10 CFR 50.55a(a)(3)(i)

APS A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

Dwight C. Mims
Vice President
Regulatory Affairs and Plant Improvement

Tel. 623-393-5403
Fax 623-393-6077

Mail Station 7605
P. O. Box 52034
Phoenix, Arizona 85072-2034

102-05703-DCM-RJR
May 16, 2007

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

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, 3
Docket No. STN 50-528/529/530
Proposed Alternative to Code Case N-638-1, Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temperbead Technique, Relief Request 37

In Arizona Public Service Company (APS) Relief Request 36 for full-structural weld overlays, dated February 8, 2007, the acceptance examination (liquid penetrant and ultrasonic) of the temperbead weld can not be conducted for at least 48 hours after the completed weld has returned to ambient temperature, based on the requirement in Code Case N-638-1. The enclosed alternative, Relief Request 37, proposes that the 48-hour hold time start at the completion of the third layer of the weld overlay. The "Basis for Use" in this request is identical to Section V.A.3.f of the request approved on April 6, 2007, for Arkansas Nuclear One, Unit 1, Agencywide Documents Access and Management System (ADAMS) Accession No. ML070850915.

APS requests NRC approval of this proposed relief request to support the schedule for the first full-structural weld overlay in the Unit 1 2007 refueling outage. The outage starts on May 19, 2007, and the welding of the first full-structural overlay is scheduled to start on May 22, 2007. Mode 2 entry is scheduled for June 23, 2007.

This letter contains no new commitments. If you have any questions about this change, please telephone Daniel G. Marks at (623) 393-6492.

Sincerely,

D. C. Mims

DCM/SAB/RJR/gt

Enclosure 1: Relief Request No. 37 - Proposed Alternative to Code Case N-638-1, Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temperbead Technique

cc: B. S. Mallett NRC Region IV Regional Administrator
M. T. Markley NRC NRR Project Manager
G. G. Warnick NRC Senior Resident Inspector for PVNGS

ENCLOSURE 1

Relief Request No. 37

Proposed Alternative to Code Case N-638-1, Similar and Dissimilar Metal Welding Using Ambient Temperature Machine GTAW Temperbead Technique

1.0 ASME Code Component(s) Affected

Unit: 1, 2 and 3
Description: Category R-A welds on the pressurizer. Palo Verde has implemented a risk-informed inservice inspection program.
Item numbers: See table below
Code Class: 1

U-1	Description	Zone	Size	DM Weld Item Number	SM Weld Item Number
Pressurizer	Spray nozzle to safe end	29	4	5-33	29-1
Pressurizer	Safety nozzle to safe end	31	6	5-32	31-13
Pressurizer	Safety nozzle to safe end	31	6	5-29	31-1
Pressurizer	Safety nozzle to safe end	31	6	5-30	31-5
Pressurizer	Safety nozzle to safe end	31	6	5-31	31-9
Pressurizer	Surge nozzle to safe end	20	12	5-34	20-1
Hot Leg	Surge nozzle to safe end	20	12	6-4	20-11
Hot Leg	SDC nozzle to safe end	21	16	6-11	21-20
Hot Leg	SDC nozzle to safe end	22	16	7-9	22-1

U-2	Description	Zone	Size	DM Weld Item Number	SM Weld Item Number
Pressurizer	Spray nozzle to safe end	29	4	5-33	29-1
Pressurizer	Safety nozzle to safe end	31	6	5-32	31-13
Pressurizer	Safety nozzle to safe end	31	6	5-29	31-1
Pressurizer	Safety nozzle to safe end	31	6	5-30	31-5
Pressurizer	Safety nozzle to safe end	31	6	5-31	31-9
Pressurizer	Surge nozzle to safe end	20	12	5-34	20-1
Hot Leg	Surge nozzle to safe end	20	12	6-10	20-11
Hot Leg	SDC nozzle to safe end	21	16	6-11	21-20
Hot Leg	SDC nozzle to safe end	22	16	7-9	22-1

U-3	Description	Zone	Size	DM Weld Item Number	SM Weld Item Number
Pressurizer	Spray nozzle to safe end	29	4	5-33	29-1
Pressurizer	Safety nozzle to safe end	31	6	5-32	31-13
Pressurizer	Safety nozzle to safe end	31	6	5-29	31-1
Pressurizer	Safety nozzle to safe end	31	6	5-30	31-5
Pressurizer	Safety nozzle to safe end	31	6	5-31	31-9
Pressurizer	Surge nozzle to safe end	20	12	5-34	20-1
Hot Leg	Surge nozzle to safe end	20	12	6-10	20-11
Hot Leg	SDC nozzle to safe end	21	16	6-11	21-20
Hot Leg	SDC nozzle to safe end	22	16	7-9	22-1

2.0 Applicable Code Edition and Addenda

The American Society of Mechanical Engineers (ASME) Code of Record for the second 10-year inservice inspection (ISI) interval for Palo Verde Nuclear Generating Station (PVNGS) Units 1 and 3 is ASME Code, Section XI, 1992 Edition, 1992 Addenda.

On March 18, 2007, Palo Verde Unit 2 entered its third inspection interval. The ASME Code of Record for Unit 2's third 10-year ISI interval is ASME Code, Section XI, 2001 Edition and Addenda through 2003. Palo Verde Units 1 and 3 will be entering their third inspection intervals on July 18, 2008 and January 11, 2008, respectively and the ASME Code of Record will be the 2001 Edition and Addenda through 2003.

For consistency in the application of the weld overlay, APS has requested, as part of a previous submittal[1], that the NRC approve use of ASME Section XI, IWA-4000, "Repair/Replacement Activities," of the 2001 Edition and Addenda through 2003 starting on March 18, 2007, for repair/replacement activities in Units 1 and 3. In addition, as allowed by 10 CFR 50.55a, ASME Section XI, 2001 Edition will be used for Appendix VIII, "Performance Demonstration for Ultrasonic Examinations."

3.0 Applicable Code Requirements

Alternative submitted in Relief Request 36[1] in part reads:

3.0(a) Acceptance Examination

2. The weld overlay and the adjacent base material for at least 1/2 inch from each side of the weld shall be examined using the liquid penetrant method. The weld overlay shall satisfy the surface examination acceptance criteria for welds of the Construction Code or ASME Section III, NB-5300. The adjacent base metal shall satisfy the surface examination acceptance criteria for base material of the Construction Code or ASME Section III, NB-2500. If ambient temperature temperbead welding is used, the liquid penetrant examination shall be conducted at least 48 hours after the completed overlay has returned to ambient temperature.

3. The examination volume A-B-C-D in Figure 1[1] shall be ultrasonically examined to assure adequate fusion (i.e., adequate bond) with the base metal and to detect welding flaws, such as interbead lack of fusion, inclusions, or cracks. The interface C-D shown between the overlay and the weld includes the bond and the heat affected zone from the overlay. If ambient temperature temperbead welding is used, the UT shall be

[1] APS letter 102-05641, dated February 08, 2007 (ADAMS ML 070470525)

conducted at least 48 hours after the completed overlay has returned to ambient temperature.

4.0 Reason for Request

Currently the applicable Code requirements above state that if ambient temperature temperbead welding is used, the liquid penetrant and ultrasonic examinations shall be conducted at least 48 hours after the completed overlay has returned to ambient temperature.

In both Electric Power Research Institute (EPRI) Technical Document 1013558 [2], "48-Hour Hold Requirements for Ambient Temperature Temperbead Welding," dated December 2006, and ASME Section XI Committee published Technical Basis Paper, RRA 05-08 [3], "N-638-x, Ambient Temperature Temperbead Welding: Begin 48 Hour Hold After 3rd Layer Completion," support an alternative to starting the 48-hour hold after the completed overlay has returned to ambient temperature. That alternative is to start the 48-hour hold at the completion of the third layer of the weld overlay.

As stated in the ASME paper, there is no effect on safety (reduction), yet the change enables substantial cost reductions by reducing the schedule impacts; reducing the complexity of plant operation, specifically with regard to plant operation during outage periods and has the potential to directly reduce facility down time and radiation exposure. Without this relief request, preliminary non-destructive examination (NDE) examinations would be performed during the 48 hour hold time, then final NDE examinations upon expiration of the 48 hour window. This change will minimize or eliminate the need for preliminary NDE, which will directly reduce radiation exposure.

5.0 Proposed Alternative and Basis for Use

Proposed Alternative

APS proposes to start the 48-hour hold at the completion of the third layer of the weld overlay.

Basis for Use

Based on Code Case N-638-1, the 48-hour hold for performing NDE starts after the weld overlay cools to ambient temperature when performing ambient temperature temperbead welding. This 48-hour hold is specified to allow sufficient time for hydrogen cracking to occur (if it is to occur) in the heat affected zone (HAZ) of ferritic materials prior to performing final NDE. However, based on

[2] Agencywide Documents Access and Management System (ADAMS) Accession No.ML070670060
[3] ADAMS Accession No.ML070790679

extensive research and industry experience, EPRI has provided a technical basis for starting the 48-hour hold after completing the third layer of the weld overlay rather than waiting for the completed weld overlay to cool to ambient temperature. Weld layers beyond the third layer are not designed to provide tempering to the ferritic HAZ when performing ambient temperature temperbead welding. EPRI has documented their technical basis in Technical Report 1013558. Although the technical data provided by EPRI in their report is based on testing performed on SA-508, Class 2 low alloy steels and other P-Number 3, Group 3 materials, the conclusions are bounding and applicable to pressurizer nozzles (P3, Group 3) as well as hot leg nozzles (P1, Group 1). After evaluating the issues relevant to hydrogen cracking such as microstructure of susceptible materials, availability of hydrogen, applied stresses, temperature, and diffusivity and solubility of hydrogen in steels, EPRI concluded the following on page 5-2 of the report: "There appears to be no technical basis for waiting 48 hours after cooling to ambient temperature before beginning the NDE of the completed weld. There should be no hydrogen present, and even if it were present, the temperbead welded component should be very tolerant of the moisture." Page 5-2 of the report also notes that over 20 weld overlays and 100 repairs have been performed using temperbead techniques on low alloy steel components over the last 20 years. During this time, there has never been an indication of hydrogen cracking by the nondestructive examination performed after the 48-hour hold or by subsequent inservice inspection.

In addition, the ASME Section XI Committee approved Revision 4 to Code Case N-638 (i.e., N-638-4) in October 2006 to allow the 48-hour hold to begin after completing the third layer of the weld overlay when using austenitic filler metals. Paragraph 4(a)(2) of the code case states in part: "When austenitic materials are used, the weld shall be nondestructively examined after the three tempering layers (i.e., layers 1, 2, and 3) have been in place for at least 48 hours." The ASME Section XI technical basis for this change is documented in Technical Basis Paper RRA 05-08. The ASME technical basis paper points out that introducing hydrogen to the ferritic HAZ is limited to the first weld layer since this is the only weld layer that makes contact with the ferritic base material. While the potential for introducing hydrogen to the ferritic HAZ is negligible during subsequent weld layers, these layers provide a heat source that accelerates the dissipation of hydrogen from the ferritic HAZ in non-water backed applications. Furthermore, the solubility of hydrogen in austenitic materials such as Alloy 52M is much higher than that of ferritic materials while the diffusivity of hydrogen in austenitic materials is lower than that of ferritic materials. As a result, hydrogen in the ferritic HAZ tends to diffuse into the austenitic weld metal which has a much higher solubility for hydrogen. This diffusion process is enhanced by heat supplied in subsequent weld layers. Like the EPRI report, the ASME technical basis paper concludes that there is sufficient delay time to facilitate detecting potential hydrogen cracking when NDE is performed 48 hours after completing the third layer of the weld overlay.

6.0 Duration of Proposed Alternative

The proposed alternative requested would be applicable for the Second and Third Inservice Inspection Interval for Units 1 and 3 and the remainder of the Third Inservice Inspection Interval for Unit 2.

7.0 Conclusion

10 CFR 50.55a(a)(3) states:

"Proposed alternatives to the requirements of paragraphs (c), (d), (e), (f), (g), and (h) of this section or portions thereof may be used when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant shall demonstrate that:

(i) The proposed alternatives would provide an acceptable level of quality and safety, or
(ii) Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety."

The revised starting point of the 48-hour hold discussed in this relief request provides an acceptable level of quality and safety. Therefore, APS requests that the proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

APS requests NRC approval of this proposed relief request to support the schedule for the first full-structural weld overlay in the Unit 1 2007 refueling outage. The outage starts on May 19, 2007, and the welding of the first full-structural overlay is scheduled to start on May 22, 2007. Mode 2 entry is scheduled for June 23, 2007.

8.0 References

1. ASME Boiler and Pressure Vessel Code, Code Case N-638-1
2. EPRI Document 1013558, 48-Hour Hold Requirements for Ambient Temperature Temperbead Welding, December 2006 (ADAMS Accession No. ML070670060)
3. ASME Technical Basis Paper RRA 05-08, "N-638-x, Ambient Temperature Temperbead Welding: Begin 48 Hour Hold After 3rd Layer Completion." (ADAMS Accession No. ML070790679)

9.0 Precedent

The "Basis for Use" in this request (Relief Request 37) is identical to Section V.A.3.f of the request approved on April 6, 2007, for Arkansas Nuclear One, Unit 1 (ADAMS Accession No. ML070850915). The Entergy submittals for Arkansas Nuclear One, Unit 1, Relief Request ANO1-R&R-101 are dated January 12, 2007, March 6 and

March 22, 2007, (ADAMS Accession Nos. ML070180170, ML070740471 and ML070880684, respectively).