Entergy

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Anthony J. Vitale
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PNP 2014-027

March 27, 2014

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

SUBJECT: License Event Report – Weld Defect in Pressurizer Nozzle to Nozzle Safe End Flange

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

Dear Sir or Madam:

Licensee Event Report (LER) 2014-003-00 is enclosed. The LER describes the discovery of two axial indications in a dissimilar metal weld between a pressurizer nozzle and a nozzle safe end flange. This LER is being submitted in accordance with 10 CFR 50.73(a)(2)(ii)(A) for a degraded condition.

This letter contains no new commitments and no revisions to existing commitments.

Sincerely,

ajv/jpm

Enclosure: LER 2014-003-00, "Weld Defect in Pressurizer Nozzle to Nozzle Safe End Flange"

cc: Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
Resident Inspector, Palisades, USNRC

ENCLOSURE

LER 2014-003-00

Weld Defect
in Pressurizer Nozzle
to Nozzle Safe End Flange

4 Pages Follow

NRC FORM 366
(01-2014)

U.S. NUCLEAR REGULATORY
LICENSEE EVENT REPORT (LER)

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

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4. TITLE Weld Defect in Pressurizer Nozzle to Nozzle Safe End Flange

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
02	05	2014	2014	- 003	- 00	03	27	2014		05000
									FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
6	☐ 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)
10. POWER LEVEL	☐ 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)
000	☐ 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
	☐ 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

FACILITY NAME	TELEPHONE NUMER *(Include Area Code)*
James P. Miksa, Regulatory Assurance Engineer	(269) 764-2945

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
B	AB	NZL	NVC490	Y					

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

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

On February 5, 2014, with the unit in Mode 6 for refueling outage 23 (1R23), during in-service inspection (ISI) examinations, an ultrasonic examination (UT) performed on a dissimilar metal weld (DMW) between the pressurizer nozzle and safe end flange for a pressurizer safety relief valve, revealed two axial indications in the root area of the weld. The two indications did not meet applicable acceptance criteria under ASME Section XI, IWB-3514, "Standards for Examination Category B-F, Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles, and Examination Category B-J, Pressure Retaining Welds in Piping."

The weld material encompassing the indications was removed. A weld repair was performed per ASME Section XI, IWA-4000, "Repair/Replacement Activities," Code Case N-638-4, "Similar and Dissimilar Welding Using Ambient Temperature Machine GTAW Temper Bead Technique," and relief request, "RR 4-19 Proposed Alternative to the Requirements of ASME Code Case N-638-4," which was submitted to, and approved by, the NRC. The repair was completed on March 08, 2014, and a post-weld radiograph was satisfactorily completed on March 09, 2014.

The event posed no threat to public health and safety.

This event is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(A) as a degraded or unanalyzed condition.

EVENT DESCRIPTION

On February 5, 2014, with the unit in Mode 6, at 0% reactor power, for refueling outage 23 (1R23), in-service inspection (ISI) examinations, to comply with the inspection requirements of ASME Code Case N-770-1, "Alternate Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities," were being conducted. The examinations were performed in accordance with ASME Section XI, Appendix VIII, Supplement 10 using performance demonstration initiative (PDI) ultrasonic examination (UT) encoded phased array. The examination identified two axial indications that appeared to be connected to the inside diameter surface on the dissimilar metal weld (DMW) between the pressurizer nozzle [NZL, AB] and safe end flange [PSF, AB] for a pressurizer safety relief valve [RV, AB].

One indication was approximately 50% through-wall and the other was approximately 25% through-wall. The outside diameter (OD) of the nozzle at the affected weld is approximately 6.25 inches. The nozzle is approximately 1.6 inches thick. The safe end connected to the nozzle is approximately 6.1 inches OD and approximately 1.5 inches thick. The weld is a DMW due to a carbon steel pressure vessel nozzle welded to an Inconel Alloy 600 safe end flange using 82/182 weld metal. The two indications did not meet applicable acceptance criteria under ASME, Section XI, IWB-3514, "Standards for Examination Category B-F, Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles, and Examination Category B-J, Pressure Retaining Welds in Piping."

The weld is a reactor coolant system [AB] pressure boundary weld.

There were no inoperable structures, systems, or components that contributed to this event.

CAUSE OF THE EVENT

The presumed cause of the weld flaws is that the weld and butter were fabricated with material susceptible to primary water stress corrosion cracking (PWSCC). The weld exhibited evidence of two service-related planar flaws. Both flaws appear to be connected to the inside diameter surface, are axially oriented, and exhibit characteristics indicative of PWSCC. Both flaws appear to lie on the upstream (nozzle side) of the weld centerline and are presumed to be contained in the PWSCC susceptible material (Alloy 600 Weld & Inconel Butter material). This presumption is based on the susceptibility of the material and industry operating experience. Determining the chronology of flaw initiation is challenged because this is the first examination using encoded phased array technology, which uses improved UT examination procedures and improved surface preparation. Previous examinations were performed on this DMW in 2010 (Refueling Outage 1R21) using manual UT.

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NARRATIVE

CORRECTIVE ACTIONS TAKEN

The weld material encompassing the indications was removed and repaired per ASME Section XI, IWA-4000, "Repair/Replacement Activities," Code Case N-638-4, "Similar and Dissimilar Welding Using Ambient Temperature Machine GTAW Temper Bead Technique," and relief request, "RR 4-19 Proposed Alternative to the Requirements of ASME Code Case N-638-4," which was submitted to, and approved by, the NRC. The repair was completed on March 08, 2014, and a post-weld radiograph was satisfactorily performed on March 09, 2014.

The modified nozzle/flange assembly replaced the existing SB-166, Alloy 600 weld neck flange with an SA-182 F316 austenitic stainless steel flange, which is not susceptible to PWSCC. The Alloy 82/182 weld material was removed and the nozzle cut back slightly to ensure that all of the original weld metal was removed. The new DMW between the stainless steel weld neck flange and low alloy steel nozzle was made with ERNiCrFe-7A (Alloy 52M) weld metal. The new materials are not susceptible to PWSCC.

Extent of condition exams were performed as required by 10CFR 50.55a in accordance with ASME Code Case N-770-1, on six additional welds. All extent of condition examinations were completed satisfactorily without any additional weld flaws identified.

ASSESSMENT OF SAFETY CONSEQUENCES

This event posed no threat to public health and safety.

The flaws identified did not represent an actual or likely increased challenge to nuclear safety. The flaws are indicative of PWSCC that has been found in DMWs at other pressurized water reactors (PWRs). PWSCC – type axial flaws are expected to be small, stable and not lead to structural failure of the weld. They typically would follow a "leak before break" scenario. This is documented in CEN-607, "Safety Evaluation For and Consequences of Reactor Vessel Head Penetration Alloy 600 ID initiated Nozzle Cracking," and CEN-614, "Safety Evaluation For and Consequences of Reactor Vessel Head Penetration Alloy 600 OD initiated Nozzle Cracking," and EPRI Report 1007029-NP, "Materials Reliability Program: Alloy 82/182 Pipe Butt Weld Safety Assessment for US PWR Plant Designs (MRP-113NP)." Even if the axial flaws had not followed this typical scenario the consequences would have been bounded by Palisades Nuclear Plant (PNP) small break LOCA safety analysis.

If the flaws had breached the OD, some leakage would have occurred. This leakage would be detected by PNP's leak detection methodology presently used, which is consistent with industry guidance. The methodology is compliant with NEI 03-08, "Guideline for the Management of Materials Issues," requirement to improve leak detection capability. PNP's leak detection methodology requires the monitoring of seven-day rolling averages of reactor coolant system leak rates for adverse trend identification and subsequent actions to identify leakage sources. Additionally, there are administrative and technical specification limits on unidentified reactor coolant system leakage which require a unit shutdown to identify and repair leakage.

LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET

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NARRATIVE

PREVIOUS SIMILAR EVENTS

LER 1993-009-00, "Pressurizer Penetration Safe end Crack Results in PCS Leakage," as supplemented by LER 1993-009-01 documents one previous occurrence of PWSCC on a dissimilar metal butt weld at PNP. In 1993, a pressure operated relief Valve (PORV) nozzle safe-end weld developed a leak due to PWSCC. It was repaired by removing the cracked weld and heat affected zone, welding a stainless steel pup piece into their place, and performing code required examinations. In 1995, the PORV safe-end, pup piece, and part of the 4" piping were replaced with a type 316 stainless steel safe-end/spool piece. Alloy 690 was used to eliminate Reactor Coolant System contact with Alloy 600 weld butter remaining on the nozzle. UT examination and liquid penetrant (PT) baseline examinations of the new welds were performed, with acceptable results. The PORV nozzle was volumetrically examined in 2014 satisfactorily. All welds in this inspection item have been inspected at PNP utilizing the PDI criteria with no other flaws identified.