



Palo Verde Nuclear  
Generating Station

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102-05827-DCM/SAB/RJR  
March 08, 2008

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

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 3  
Docket No. STN 50-530  
APS 60-Day after Plant Restart Response to First Revised NRC Order  
EA-03-009 – U3R13**

By letter dated February 20, 2004, the NRC issued to Arizona Public Service Company (APS) the First Revised NRC Order EA-03-009. Item IV.E of EA-03-009 requested that a 60-day report detailing the inspection results of the reactor pressure vessel (RPV) head be submitted to the NRC upon returning each unit to operation.

The enclosure to this letter contains the following requested information for the Unit 3 thirteenth refueling outage (U3R13).

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

APS completed the Palo Verde Unit 3 13<sup>th</sup> refueling outage on January 19, 2008. No new commitments are being made to the NRC by this letter. Should you have any questions, please contact Glenn A. Michael at (623) 393-5750.

Sincerely,

DCM/TNW/RJR/gat

Enclosure: APS 60-Day after Plant Restart Response to First Revised NRC Order  
EA-03-009 – U3R13

cc: E. E. Collins Jr. NRC Region IV Regional Administrator  
M. T. Markley NRC NRR Project Manager  
G. G. Warnick NRC Senior Resident Inspector for PVNGS

A member of the STARS (Strategic Teaming and Resource Sharing) Alliance

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**cc: (continued)**

**Assistant General Counsel for Materials Litigation and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555**

**Secretary, Office of Secretary of the Commission  
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**Enclosure**

**APS 60-Day after Plant Restart Response to First  
Revised NRC Order EA-03-009 – U3R13**

## **First Revised NRC Order EA-03-009**

At the start of the Palo Verde Unit 3 13<sup>th</sup> refueling outage (U3R13) in the fall of 2007, the effective degradation years (EDY) were calculated as 14.12 EDY, which places Palo Verde Unit 3 reactor pressure vessel (RPV) head in the high susceptibility category.

### **Results of the Inspection Required by Paragraph IV.C**

First Revised NRC Order EA-03-009 IV.C(1) states:

For those plants in the High Susceptibility category, RPV head and head penetration nozzle inspections shall be performed using the techniques of paragraph IV.C(5)(a) and paragraph IV.C(5)(b) every refueling outage.

- IV.C(5)(a) Bare metal visual examination of 100 percent of the RPV head surface (including 360° around each RPV head penetration nozzle). For RPV heads with the surface obscured by support structure interferences which are located at RPV head elevations downslope from the outermost RPV head penetration, a bare metal visual inspection of no less than 95 percent of the RPV head surface may be performed provided that the examination shall include those areas of the RPV head upslope and downslope from the support structure interference to identify any evidence of boron or corrosive product. Should any evidence of boron or corrosive product be identified, the licensee shall examine the RPV head surface under the support structure to ensure that the RPV head is not degraded.
- (b) For each penetration, perform a nonvisual NDE in accordance with either (i), (ii) or (iii):
- (i) Ultrasonic testing of the RPV head penetration nozzle volume (i.e., nozzle base material) from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-1]); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-2). In addition, an assessment shall be made to determine if leakage has occurred into the annulus between the RPV head penetration nozzle and the RPV head low-alloy steel.

## First Revised NRC Order EA-03-009

- (ii) Eddy current testing or dye penetrant testing of the entire wetted surface of the J-groove weld and the wetted surface of the RPV head penetration nozzle base material from at least 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 2 inches below the lowest point at the toe of the J-groove weld on a horizontal plane perpendicular to the nozzle axis (or the bottom of the nozzle if less than 2 inches [see Figure IV-3]); OR from 2 inches above the highest point of the root of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) to 1.0-inch below the lowest point at the toe of the J-groove weld (on a horizontal plane perpendicular to the nozzle axis) and including all RPV head penetration nozzle surfaces below the J-groove weld that have an operating stress level (including all residual and normal operation stresses) of 20 ksi tension and greater (see Figure IV-4).
- (iii) A combination of (i) and (ii) to cover equivalent volumes, surfaces and leak paths of the RPV head penetration nozzle base material and J-groove weld as described in (i) and (ii). Substitution of a portion of a volumetric exam on a nozzle with a surface examination may be performed with the following requirements:
  1. On nozzle material below the J-groove weld, both the outside diameter and inside diameter surfaces of the nozzle must be examined.
  2. On nozzle material above the J-groove weld, surface examination of the inside diameter surface of the nozzle is permitted provided a surface examination of the J-groove weld is also performed.

### IV.C(5)(a) Bare Metal Visual Examination Results

This examination was conducted in accordance with the requirements of the First Revised Order with no relaxations. A visual examination of the bare-metal surface of the reactor head found no evidence of boron or corrosion. No cleaning of the RPV head was necessary during U3R13.

### IV.C(5)(b) Nonvisual Nondestructive Examination (NDE) Results:

Nonvisual NDE was performed in accordance with the requirements of the First Revised NRC Order EA-03-009 Section IV.C(5)(b) and approved relaxations and commitments.

## First Revised NRC Order EA-03-009

### Reactor Head Vent Nozzle:

The head vent nozzles at Palo Verde do not protrude below the surface of the RPV head and as a result, there is no material below the J-groove weld to be examined. The results of the examinations were acceptable with no detectable defects.

### Control Element Drive Mechanisms (CEDM):

The 97 CEDM nozzles were examined in accordance with Order requirement IV.C(5)(b). The ultrasonic testing (UT) results were satisfactory. Six nozzles (30, 39, 47, 50, 67 and 79) had additional examinations performed as described below as a result of areas of interest identified during the initial exams.

For the six nozzles noted above, the UT results were compared to prior historical data. An eddy current test (ECT) was then performed on the outer diameter of the six nozzles. The ECT scans resulted in two nozzles (39 and 50) with indications requiring further evaluation. None of these appeared as crack-like primary water stress corrosion cracking (PWSCC) and they were not aligned with the UT indications.

A dye penetrant test (PT) was then performed on the J-groove welds in the areas of the ECT indications on these two nozzles (39 and 50). The dye penetrant test results on nozzle 50 showed no indications and this nozzle was determined to be acceptable. Nozzle 39 had four indications which were not aligned with the ECT results.

The 4 indications on nozzle 39 were rounded and were acceptable per the ASME Section III code. Minor grinding was performed on the four locations and they all remained rounded and acceptable.

### **Results of the Inspection Required by Paragraph IV.D**

First Revised NRC Order EA-03-009 Section IV.D states:

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.

## **First Revised NRC Order EA-03-009**

### **First Revised NRC Order EA-03-009 Section IV.D. Results:**

APS personnel performed a boric acid walkdown at the beginning of the U3R13 refueling outage using PVNGS procedure 70TI-9ZC01, Boric Acid Corrosion Prevention Program. As part of this inspection, potential boric acid leakage sites from pressure retaining components above the RPV head were examined. No new boric acid leakage sites were identified.

Previously APS had reported CEDM sites where dried boric acid had been identified but where there were no active leaks as follows:

- U3 CEDM Versa Vents 7 and 34 were previously reported in APS letter 102-05529, dated July 10, 2006, U3R12 Refueling Outage 60-Day after Plant Restart (ADAMS ML062000040)
- U3 CEDM Versa Vents 23, 53 and 54 were previously reported in Special Report 3-SR-2006-002 (APS letter 102-05552, dated August 22, 2006, ADAMS ML062430320)
- U3 CEDM Versa Vent 69 was previously reported in Special Report 3-SR-2007-001 (APS letter 102-05671, dated March 22, 2007, ADAMS ML070920308)

These locations were reworked in the Palo Verde U3R13 refueling outage.

At the end of U3R13 potential boric acid leakage sites from pressure retaining components above the RPV Head were again examined and two new CEDM leakage sites were identified. CEDM Versa Vents 80 and 88 were found to have a dried boric acid indication. There was no active leak from either Versa Vent. The leakage/boric acid residue stayed in the immediate area of the Versa Vent (i.e., the leakage/boric acid residue did not make it down to the reactor head or related insulation) and there was no carbon steel affected. The dry residue was cleaned.

Since no carbon steel was affected and neither site was an active leak, corrective maintenance work orders (CMWO) 3120130 and 3120129 were initiated to rework Versa Vents No. 80 and 88 at the next available opportunity during a Palo Verde Unit 3 outage.