LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Palo Verde Unit 3	0 5 0 0 0 5 3 0	1 OF 0 7

TITLE (4)
Power Operation Greater than 20 Percent with Cross-Wired Incore Instruments Resulting in a Technical Specification Violation

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 NAMES	DOCKET NUMBERS
									N/A	0 5 0 0 0
1 2	0 9	9 4	9 4	- 0 0 8	- 0 0	0 3	1 7	9 5	N/A	0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)							
POWER LEVEL(10)	0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
			20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract
			20.405(a)(1)(iii)	X	50.73(a)(2)(i)		50.73(a)(2)(vii)(A)		below and in Text, NRC Form
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(vii)(B)		366A)
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Burton A. Grabo, Section Leader, Nuclear Regulatory Affairs	AREA CODE 6 0 2 3 9 3 - 6 4 9 2

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	

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 fifteen single-space typewritten lines) (16)

On December 9, 1994, at approximately 1300 MST, Palo Verde Unit 3 was in MODE 5 (COLD SHUTDOWN) when a refuel handler discovered eight standard and eight mini incore instruments (ICI) cross-wired. Unit 3 operated at power above 20 percent from June 21, 1994 to November 26, 1994 with the input signals from the mini ICIs supplying the Core Operating Limit Supervisory System (COLSS). Data processed in the COLSS is used for calculating power distribution in the core. The sensitivity and background correction factors used by the COLSS are different for each individual ICI. Cross-wiring the standard and mini ICIs resulted in a violation of Technical Specification Limiting Condition for Operation (TS LCO) 3.2.2 in that the measured PLANAR RADIAL PEAKING FACTORS (Fxy) were greater than the affected Fxy, used in the COLSS and the Core Protection Calculators (CPC), during power operation above 20 percent. As corrective action, the standard ICIs were reconnected to the COLSS, and the Plant Monitoring System (PMS) detector information database (DET) file was reconstructed. An investigation determined that there were no adverse safety impacts as a result of operating with the ICIs cross-wired.

There have been no previous similar events reported pursuant to 10CFR50.73.

TEXT

I. REPORTING REQUIREMENT:

This LER 530/94-008-00 is being written to report a condition that resulted in an operation prohibited by the plant's Technical Specifications (TS).

Specifically, at approximately 1300 MST on December 9, 1994, Palo Verde Unit 3 was in MODE 5 (COLD SHUTDOWN) for a steam generator (AB) mid-cycle outage with the Reactor Coolant System (AB) at approximately 101 degrees Fahrenheit and at atmospheric pressure, when a refuel handler (utility, non-licensed) discovered eight standard and eight mini incore instruments (ICI) (IG) cross-wired. Unit 3 operated at power above 20 percent from June 21, 1994 to November 26, 1994 with the input signals from the mini ICIs supplying the Core Operating Limit Supervisory System (COLSS) (ID). Data processed in the COLSS is used for calculating power distribution in the core (AC). The sensitivity and background correction factors used by the COLSS are different for each individual ICI. Cross-wiring the standard and mini ICIs resulted in a violation of Technical Specification Limiting Condition for Operation (TS LCO) 3.2.2 in that the measured PLANAR RADIAL PEAKING FACTORS (Fxy) were greater than the affected Fxy used in the COLSS and the Core Protection Calculators (CPC) (JC) during power operation above 20 percent.

2. EVENT DESCRIPTION:

On December 9, 1994, at approximately 1300 MST, a refuel handler discovered eight standard and eight mini ICIs cross-wired. Unit 3 operated at power above 20 percent from June 21, 1994, to November 26, 1994, with the input signals from the mini ICIs supplying the COLSS. Data processed in the COLSS is used for calculating power distribution in the core. The sensitivity and background correction factors used by the COLSS are different for each individual ICI. Cross-wiring the standard and mini ICIs resulted in a violation of TS LCO 3.2.2 in that the measured PLANAR RADIAL PEAKING FACTORS (Fxy) were

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greater than the affected Fxy used in the COLSS and the CPCs during power operation above 20 percent. TS LCO 3.2.2, Action (b) states:

> "With an F_{xy}^{m} exceeding a corresponding F_{xy}^{c}, within 6 hours ...:
>
> Adjust the affected PLANAR RADIAL PEAKING FACTORS $\left(F_{xy}^{c}\right)$ used in the COLSS and CPC to a value greater than or equal to the measured PLANAR RADIAL PEAKING FACTORS $\left(F_{xy}^{m}\right)$ or...."

Because the reactor (AC) was shut down in MODE 5 at the time of discovery, no immediate action was necessary to place the plant in a safe condition. The as-found condition was analyzed to determine the effects of using the incorrect detector (DET) signals in the COLSS. The effects were found to be minimal but outside TS LCO 3.2.2. The most significant effect was the overestimation of AZIMUTHAL TILT which resulted in a measured PLANAR RADIAL PEAKING FACTOR (Fxy) of 1.546 instead of 1.560. The affected PLANAR RADIAL PEAKING FACTOR (Fxy) used in COLSS was set at 1.550.

Prior to the event, in March 1991, eight mini ICIs were installed in Unit 3 under an approved Temporary Modification (T-Mod) to determine whether mini ICIs could be used as future ICI replacements. The mini ICIs fit inside the moveable incore calibration tube (IG) of the standard ICIs. The mini ICI signals feed a Temporary Data Acquisition System (TDAS) (IQ) which was also installed under an approved T-Mod. During refueling operations, the standard and mini ICI cables are disconnected at the ICI seal (SEAL) table located inside the refueling pool (NH).

The connectors (CON) on the standard and mini ICIs are identical; however, the plant cables to the standard ICIs and the temporary cables to the mini ICIs are different. The mini ICIs are physically smaller than the standard ICIs but operate

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on the same principle (i.e., rhodium activation and beta decay). Each ICI detector signal is compensated for by using its own unique sensitivity and background correction constants. These correction constants are contained in the detector information database (DET) file and used in the Plant Monitoring System (PMS) (IO) algorithm which performs the detector flux to power conversion.

On May 14, 1994, following the fourth refueling outage (U3R4) core reload, eight standard ICI cables were inadvertently reconnected to eight mini ICIs by personnel in the Refueling and Mechanical Support (RAMS) refuel group (utility, non-licensed) under an approved Work Order (WO). Six days later, on May 20, 1994, the remaining cables (temporary mini ICI cables) were reconnected to the remaining connectors (standard ICIs) by Instrument and Control (I&C) Department personnel (utility, non-licensed) under a different approved WO. Both work documents required a self-verification that the proper cables were connected to the proper ICIs. In both cases, the self-verification was not adequately performed.

During power operation following Unit 3's fourth refueling outage, APS Reactor Engineering personnel questioned some of the data from the mini ICIs and initiated a work request to inspect the connectors and verify the insertion length of the mini ICIs. An inspection of the ICI connectors, at the ICI seal table, was conducted on December 9, 1994. The WO controlling the inspection required that the ICI connectors be disconnected, inspected, and reconnected. During the inspection, eight mini ICI cables were found connected to the standard ICI detectors. The standard and mini ICI cables and detectors were reassembled in accordance with the approved design configuration. Restoration was completed on December 9, 1994.

An evaluation was initiated to determine the effects of using the incorrect detector signals in the COLSS. The evaluation reanalyzed a previously performed power distribution surveillance test. The surveillance test uses ICI data and an off-line computer code to verify that the Fxy and AZIMUTHAL TILT meet applicable TS requirements. The off-line computer

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code was rerun with the eight signals from the mini ICIs flagged non-functional. The evaluation of the rerun surveillance test results was completed on February 8, 1995. The effects were found to be minimal with no impact on the safe operation of the plant. As part of the evaluation, the PMS detector information database (DET) file was reconstructed using the daily "snapshots" from the TDAS which contained the detector signals from the standard ICIs for the period of June 21, 1994, to November 26, 1994, and reloaded into the PMS. On February 15, 1995, following a review of the completed evaluation, the condition was determined to be reportable as an operation prohibited by the plant's TS LCO 3.2.2.

3. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

There was no adverse safety impact as a result of operating with the standard and mini ICIs cross-wired. Limiting the values of the affected PLANAR RADIAL PEAKING FACTORS (Fxy) used in the COLSS and CPCs to values equal to or greater than the measured PLANAR RADIAL PEAKING FACTORS (Fxy) provides assurance that the limits calculated by the COLSS and CPCs remain valid. The output from the COLSS using the cross-wired ICIs was not significantly different than if the cross-wiring had not occurred. Of the eight cross-wired ICIs, only five were being used by the COLSS. Three of the five signals were essentially the same as their host ICI signals and detectors for the remaining two ICIs were located on the core periphery and had little impact on the calculation of the incore power distribution.

The event did not result in any challenges to the fission product barriers or result in any releases of radioactive material. Therefore, there were no adverse safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or the health and safety of the public.

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4. CAUSE OF THE EVENT:

An investigation was performed under the APS Corrective Action Program. The investigation determined that the cause of the event was personnel error on the part of the RAMS and I&C personnel for failure to follow the approved work instructions (SALP Cause Code A: Personnel Error). An inadequate pre-job briefing specific to the installation configuration of the standard verses mini ICI connections and insufficient detail in the work documents used to reconnect the standard and mini ICIs during U3R4 contributed to the event. Restricted visibility and radiological conditions at the ICI seal table also contributed to the event.

5. STRUCTURES, SYSTEMS, OR COMPONENT INFORMATION:

The COLSS and CPCs were considered administratively inoperable during the periods of operation above 20 percent power from June 21, 1994, to November 26, 1994, in that the incorrect input (from the mini ICIs) resulted in a slightly non-conservative measurement of the PLANAR RADIAL PEAKING FACTORS (Fxy); however, there were no indications that component or system failures were involved. No failures of components with multiple functions were involved. No failures that rendered a train of a safety system inoperable were involved. There were no safety system actuations and none were required.

6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

Actions to prevent recurrence are being tracked under the Palo Verde Nuclear Generating Station's Commitment Action Tracking System. These actions include:

Removing the mini ICI T-Mod during Unit 3's next refueling outage (U3R5), currently scheduled for December 1995, and

Evaluating the effectiveness of the configuration controls placed on temporary modifications during periods when a modification may become temporarily

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disassembled and initiating any needed changes to the Temporary Modification Program.

7. PREVIOUS SIMILAR EVENTS:

There have been no previous similar events reported pursuant to 10CFR50.73 in the last three years.