Palo Verde Nuclear
Generating Station

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192-01059-WEI/DGM/RAS
October 29, 1999

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Unit 1
Docket No. STN 50-528
License No. NPF-41
Licensee Event Report 99-006-00

Attached please find Licensee Event Report (LER) 50-528/99-006-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports the findings and corrective actions taken upon discovery of a leak in an Inconel Alloy 600 instrument nozzle. APS has repaired the degraded nozzle and will test the repair during start-up (Mode 3) at normal operating pressure and temperature. No commitments are being made to the NRC by this letter.

In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV and to the Resident Inspector. If you have questions regarding this submittal, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

Sincerely,

WEI/DGM/RAS/ras

IE22

Attachment

cc: E. W. Merschoff (all with attachment)
J. H. Moorman
M. B. Fields
INPO Records Center

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Palo Verde Nuclear Generating Station-Unit 1	05000528	1 OF 4

TITLE (4)

Reactor Coolant System Pressure Boundary Leakage Due to Degraded Alloy 600 Instrument Nozzle

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	02	1999	1999	- 006 -	00	10	29	1999	N/A	
									FACILITY NAME	DOCKET NUMBER
									N/A	

OPERATING MODE (9)	3
POWER LEVEL (10)	000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Daniel G. Marks, Section Leader, Nuclear Regulatory Affairs	623-393-6492

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	AB	NZL	C490	Y					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On October 2, 1999, at approximately 0300 mountain standard time, Unit 1 was in Mode 3, Hot Standby, cooling down for a refueling outage when engineering personnel, who were performing a routine boric acid walkdown, discovered a small accumulation of boric acid residue on a reactor coolant system loop 2 hot leg instrument nozzle. The boric acid had accumulated on the exterior of the hot leg piping around the outer perimeter of the instrument nozzle. The nozzle was visually inspected during the last refueling outage in March of 1998 and no leakage was identified at that time. Visual inspections of other Alloy 600 hot leg nozzles have not identified other degraded components.

The nozzle has been repaired and testing will be completed during startup (Mode 3) at normal operating pressure and temperature. The remaining Alloy 600 hot leg nozzles in all three units are scheduled to be replaced during future outages.

No previous similar events have been reported pursuant to 10CFR50.73 in the past three years.

I. REPORTING REQUIREMENT(S):

This LER is being submitted pursuant to 10CFR50.73(a)(2)(ii).

Specifically, on October 2, 1999, engineering personnel discovered boric acid residue on two reactor coolant system (RCS) (EIIS:AB) hot leg instrument nozzles (EIIS:NZL). Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.4.14 permits no RCS pressure boundary leakage and therefore, the discovery of leakage (boric acid residue) from the nozzles was potentially a degradation of a principal safety barrier. Upon notification of the discovery, Operations personnel conservatively entered LCO 3.4.14 Condition b at 0953 mountain standard time (MST). On October 3, 1999, an isotopic analysis of the boric acid was completed which confirmed that the boric acid residue had originated from within the RCS and notification of the event (ENS# 36256) was made in accordance with 10CFR50.72(b)(2)(i) at 1504 MST. Subsequent engineering evaluation confirmed that only one hot leg instrument nozzle (RC-PDT-125) had leaked. Hence, this LER reports only the confirmed degraded nozzle.

II. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) OR COMPONENT(S):

The hot leg instrument nozzle was fabricated from NiCrFe Alloy 600 (Inconel 600) hot worked and annealed bar stock. The degraded nozzle penetrates RCS Loop 2 hot leg piping and provides a connection, via a 0.75 inch instrument line, for differential pressure transmitters (RC-PDT-125A, RC-PDT-124Y and RC-PDT-124Z) (EIIS: PT).

III. INITIAL PLANT CONDITIONS:

On October 2, 1999 Unit 1 was in Mode 3, Hot Standby. The RCS was being cooled down in preparation for Unit 1's eighth refueling outage. There were no structures, systems, or components that were inoperable at the time of discovery that contributed to this condition. There were no failures that rendered a train of a safety system inoperable and no failures of components with multiple functions were involved.

IV. EVENT DESCRIPTION:

On October 2, 1999, at approximately 0300 MST, APS engineering personnel were performing preplanned visual examinations of RCS piping in accordance with procedure requirements . The purpose of the visual examinations was to identify leakage from pressure retaining components. The examinations are part of APS' systematic measures to ensure that boric acid corrosion does

not lead to degradation of the reactor coolant pressure boundary and assure an extremely low probability of abnormal leakage, rapidly propagating failure, or gross rupture.

During the visual examinations of the Loop 2 RCS piping, a small amount of boric acid residue was observed around a nozzle that penetrates the Loop 2 hot leg. The boric acid had accumulated on the exterior of the hot leg piping around the outer perimeter of the instrument nozzle. An isotopic analysis of the boric acid confirmed that it had originated from within the RCS.

V. SAFETY CONSEQUENCES:

To date, the cracking of Alloy 600 instrument nozzles both at Palo Verde and industry-wide has been attributed to axially oriented, primary water stress corrosion cracking (PWSCC). PWSCC is not considered a significant threat to the structural integrity of the RCS boundary or the instrument nozzle, as this type of cracking typically results only in small leaks.

The bases for this conclusion is that if PWSCC occurred at Palo Verde, the cracks would be predominately axial in orientation, the cracks would result in detectable leakage, and the leakage would be apparent during visual examinations performed as part of surveillance walkdown inspections before significant damage to the reactor coolant boundary occurred.

VI. CAUSE OF THE EVENT:

An investigation of this event is being conducted in accordance with the PVNGS Condition Reporting program. Primary water stress corrosion cracking is believed to be the mechanistic cause of the instrument nozzle cracking, resulting in axial cracking of the Inconel 600 material. This type of cracking is known to be affected by high temperatures and time duration. Industry and Palo Verde specific data demonstrates that these PWSCC cracks will not result in a complete failure of the pressure boundary but will become evident through small leaks.

Alloy 600 nozzles show significant variability with respect to PWSCC. Forgings and hot worked bar stack may be more susceptible to this form of degradation than cold drawn and annealed pipe material. Nozzles with a wide variety of yield strength levels from near the specification minimum to very high have cracked. Nozzles fabricated from Alloy 600 with a variety of microstructures, including some that steam generator experience indicated should have been resistant to PWSCC, have cracked, as have nozzles fabricated from material with high and low final mill-anneal temperatures.

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. No personnel or procedural errors contributed to this event.

VII. CORRECTIVE ACTIONS:

The degraded hot leg instrument nozzle has been repaired and testing will be completed during startup (Mode 3) at normal operating pressure and temperature. The repair consisted of cutting the existing nozzle off at the outside diameter of the hot leg and installing a new nozzle made of Alloy 690, and welding the nozzle in place at the outside diameter of the hot leg piping.

To date, APS has replaced all Alloy 600 pressurizer instrumentation nozzles (seven per unit) with corrosion resistant Alloy 690 nozzles and has replaced the Alloy 600 RCS hot leg pressure instrumentation and sampling nozzles in Unit 2 with Alloy 690 nozzles. In addition, all hot leg Alloy 600 instrument nozzles in Units 1, 2 , 3 are scheduled to be modified in future outages.

Any additional corrective actions taken as a result of the investigation of this event will be implemented in accordance with the PVNGS corrective action program. If information is subsequently developed that would significantly affect a reader's understanding or perception of this event, a supplement to this LER will be submitted.

VIII. PREVIOUS SIMILAR EVENTS:

No previous similar events have been reported pursuant to 10CFR50.73 in the past three years.