned to service with the LCO Completion Times. At 0300 CDT on 09/08/16, GGNS initiated the transition to Mode 4.																
The Direct Cause was the pump's inability to develop a TS differential pressure of 131 psid.																
The Apparent Cause revealed defects in the manufacturing process which led to inter-column leakage; misalignment between rotating and stationary elements; and machined registered fits that were out-of-tolerance.																
The failed pump was removed and sent to the vendor facility for failure analysis. A replacement pump was installed and tested satisfactorily. RHR 'A' was returned to operable.																

U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0104

EXPIRES: 10/31/2018



NRC FORM 366A

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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 e-mail to infocollects.Resource@nrc.gov, and to the Desk Officer, Officer 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

(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/)

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER			
Grand Gulf Nuclear Station, Unit 1	05000-416	YEAR	SEQUENTIAL NUMBER	REV NO.	
		2016	007	01	

NARRATIVE

PLANT CONDITIONS PRIOR TO THE EVENT

At the time of the event, Grand Gulf Nuclear Station (GGNS) Unit 1 was in Mode 1, at 100% rated thermal power. All systems, structures and components, with the exception of the RHR 'A' pump, that were necessary to mitigate, reduce the consequences of, or limit the safety implications of the event were available. No other safety significant components were out of service.

DESCRIPTION

On September 4, 2016, GGNS was performing a Residual Heat Removal (RHR)[BO] 'A' quarterly Technical Specification (TS) Surveillance Requirement (SR). At 02:58, The RHR pump failed to meet its TS SR Acceptance Criteria for flow and differential pressure (d/p) and was therefore declared Inoperable. Action Statements for TS Limiting Conditions for Operation (LCOs) 3.5.1, 3.6.1.7 and 3.6.2.3 were entered, each having Completion Times of 7 days.

LCO Action Statements entered:

1) 3.5.1 for one low pressure ECCS[BO] injection/spray subsystem,

2) 3.6.1.7 for one RHR containment spray subsystem, and

3) 3.6.2.3 for one RHR suppression pool cooling subsystem.

Initial troubleshooting verified that the pump was incapable of meeting the flow requirement of 7756 gpm and d/p of 131 psid simultaneously. The observed pump flow and discharge pressures were verified to be correct via a temporarily installed ultrasonic flow meter and pressure gauge. RHR system valves and lines were verified not to be clogged or leaking. The pump motor was confirmed to be operating at the proper speed.

Further troubleshooting and testing lead station management to the conclusion that RHR 'A' would not be returned to operable status within the 7 day Completion Time. A decision was made to commence an orderly shutdown. On September 8, 2016 at 0300, GGNS began the transition to Mode 4. No other systems were out of service that would have complicated an orderly shutdown to Mode 4.

REPORTABILITY

Event Notification No. 52225 was made to the U.S. Nuclear Regulatory Commission (NRC) Operations Center. This LER is being submitted pursuant to Title 10 Code of Federal Regulations 10 CFR 50.73(a)(2)(i)(A) for the completion of any nuclear plant shutdown required by the plant's Technical Specifications. Telephonic notification was made to the NRC Emergency Notification System on September 8, 2016, at 03:27, pursuant to 10 CFR 50.72(b)(2)(i) for the initiation of any nuclear plant shutdown required by the plant's Technical Specifications.

CAUSE

The Direct Cause was the pump's inability to develop a TS differential pressure of 131 psid.

NRC FORM 366A	U.S. NUCLEAR REGULA	TORY COMMISSION	APPROVED BY OMB: NO. 3150-010	04 EXPIRES: 10/31/2018			
(06-2016)	LICENSEE EVENT RI	EPORT (LER) SHEET	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 2055-0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, PGDB-10202, (3150-0104), Office of Management and Budoet, Washington, DC 20503 if a				
(See NUREG-1022 http://www.nrc.gov/	 R.3 for instruction and guidance to reading-m/doc-collections/nuregs/s 	r completing this form taff/sr1022/r3/)	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 NAM	E	2. DOCKET N	UMBER	3. LER NUMBER			

Grand Gulf Nuclear Station, Unit 1	05000-416	YEAR SEQUENTIAL NUMBER		REV NO.
		2016	007	01

The Apparent Cause revealed defects in the manufacturing process which led to inter-column leakage; misalignment between rotating and stationary elements; and machined registered fits that were out-of-tolerance. A third party independent analysis noted that the column register fits were significantly out of tolerance and that the wear rings on both the suction head and 1st impeller stage spun in their fit.

EXTENT OF CONDITION

Quarterly surveillance data of similar Emergency Core Cooling System (ECCS) pumps showed no evidence of degradation. Data was re-examined from the following pumps: Low Pressure Core Spray (LPCS), High Pressure Core Spray (HPCS)[BG] and RHR 'B' and 'C.' GGNS also performed a partial quarterly surveillance on the RHR 'B' which was completed satisfactorily.

CORRECTIVE ACTIONS

The RHR 'A' pump was replaced and retested satisfactorily. The degraded pump was removed from service and sent to the vendor facility for failure analysis. Actions were put in place to incorporate more rigorous measures to preclude misalignment during the manufacturing and installation processes for safety-related vertical pumps.

SAFETY SIGNIFICANCE

The event posed no threat to the health and safety of the general public or to nuclear safety as safety-systems performed as designed. No Technical Specification safety limits were violated. Industrial safety was not challenged, and there was no potential or actual radiological release during the event.

PREVIOUS SIMILAR EVENTS

LER-2004-002-00 documented a TS RHR 'B' inoperability. A valve in the minimum flow line was found closed during operation of the pump. The condition was found to exist for approximately 13 days which exceeded the LCO Completion Time and was therefore prohibited. This event was similar only because of system inoperabilities. Otherwise, there were no common event sequences or learnings that would be applicable to the LER 2016-007-001 event.

A search was performed in the INPO ICES and GGNS Corrective Action Program databases to find Operating Experience which would help in the evaluation of corrective actions. At Columbia Generating Station, an RHR pump failed to meet its required TS flow. Columbia revised its calculation and submitted a License Amendment Request to acquire more margin to its TS flow limit. Grand Gulf therefore reviewed the details of its RHR quarterly functional test to verify they were correct. At Duane Arnold, an RHR pump failed to meet its required TS discharge pressure. An investigation revealed that a vendor had failed to bend a locking washer as required by shop procedures. Grand Gulf therefore did performance testing before and after the installation of the newly assembled spare RHR pump. At Pilgrim Nuclear Generating Station, an RHR pump failed to meet its required TS differential pressure because a min flow valve was inadvertently left open. Grand Gulf therefore added a left open min flow valve in its Failure Mode Analysis.