



A subsidiary of Pinnacle West Capital Corporation

10 CFR 50.73

Palo Verde Nuclear  
Generating Station

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102-05872-DCM/DFH  
July 21, 2008

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 2008-001-00**

Attached, please find Licensee Event Report (LER) 50-529/2008-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports a condition prohibited by technical specifications and that could have prevented the fulfillment of a safety function because of an inoperable boron dilution alarm system.

In accordance with 10 CFR 50.4, 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 A. Proctor, Section Leader, Regulatory Affairs, at (623) 393-5730.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

DCM/JAP/DFH/gat

Attachment

cc: E. E. Collins Jr. NRC Region IV Regional Administrator  
M. T. Markley NRC NRR Project Manager - (send electronic and paper)  
R. I. Treadway NRC Senior Resident Inspector for PVNGS

A member of the **STARS** (Strategic Teaming and Resource Sharing) Alliance  
Callaway • Comanche Peak • Diablo Canyon • Palo Verde • South Texas Project • Wolf Creek

JE22  
NRR

**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: 80 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<br>Palo Verde Nuclear Generating Station (PVNGS) Unit 2 | 2. DOCKET NUMBER<br>05000529 | 3. PAGE<br>1 OF 4 |
|--|------------------------------|-------------------|

4. TITLE  
Inoperable Boron Dilution Alarm Monitoring System

| 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 |
| 05            | 21  | 08   | 2008          | - 001 -           | 00      | 07             | 21  | 2008 |                              | 05000         |
|               |     |      |               |                   |         |                |     |      | FACILITY NAME                | DOCKET NUMBER |
|               |     |      |               |                   |         |                |     |      |                              | 05000         |

|   |  |   |   |  |   |                                     |  |   |   |  |  |   |   |   |  |   |   |  |   |   |   |   |                                      |   |                                      |  |  |  |                                      |   |  |  |                                |  |   |  |   |
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| 9. OPERATING MODE<br><br>5 and 6            | 11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)   |   |   |  |   |                                     |  |   |   |  |  |   |   |   |  |   |   |  |   |   |   |   |                                      |   |                                      |  |  |  |                                      |   |  |  |                                |  |   |  |   |
| 10. POWER LEVEL<br><br>00                   | <table style="width:100%; border: none;"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td style="font-size: small;">Specify in Abstract below or in NRC Form 366A</td> </tr> </table> | <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 checked="" 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 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 |
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12. LICENSEE CONTACT FOR THIS LER

|   |  |
|---|--|
| FACILITY NAME<br>James A. Proctor, Section Leader, Regulatory Affairs | TELEPHONE NUMBER (Include Area Code)<br>623-393-5730 |
|---|--|

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 |
|-------|--------|-----------|---------------|--------------------|-------|--------|-----------|---------------|--------------------|
|       |        |           |               |                    |       |        |           |               |                    |

|   |  |
|---|--|
| 14. SUPPLEMENTAL REPORT EXPECTED<br><input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO | 15. EXPECTED SUBMISSION DATE<br>MONTH: 10    DAY: 31    YEAR: 2008 |
|---|--|

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

On May 21, 2008, plant staff noted that the Boron Dilution Alarm System (BDAS) had been in alarm for approximately one hour. When a BDAS channel is in an alarm condition, the channel loses its function to monitor start-up channel neutron flux and detect an inadvertent boron dilution event until the channel is reset manually. Initial review of alarm logs indicated that during the period from May 8 to May 21, 2008, when Unit 2 was in Modes 5 and 6 requiring the BDAS, either a single BDAS channel or both channels were in alarm on multiple occasions for extended periods. During these periods, required technical specification (TS) 3.3.12 Actions A.1, B.1 and C.1 were not performed.

A night order was issued on May 22, 2008, as an immediate corrective action to direct timely reset of BDAS alarms. An investigation is underway and the root cause has not been determined. This LER will be supplemented when the investigation is complete.

No similar conditions have been reported in the past three years.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

| 1. FACILITY NAME                                | 2. DOCKET | 6. LER NUMBER |                      |                    | 3. PAGE |
|---|-----------|---------------|----------------------|--------------------|---------|
| Palo Verde Nuclear Generating Station<br>Unit 2 | 05000529  | YEAR          | SEQUENTIAL<br>NUMBER | REVISION<br>NUMBER | 2 OF 4  |
|   |           | 2008          | - 001                | - 00               |         |

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

All times are Mountain Standard Time and approximate unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications (TS) and 10 CFR 50.73(a)(2)(v)(A) as a condition that could have prevented the fulfillment of a safety function required to maintain the reactor in a safe shutdown condition.

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

The Boron Dilution Alarm System (BDAS) (EISS: IG) provides two independent and redundant channels (channels 1 and 2) to ensure detection of a boron dilution event while in hot standby, hot shutdown, cold shutdown, and refueling modes, Modes 3 through 6, respectively.

BDAS is credited in the Updated Final Safety Analysis Report Chapter 15 safety analysis with providing operators an alert to inadvertent boron dilution 15 minutes prior to achieving criticality assuming the maximum dilution rate while in modes 3, 4, and 5, and 30 minutes warning in Mode 6. This allows the operator time to diagnose and terminate the boron dilution prior to criticality.

BDAS receives and monitors two neutron flux signals (one per BDAS channel) from the startup channel nuclear instrumentation. When these neutron flux signals increase during shutdown to equal or greater than the calculated alarm setpoint, alarm signals are generated. The BDAS provides two separate and independent alarm signals (one signal per BDAS channel) to the plant annunciation system upon determination of a boron dilution event. Each alarm signal will cause the annunciator window "Possible Inadvertent Boron Dilution" to alarm.

The alarm setpoint periodically lowers, automatically to a fixed point above the current neutron flux levels if flux decreases. Each BDAS channel calculates the boron dilution alarm setpoint to one-third decade above the current neutron flux when the flux is not increasing. If the neutron flux signal increases to the setpoint, the alarm signal is generated. The current neutron flux indication and alarm setpoint (per channel) is displayed on the panel behind the control room panel.

The alarm reset capability allows the operator to acknowledge the alarm and initialize the system to the current neutron flux. When a BDAS channel alarms, the reactor operator is required to evaluate the alarm and take appropriate actions. A reset at the BDAS module reestablishes a new setpoint.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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

**3. INITIAL PLANT CONDITIONS:**

Unit 2 entered Mode 6 (Refueling) following defueled outage operations at 11:26 on May 8, 2008, and Mode 5 at 02:57 on May 14, 2008. Reactor coolant system (RCS) (EIS: AB) temperature ranged from approximately 76 to 99 degrees Fahrenheit while in Mode 6 and from 99 to 192 degrees while in Mode 5. RCS pressure ranged from atmospheric pressure to approximately 383 psia while in Mode 5.

**4. EVENT DESCRIPTION:**

From May 8 through May 21, 2008, multiple instances occurred in which the required BDAS channels were alarming without being reset for periods greater than allowed by TS and therefore, were inoperable.

Technical Specification Limiting Condition for Operation (TS LCO) 3.3.12 requires two channels of BDAS to be OPERABLE in Modes 3, 4, 5, and 6. LCO Action A.1 requires immediate determination of RCS boron concentration with one channel inoperable and at the frequency prescribed in the Core Operating Limits Report (COLR). With two channels inoperable (Action B.1), immediate determination of RCS boron concentration is required by redundant methods and at the frequency prescribed in the Core Operating Limits Report (COLR). If the required actions and completion times are not met, immediate suspension of operations involving positive reactivity addition is required (Action C.1).

**5. ASSESSMENT OF SAFETY CONSEQUENCES:**

An investigation of the event is in progress. Information on the safety consequence will be provided in a supplement to this LER.

**6. CAUSE OF THE EVENT:**

The root cause investigation is in progress. This LER will be supplemented when the investigation is complete.

**7. CORRECTIVE ACTIONS:**

A night order was issued on May 22, 2008 after the condition was identified. The night order stated the importance of the BDAS alarm and directed timely reset of the alarms.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

| 1. FACILITY NAME  | 2. DOCKET | 6. LER NUMBER |                      |                    | 3. PAGE |
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| <b>Palo Verde Nuclear Generating Station<br/>Unit 2</b> | 05000529  | YEAR          | SEQUENTIAL<br>NUMBER | REVISION<br>NUMBER | 4 OF 4  |
|   |           | 2008          | - 001                | - 00               |         |

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

Corrective actions for this event are still being evaluated and will be identified in the supplement to this LER.

8. PREVIOUS SIMILAR EVENTS:

No similar conditions have occurred in the prior three years.