



Palo Verde Nuclear  
Generating Station

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102-05050-CDM/SAB/RJR  
February 17, 2004

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  
Unit 2's 60-Day after Plant Restart Letter in Response to NRC Bulletin  
2003-02, Commitment No. 3 and Order EA-03-009, Item IV.E.**

NRC Bulletin 2003-02, Item 1(c) and NRC Order EA-3-009, Item IV.E both requested that a 60-day report detailing the inspection results of the bottom mounted instrumentation (BMI) nozzles and the reactor pressure vessel (RPV) head be submitted to the NRC upon returning Unit 2 to operation. Unit 2 was returned to operation on December 15, 2003 (breakers closed at 0544 MST).

The enclosure to this letter contains the following information on the Unit 2 BMI inspection:

- a summary of the inspections performed,
- the extent of the inspections,
- the methods used,
- a description of the "as-found" condition of the lower head,
- any findings of relevant indications of through-wall leakage, and
- a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found.

The enclosure also contains the following information in response to NRC Order EA-03-009:

- Inspection results for each inspection required by Paragraph C of the Order, and
- Inspection results for each inspection required by Paragraph D of the Order.

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A109  
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U. S. Nuclear Regulatory Commission  
PVNGS Unit 2's 60-Day after Plant Restart Letter

No commitments are being made to the NRC in this letter. Should you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,



CDM/SAB/RJR/kg

Enclosure: PVNGS' Unit 2 60-day Report Detailing the Inspection Results of the  
Reactor Pressure Vessel Head and Bottom Mounted Instrumentation  
Nozzles

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**Enclosure**  
**PVNGS' Unit 2 60-day Report Detailing the Inspection Results of**  
**the Reactor Pressure Vessel Head and Bottom Mounted**  
**Instrumentation Nozzles**

# **PVNGS' Unit 2 60-day Report Detailing the Inspection Results of the Reactor Pressure Vessel Head and Bottom Mounted Instrumentation Nozzles**

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## **Results of the Unit 2 Bottom Mounted Instrumentation (BMI) Inspection, NRC Bulletin 2003-02**

### **Summary of the Inspections Performed**

APS performed an as-found inspection of all 61 bottom mounted instrumentation (BMI) nozzles at PVNGS Unit 2 during the 11<sup>th</sup> refueling outage. The as-found examination of all 61 penetrations (360° around each nozzle-bottom head interface) was performed by an APS Level III VT-2 qualified examiner using remote operated robotic camera equipment with zoom capabilities. There were no boric acid deposits noted during this detailed as-found examination. Some minor bridging and blockage of the nozzle annulus was observed, such as, residual spray-lat coating, tape, and insulation. The nozzles are assembled with a clearance fit and the bridging/blockage did not restrict the visual examination.

Cleaning of the nozzle-head interface area was started during this outage. However, as discussed in APS letter 102-05033, dated January 21, 2004, APS was unable to complete the cleaning process to allow performance of a "bare-metal" visual inspection of all 61 bottom mounted nozzles. A "bare-metal" zone was achieved on 39 of the 61 nozzles before implementation problems developed. Due to the size of the cleaning robot, this robot could not reach the lowest nozzles (center) and because of balance and stability issues, this robot could not clean the tallest nozzles (peripheral).

There were no boric acid deposits noted in the area of the nozzle annulus during the "as-found" inspection.

### **Extent of the Inspections**

An initial visual inspection of all 61 penetrations was performed using a robot-mounted camera. The camera included a zoom feature. The maneuverability of the robot allowed a complete 360° inspection around each nozzle-bottom head interface and was completed prior to any cleaning being attempted. Following the initial visual inspections, a "bare-metal" zone was achieved by cleaning 39 of the 61 nozzles before implementation problems developed. Twenty-two nozzles remain to be cleaned during the next refueling outage in Unit 2 currently scheduled for the spring of 2005.

### **Inspection Methods Used**

The "as-found" inspection of all 61 penetrations (360° around each nozzle-bottom head interface) was performed by an APS Level III VT-2 qualified examiner using robotic equipment with zoom capabilities. The post cleaning "bare-metal" inspection was also performed by an APS Level III VT-2 qualified examiner using robotic equipment with zoom capabilities.

# **PVNGS' Unit 2 60-day Report Detailing the Inspection Results of the Reactor Pressure Vessel Head and Bottom Mounted Instrumentation Nozzles**

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## **Description of the "As-found" Condition of the Lower Head**

As expected from the Unit 3 scoping walkdown performed this past spring, a residual spray-lat coating, caulking, and other foreign material were found adhered to the Unit 2 BMI nozzles in the area of the nozzle-bottom head interface. Although there was some minor bridging and blockage of the nozzle annulus observed, the bridging/blockage did not restrict the visual inspection. These nozzles are assembled with a clearance fit. This type of fit provides sufficient radial clearance around the nozzle to perform the required visual inspection. There were no boric acid deposits noted in the area of the nozzle annulus during the "as-found" inspection.

Streaks and stains were observed on the outside of the bottom head. No corrosion of the carbon steel shell was observed. Corrective Action documents were initiated as a result of this observation as described below.

## **Any Findings of Relevant Indications of Through-wall Leakage**

There was no indication of through-wall leakage.

## **Summary of the disposition of any Findings of Boric Acid Deposits and any Corrective Actions Taken as a Result of Indications Found**

As stated above, there were no boric acid deposits noted in the area of the nozzle annulus during the "as-found" inspection and there was no evidence of leakage from any bottom-mounted nozzle. However, corrective action document CRDR 2638613 was initiated to evaluate the streaks and stains observed on the outside of the bottom head. The Engineering evaluation performed concluded that the staining observed was from leakage caused by loss of air to the temporary pool seals during the 1990 spring outage and spillage from the control rod drive mechanism air conditioning units during the early outages in Unit 2.

Based on the current visual inspection, APS concludes that PVNGS Unit 2 meets applicable regulatory requirements related to the structural and leakage integrity of the RPV lower head penetrations.

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## **Results of the Unit 2 Interim Inspection of the Reactor Pressure Vessel Head**

At the start of the Unit 2 11<sup>th</sup> refueling outage (U2R11) in the fall of 2003, the effective degradation years (EDY) were calculated as 11.66 as reported in APS letter 102-04968-GRO/SAB/RJR, dated July 17, 2003. As such Unit 2 was in the moderate susceptibility category.

## **Results of the Inspection Required by Paragraph C of NRC Order EA-03-009**

NRC Order EA-03-009 IV.C. 2 states that:

- (2) For those plants in the Moderate category, RPV head and head penetration inspections shall be performed such that at least the requirements of 2(a) or 2(b) are performed each refueling outage. In addition the requirements of 2(a) and 2(b) shall each be performed at least once over the course of every two (2) refueling outages.
  - (a) Bare metal visual examination of 100% of the RPV head surface (including 360° around each RPV head penetration nozzle).
  - (b) Either:
    - (i) Ultrasonic testing of each RPV head penetration nozzle (i.e., nozzle base material) from two (2) inches above the J-groove weld to the bottom of the nozzle and an assessment to determine if leakage has occurred into the interference fit zone, OR
    - (ii) Eddy current testing or dye penetrant testing of the wetted surface of each J-Groove weld and RPV head penetration nozzle base material to at least two (2) inches above the J-groove weld.

During the previous U2 refueling outage, APS performed under the head non-destructive examinations in accordance with the requirements of, and commitments to NRC Bulletins 2001-01 and 2002-01. The examination methods and results are discussed in APS letters 102-04681, dated April 3, 2002, and 102-04703, dated May 17, 2002. During U2R11, APS conducted inspections of the RPV head in accordance with the requirements of NRC Order Section IV.C.(2)(a). This inspection was performed with the insulation removed.

During the "bare-metal" visual inspection of the RPV head surface, evidence of an old, inactive boric acid leak was identified. The inspection revealed a white stain coming down the side of control element drive mechanism (CEDM) nozzle No.18 to its base, and then proceeding down the head and around the base of down hill nozzles No.'s 30 and 55. The extent of the staining is detailed below.

## **PVNGS' Unit 2 60-day Report Detailing the Inspection Results of the Reactor Pressure Vessel Head and Bottom Mounted Instrumentation Nozzles**

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1. A light residue on nozzle No. 18 from the plenum plate to the base of the nozzle (observation above the plenum plate was not possible during this inspection)
2. A light residue on the reactor head base material at the base of nozzle No. 18 and proceeding downhill to and around the base of nozzles No. 30 and No. 55.
3. A very small accumulation of residue at the base of each of these three nozzles on the uphill side at the nozzle to base metal interface.

The inspection identified that there was no active leak and that there was no discernable corrosion of the RPV head base metal. Corrective action document CRDR 2642817 was initiated to document and evaluate the condition.

An attempt was made to obtain a sample of the residue for possible chemical or radioisotopic analysis. Because of very limited access to the area of interest and radiological conditions, only a very small sample of residue could be obtained. Preliminary analysis of the sample indicates the residue consists of low activation boric acid crystals. The analysis indicates the stain is the result of an old, inactive boric acid leak.

During U2R10, a limited visual inspection of the reactor head area above the insulation was performed. This inspection also identified a stain on nozzle 18 coming down from the plenum plate. There is no discernible difference between the stain as observed during the U2R10 inspection and the current inspection. Thus it is concluded that the stain is the result of an old in-active borated water leak from above the plenum plate. In the PVNGS response to NRC Bulletin 2002-01 dated April 3, 2002, APS identified in letter 102-04681 the fact that during U2R6, a spill from CEDM versa-vents above the reactor head during an RCS fill and venting activity occurred. Therefore, the most likely source of the slight boric acid residue is the spill that occurred during U2R6.

The current inspection also identified small accumulations of residue on the uphill sides of each of these nozzles (18, 30, 55) at the annulus. The evaluation of CRDR 2642817 identified a potential for this residue to mask a new or slight nozzle or weld crack leak since the presence of these small accumulations prevents the direct visual inspection of the nozzle annulus for signs of a nozzle/weld leak. The purpose of the inspection of the reactor head is to inspect for leakage from the CEDM nozzles. Since the inspection of these nozzles could not be adequately performed from the RPV head surface, confirmation of integrity of these three nozzles and associated welds were demonstrated by the performance of Eddy current/Ultrasonic testing from under the head.

On November 22, 2003, ultrasonic and eddy current examinations of penetration nozzles 18, 30, and 55 were performed and identified no detectable defects. There were no indications of CEDM nozzle/weld cracks or leaks. Therefore it is concluded the

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observed stain and residue accumulation are not masking potential leaks from the CEDM nozzles.

### **Results of the Inspection Required by Paragraph D of NRC Order EA-03-009**

NRC Order EA-03-009 IV.D. states that:

During each refueling outage, visual inspections shall be performed to identify potential boric acid leaks from pressure-retaining components above the RPV head. For any plant with boron deposits on the surface of the RPV head or related insulation, discovered either during the inspections required by this Order or otherwise and regardless of the source of the deposit, before returning the plant to operation the Licensee shall perform inspections of the affected RPV head surface and penetrations appropriate to the conditions found to verify the integrity of the affected area and penetrations.

A Boric Acid Walkdown (BAW) was performed for the U2R11 refueling outage on September 27, 2003. Potential boric acid leak sites from pressure retaining components above the RPV Head were examined using PVNGS procedure 70TI-9ZC01, Boric Acid Corrosion Prevention Program. Four sites were found. They are the Unit 2 CEDM Versa-Vent No.'s 7, 8, 36, and 46. The information on these leaks is presented below.

#### **CEDM VERSA VENT No. 7**

No active leak was identified. The leakage stayed in the area of the vent and did not make it down to the reactor head or insulation. This leak was identified, but not cleaned during the U2 July 2003 outage and was documented in Special Report (SR) 2-SR-2003-001, APS letter 192-01126-CDM/RAS, dated September 23, 2003. The boric acid residue was cleaned during U2R11. No carbon steel was affected and there was no non-conforming condition

#### **CEDM VERSA VENT No. 8**

No active leak was identified. The leakage stayed in the area of the vent and did not make it down to the reactor head or insulation. This leak was identified, but not cleaned during the U2 July 2003 outage and was documented in Special Report (SR) 2-SR-2003-001, APS letter 192-01126-CDM/RAS, dated September 23, 2003. The boric acid residue was cleaned during U2R11. No carbon steel was affected and there was no non-conforming condition.

#### **CEDM VERSA VENT No. 36**

No active leak was identified. The leakage stayed in the area of the vent and did not make it down to the reactor head or insulation. This was a new leak identified in

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U2R11. The boric acid residue was cleaned. No carbon steel was affected and there was no non-conforming condition.

### CEDM VERSA VENT No. 46

NO active leak was identified. The leakage stayed in the area of the vent and did not make it down to the reactor head or insulation. This was a new leak identified in U2R11. The boric acid residue was cleaned. No carbon steel was affected and there was no non-conforming condition.