



A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear
Generating Station

Cliff Eubanks
Vice President
Nuclear Operations

Tel (623) 393-6116
Fax (623) 393-6077

Mail Station 7602
PO Box 52034
Phoenix, Arizona 85072-2034

102-05524-CE/CKS/REB
July 01, 2006

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

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2
Docket No. STN 50-529
License No. NPF 51
Licensee Event Report 2005-004-01**

Attached please find supplement 1 to Licensee Event Report (LER) 50-529/2005-004 prepared and submitted pursuant to 10 CFR 50.73. This LER reports a shutdown required by Technical Specifications based on the inoperability of all four channels of the Core Protection Calculators.

In accordance with 10 CFR 50.73(d), copies of this LER are being forwarded to the NRC Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact James Proctor, Section Leader, Regulatory Affairs, at (623) 393-5730.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

CE/CKS/REB/gt

Attachment

cc: B. S. Mallett NRC Region IV Regional Administrator
M. B. Fields NRC NRR Project Manager - (send electronic and paper)
G. G. Warnick NRC Senior Resident Inspector for PVNGS

JE22

LICENSEE EVENT REPORT (LER)

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

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@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 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 Palo Verde Nuclear Generating Station Unit 2	2. DOCKET NUMBER 05000529	3. PAGE 1 OF 7
---	-------------------------------------	--------------------------

4. TITLE
Technical Specification Required Shutdown Due to Core Protection Calculators Inoperable

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
08	22	2005	2005	- 004 -	01	07	01	2006	None	05000
									FACILITY NAME	DOCKET NUMBER
									None	05000

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)									
10. POWER LEVEL 99	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)						
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)							
<input type="checkbox"/> 20.2203(a)(2)(v)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER							
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A							

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME James Proctor, Section Leader, Regulatory Affairs	TELEPHONE NUMBER (Include Area Code) (623) 393-5730
--	--

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	SB	JC	W351	Y					

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

On August 22, 2005 at approximately 1750 Mountain Standard Time (MST), Unit 2 completed a reactor shutdown required by the Technical Specifications. The shutdown was required due to all four channels of the Core Protection Calculators (CPC) being declared inoperable on August 22 at 1326 MST based on information from the CPC vendor that software changes that had previously been implemented in Unit 2 CPCs changed the way the CPCs would operate for a failed sensor.

The direct cause of the Unit 2 CPC software issue was a 2002 revision of the software requirements specification led to an inconsistency with the system requirements specification. The root cause was determined to be that no formal communication plan existed within the internal Westinghouse users of the reactor trip function in the CPCs.

The Unit 2 software has been corrected. Unit 1 had the correct software installed when the software change was made. Unit 3 has not installed the new software at this time.

Although other Technical Specification required shutdowns have been reported in the last three years none were due to similar causes or equipment.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 2	05000529	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 7
		2005	-- 004	-- 01	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

Note: all times in this report are approximate and Mountain Standard Time unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This LER (50-529/2005-004-00) is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(A), to report the completion of a reactor shutdown required by Technical Specifications. Specifically, on August 22, 2005 at 1750 hours Control Room personnel completed a reactor shutdown (entered Mode 3, Hot Shutdown) to comply with Limiting Condition for Operation (LCO) 3.0.3 as a result of all four channels of the Core Protection Calculators (CPC) being declared inoperable at 1326 hours.

In addition, the event is being reported pursuant to 10 CFR 50.73(a)(2)(i)(B), to report a condition which was prohibited by technical specification LCO 3.3.1.

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

The CPCs consist of four separate, redundant channels. Each channel is a computer system that continuously calculates thermal conditions and thermal limits. The CPC system is an integral part of the plant protective system (EISS:JC) in that it provides two trips to the reactor protection system (RPS) (EISS:JC); Departure from Nucleate Boiling Ratio (DNBR) and Local Power Density (LPD). Trip signals are provided to the RPS whenever the minimum departure from nucleate boiling ratio (DNBR) or fuel design limit Local Power Density is approached during reactor operation.

The four channels of CPCs are located inside the auxiliary protective cabinet where the channels are physically separated and isolated from each other. Each CPC channel provides contact outputs to its respective RPS channel. The following analog input sensors are processed in each CPC channel:

- 2 Cold Leg Temperatures
- 2 Hot Leg Temperatures
- 1 Pressurizer Pressure

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 2	05000529	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 7
		2005	-- 004	-- 01	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

- 3 Ex-core Neutron Flux Detectors

In the event of a failure of one of the input sensors a trip signal for the applicable CPC channel should be generated.

Each input parameter is read by two separate analog input modules in a channel. One of the two redundant analog input modules is normally selected. In the event the normally selected module indicates a failure, the software will select the alternative module. In the event of a failure of both modules at the same time a trip signal for that channel should be generated.

Detectable CPC channel failures, resulting in a loss of protective function and channel inoperability, are required to generate CPC Fail indication and associated Low DNBR and High LPD channel trips. Input failures resulting in a sensor out of range affecting one or more CPC process inputs will result in a CPC Sensor Failure indication. In addition, since the CPC software limits the sensor value to the lower or upper range limit value, a CPC channel trip would be generated in most cases due to these extreme values.

3. INITIAL PLANT CONDITIONS:

On August 22, 2005 at 1326 hours Unit 2 was operating in Mode 1, Power Operation, at approximately 100 per cent power when control room personnel declared all four channels of the CPCs inoperable.

No other major structures, systems, or components were inoperable that contributed to the event.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 2	05000529	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 7
		2005	-- 004	-- 01	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

4. EVENT DESCRIPTION:

On May 18, 2005 Westinghouse personnel identified a potential problem with the installed version of the CPC software for Unit 2. It was discovered that the installed version (release 6.1) of the Unit 2 CPC software was not consistent with the system requirements regarding the system response to analog input module errors. When both analog input modules within a CPC channel indicate an error simultaneously the CPC uses the last known good value. However, the system requirements state that a channel trip should be initiated for this event. Software release 6.1 was installed into the Unit 2 CPCs in May 2005 and resulted in the CPCs not being able to generate this trip signal. On August 8, 2005 Westinghouse personnel completed an apparent cause analysis for the issue and concluded the issue was a nuclear safety concern.

At 0900 hours on August 22, 2005, during a weekly phone call, a Westinghouse engineer informed the Palo Verde Operations Computer System (OCS) section leader of the issue with the CPC software. The OCS section leader discussed the issue with the OCS department leader, an OCS engineer, OCS planner and a nuclear fuel analysis engineer and then performed a test in the shop that confirmed the problem. The OCS section leader informed the Unit 2 shift manager (SM) at 1300 on August 22, 2005 of the issue.

The SM made the decision to enter Technical Specification LCO 3.0.3 at 1326 due to the installed CPC software not supporting Technical Specification Bases 3.3.1 which states:

“Those detectable channel failures resulting in a loss of protective function and channel inoperability will result in a CPC Fail indication and associated Low DNBR and High LPD trips”.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 2	05000529	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 7
		2005	-- 004	-- 01	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

Plant shutdown commenced at 1605 on August 22, 2005 (reference ENS 41939) and LCO 3.0.3 was exited at 1750 when the unit entered Mode 3, Hot Standby.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

Palo Verde Unit 2 CPCs provide the reactor trip functions for Low DNBR and High LPD. The CPC system is a four channel system that uses a two out of four logic for reactor trip signal generation. Since a sensor failure most likely will occur as a result of a localized failure in one of four channels the CPC safety function will continue to be provided by the other three safety channels. Likewise, a failure of both analog input modules in more than one channel at the same time is not likely to occur. It should be noted that sensor failures involved in the identified condition would have to occur within approximately 50 milliseconds.

Both a sensor failure and an analog input module failure actuate contact output signals in the affected channel to the CPC Operator's Module Alarm and the plant annunciator alarm in the main control room which would alert the control room operators to the condition.

Plant Technical Specification LCO 3.3.1 requires that a failed channel be placed in bypass or trip within one hour. Alarm response procedure 42AL-2RK5A directs compliance with LCO 3.3.1 for a CPC sensor failure (alarm window 5A13B).

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

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 2	05000529	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	6 OF 7
		2005	-- 004	-- 01	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

The event did not result in a transient more severe than those analyzed in the updated Final Safety Evaluation Report Chapters 6 and 15. The event did not have any nuclear safety consequences or personnel safety impact.

The condition would not have prevented the fulfillment of any safety function and did not result in a safety system functional failure as defined by 10 CFR 50.73(a)(2)(v).

6. CAUSE OF THE EVENT:

The direct cause of the Unit 2 CPC software issue was a 2002 revision of the software requirements specification led to an inconsistency with the system requirements specification.

The root cause of the software requirements specification not being consistent with the system requirements specification was determined to be that no formal communication plan existed with the internal Westinghouse "downstream" users of reactor trip function. The Westinghouse Reactor Protection and Monitoring Systems group did not communicate with the Transient Analysis and Setpoint group to discuss the trip functions when setting the software for the trip function during CPC system development.

7. CORRECTIVE ACTIONS:

On August 25, 2005 activities were completed to install CPC software version 6.3 in all four channels of Unit 2 CPCs.

Corrective actions to prevent recurrence are internal to Westinghouse and documented in a Vendor Corrective Action Report.

LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station Unit 2	05000529	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	7 OF 7
		2005	-- 004	-- 01	

17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

8. ADDITIONAL INFORMATION

The CPCs in Unit 2 were upgraded in November 2003. Unit 1 CPC upgrade was completed during 1R12 (October-December 2005) with the correct software installed. Unit 3 is scheduled to receive the upgraded CPC system in a future refueling outage. Changes will be made to the Unit 3 upgraded CPCs, prior to their use, to correct the problem.

9. PREVIOUS SIMILAR EVENTS:

In the past three years, Palo Verde reported reactor shutdowns required by Technical Specifications but none associated with the same root cause.