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Christina L. Perino Manager Licensing

GNRO-2012/00069

June 27, 2012

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

SUBJECT: Licensee Event Report 2012-004-00 Weld Defect Indication Found in Residual Heat Removal System to Reactor Pressure Vessel Boundary Nozzle Grand Gulf Nuclear Station, Unit 1 Docket No. 50-416 License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2012-004-00 which is a final report. This report is submitted in accordance with 10 CFR 50.73(a)(2)(ii)(A).

This letter does not contain any commitments. Should you have any questions regarding the attached report, please call Christina L. Perino at 601-437-6299.

Sincerely,

In This

CLP/ras

Attachment:

Licensee Event Report (LER) 2012-004-00

cc: (see next page)

GNRO-2012/00069 Page 2 of 2

cc: Mr. Elmo Collins Regional Administrator, Region IV U. S. Nuclear Regulatory Commission 1600 East Lamar Boulevard Arlington, TX 76011-4511

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

U. S. Nuclear Regulatory Commission ATTN: Mr. A. B. Wang, NRR/DORL (w/2) Mail Stop OWFN 8 B1 Washington, DC 20555-0001

Attachment To GNRO-2012/00069

Licensee Event Report (LER) 2012-004-00

NRC FORM	NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION							APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013						
LICENSEE EVENT REPORT (LER)								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 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						
(See reverse for required number of digits/characters for each block)							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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Grand Gulf Nuclear Station, Unit 1								05000 416 1 OF 5						
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 LICENSEE EVENT REPORT (LER)
 U.S. NUCLEAR REGULATORY COMMISSION

 CONTINUATION SHEET
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 2. DOCKET
 6. LER NUMBER
 3. PAGE

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Grand Gulf Nuclear Station, Unit 1	05000 446	YEAR	SEQUENTIAL NUMBER	REV. NO.	2055
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NARRATIVE

A. Reportable Occurrence

This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(A) as a degraded or unanalyzed condition when an indication indicative of intergranular stress corrosion cracking (IGSCC) was detected, and confirmed, in the weld root area of N6B-KB reactor coolant system pressure boundary weld on 4/28/2012.

B. Description of Structure(s), System(s) and Component(s)

The N6B nozzle connects the Residual Heat Removal C (EIIS:BO) system to the reactor pressure vessel (RPV). The Residual Heat Removal (RHR) system is comprised of three independent loops. Each loop contains its own motor-driven pump, piping, valves, instrumentation and controls. Each loop has a suction source from the suppression pool and is capable of discharging water to the reactor vessel via a separate nozzle, or back to the suppression pool via a full flow test line. The RHR/LPCI system removes decay and sensible heat from the reactor during shutdown, accident, and refueling conditions. The system also cools the suppression pool and the containment and maintains the required water level in the reactor vessel following a loss of cooling accident (LOCA).

C. Initial Conditions

The reactor was in Refueling Outage Mode 4 with reactor shutdown. There were no inoperable structures, systems, or components that contributed to this event.

D. Description of Occurrence

During refueling outage 18 (RF18), as part of the In-Service Inspection (ISI) program, weld N6B-KB, the Residual Heat Removal (RHR)/Low Pressure Injection (LPCI) "C" Nozzle to Safe End Weld, was ultrasonically (UT) examined to comply with the inspection requirements of the Boiling Water Reactor Vessel Internals Program (BWRVIP) 75A for Category "C" welds. The UT examination was performed in accordance with American Society of Mechanical Engineers (ASME) Section XI, Appendix VIII, Supplement 10 as implemented by the Performance Demonstration Initiative (PDI).

In performing this UT examination, an indication indicative of intergranular stress corrosion cracking (IGSCC) was detected. The indication was axially oriented and wholly located within the weld and butter. The length of the indication was 0.94 inches. The depth of the indication was 0.47 inches with a remaining ligament from the outside surface of 0.90 inches. The indication was located circumferentially 8.1 inches from top-dead-center looking into the vessel.

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Grand Gulf Nuclear Station, Unit 1		05000 440	YEAR	SEQUENTIAL NUMBER	REV. NO.	
05000 416 2012 004 00						3 OF 5
NARRATIVE						

Description of Occurrence (continued)

The outside diameter (OD) of the nozzle at the affected weld is approximately 14.5 inches. The nozzle is approximately 1.4 inches thick. The safe end connected to the nozzle is approximately 14.3 inches OD and approximately 1.3 inches thick. The weld is considered a dissimilar metal (DM) weld due to the design of nozzle carbon steel to Inconel safe end with Inconel weld metal.

E. Cause of Occurrence

The apparent cause of the weld indication is that the weld and weld butter were fabricated with material susceptible to IGSCC type cracking. Actions were taken to mitigate this condition through the stress relieving process of Induction Heating Stress Improvement (IHSI). A contributing cause for identification of this condition in 2012 (versus earlier) is the development and use of improved ultrasonic examination procedures, improved surface preparation and better qualified technicians.

The weld and weld butter were fabricated with Inconel 82/182 which has been shown to be susceptible to IGSCC-type cracking. The indication was detected in the weld butter and weld root area.

IHSI was performed in refueling outage four (RF04 in 1990) on the N6B nozzle to relieve stress and prevent and/or mitigate nozzle cracks. BWRVIP 61, "Induction Heating Stress Improvement Effectiveness on Crack Growth in Operating Plants," documents the results of an investigation into the most likely causes for post-IHSI IGSCC. Per the report, the apparent new cracking reported after IHSI can be attributed to existing cracking that initially went undetected following application of IHSI. Another possible explanation is that the flaw existed at the time of IHSI treatment and did not grow post-IHSI, but was later detected with better examination methods and better trained personnel.

Per BWRVIP 75A, extensive reviews of IHSI and UT data have concluded that the likely cause of "new IGSCC" is the existence of IGSCC that was undetected until later examinations were performed using better procedures. Automated examination is being utilized. The data is indexed and can be retrieved later for multiple reviews. Additionally, Electric Power Research Institute (EPRI) provided an independent review of the Grand Gulf Nuclear Station (GGNS) data for the N6B-KB nozzle weld.

NRC FORM 366A (9-2007) LICENSEE EVENT REPORT (LER) U.S. NUCLEAR REGULATORY COM CONTINUATION SHEET						
1. FACILITY NAME	2. DOCKET	6. LER NUMBER	3. PAGE			
Grand Gulf Nuclear Station, Unit 1		YEAR SEQUENTIAL REV. NUMBER NO.	4 OF 5			
	05000 416	2012 004 00				
NARRATIVE		LL	4			
F. Corrective Actions						
An ISI Relief Request was verbal approval of relief rec	prepared and su quest to allow ins	bmitted to the NRC. The NRC stallation of a weld overlay.	granted			
A full structural overlay rep accordance with Relief Rec	air to restore the quest ISI-17 was	weld to ASME Code requirem completed on May 14, 2012.	ients in			
Post weld UT testing and L 2012. No indications associte testing and no relevant indi Examination.	iquid Penetrant ciated with IGSC ications were no	Examination were completed o C were recorded during the po ted during the Liquid Penetran	on May 16, ost-weld UT t			
G. Safety Assessment						
The event posed no threat	to public health	and safety.				
The indication found in the increased challenge to nuc cracks that have been four (BWRs). IGSCC-type axia weld as typically this would	N6B-KB nozzle lear safety. The id in dissimilar m I cracking typica follow a "leak be	weld does represent an actual indication is indicative of the IC netal welds at Boiling Water Re Ily does not lead to structural fa efore break scenario." If the fl	or likely SSCC actors ailure of the aw had			

would be detected by installed drywell leak detection systems. Limits on unidentified leakage in the drywell would force reactor shutdown before there is any threat of crack growth that would jeopardize the overall structural

integrity of the reactor coolant boundary piping (i.e., guillotine failure).

breached the outside diameter, some leakage would have occurred. This leakage

IHSI was performed on all dissimilar metal (DM) welds in RF04 (1990) by NUTECH Engineers Inc. The IHSI treatment on the DM welds was performed on the N6B nozzle. A post-UT examination was completed and no indications were identified.

Effective programs in accordance with the ISI Program/BWRVIP 75A requirements are in place to manage the age-related degradation of flaws in the reactor coolant pressure boundary and avoid any undue risk to nuclear safety.

NRC FORM 366A (9-2007) LICENSEE EVENT REPORT (LER) U.S. NUCLEAR REGULATORY COMMISSION CONTINUATION SHEET							
1. FACILITY NAME	2. DOCKET	6. LER NUMBER	3. PAGE				
Grand Gulf Nuclear Station, Unit 1	05000 416	YEAR SEQUENTIAL REV. NUMBER NO.	5 OF 5				
	05000 416	2012 004 00					
NARRATIVE							
H. Additional Information							
Grand Gulf has thirty-four (34 under BWRVIP 75A (October detailed in BWRVIP 75A, Tab) DM welds in 2005). Inspe le 3-1, page 3	the ISI program which require ction requirements for these v B-2. Due to industry concerns	e inspection velds are s with				
cracking incidents in DM Weld	is, the industry	y committee to an accelerated					

program. Details of this program and requirements are detailed in BWRVIP 222, "Accelerated Inspection Program for BWRVIP 75A Category C Dissimilar Metal Welds Containing Alloy 182", July 2009. Twenty (20) DM Category C welds were inspected prior to RF18 to comply with the PDI requirements which became effective in November, 2002. The remaining fourteen (14) welds in the program were inspected during RF18. All BWRVIP Category C welds at Grand Gulf have been inspected using the ASME Section XI, Appendix VIII, Supplement 10 qualified techniques. The N6B nozzle was the last nozzle requiring inspection.

I. Previous Occurrences

There are no previous occurrences. All welds of this type have been inspected at Grand Gulf utilizing the PDI criteria with no other flaws noted.