Palo Verde Nuclear
Generating Station

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10CFR 50.55a

102-04705-CDM/SAB/RJR
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U.S. Nuclear Regulatory Commission
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Reference Westinghouse letter LTR-NRC-02-6, "ASME Section XI Inservice Inspection Program Relief Request – Alternative Repair Technique," dated February 18, 2002, from H. A. Sepp, Manager Regulatory and Licensing to D. Holland, USNRC

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Proposed Alternative Repair Method for Reactor Vessel Head Penetrations – Relief Request No. 18

During the next PVNGS Unit 1 and 3 refueling outages, Arizona Public Service Company (APS) will be conducting inspections of the reactor vessel head penetrations (VHP) in accordance with NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles." In accordance with 10 CFR 50.55a(a)(2), systems and components of pressurized water-cooled nuclear power reactors must meet the requirements of the ASME Code. APS is proposing relief request 18 to the requirements of Section XI of the ASME Code for repair of flaws that may be identified during these inspections. The proposed alternative was presented to the NRC by Westinghouse on February 18, 2002, (Reference) and is similar to the alternatives proposed by North Anna Power Station Unit 2, Turkey Point Unit 3, and D.C. Cook Units 1 and 2.

Relief request 18 is being submitted pursuant to 10 CFR 50.55a(a)(3)(i) and 10 CFR 50.55a(a)(3)(ii). Under these provisions, licensees may propose alternatives to the requirements of 10 CFR 50.55a if they meet the following criteria:

- The proposed alternative would provide an acceptable level of quality and safety
- Compliance with the specified requirements would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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Specifically, APS requests authorization to use an ambient temperature automatic or machine gas-tungsten arc weld (GTAW) temperbead process for certain repairs to j-groove welds on the VHP. This technique has been shown to provide an acceptable level of quality and safety. The work required to meet the current Code repair method, automatic or machine GTAW temperbead with 300°F minimum preheat and 300°F post weld hydrogen bakeout, would be extremely difficult without a compensating increase in the level of quality or safety. The preheat and post weld bake requirements for the reactor vessel head are considered a hardship as the radiation exposures for set-up, monitoring, and removal of the required equipment is unjustified. Repair welds performed using an ambient temperature temperbead procedure which utilizes a machine GTAW process exhibit mechanical properties equivalent or better than those of the surrounding base material. Using the proposed method of repair, it is estimated between 11 and 13 person-rem could be saved on each required repair.

The enclosure to this letter includes the PVNGS component identification information as well as the PVNGS specific information as it applies to the Westinghouse relief request and includes one exception to Section 4.0 Examination. APS requests approval of the proposed alternatives to support the VHP inspections scheduled during the upcoming refueling outages for Units 1 and 3.

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

cc: E. W. Merschoff (NRC Region IV)
J. N. Donohew (NRR Project Manager)
J. H. Moorman (NRC Resident Inspector)

ENCLOSURE

Proposed Alternative Repair Method for Reactor Vessel Head Penetrations - Relief Request No. 18

Proposed Alternative Repair Method for
PVNGS Reactor Vessel Head Penetrations

Relief Request No. 18

Code Class: 1

Code References: 1992 Edition, 1992 Addenda of The American Society of Mechanical Engineers (ASME) Code, Section III, NB-5245 and NB-4622; Section XI, IWA-4170, IWA-4310, and IWA-4500

Examination Category: B-E

Item Numbers: B4.12

System/Component: Control element drive mechanisms (CEDM) nozzles (97 penetrations)
Reactor head vent nozzle (1 penetration)

PVNGS Units: All

Inspection Interval: Second 10-Year ISI Interval

Code Requirement:

PVNGS Units 1 and 3 are in the second ten-year inservice inspection interval using the 1992 Edition, 1992 Addenda of ASME Code, Section XI.

ASME Section XI, IWA-4170, "Rules and Requirements," states:

> "Repairs shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. Later Editions and Addenda of the Construction Code or of Section III either in their entirety or portions thereof, and Code Cases may be used. If repair welding cannot be performed in accordance with these requirements, the applicable alternative requirements of IWA-4500 and the following may be used:..."

The 1992 Edition of Section XI of the ASME Code provides alternative rules for such a repair, in paragraph IWA-4500. The provisions of IWA-4500 allow for a Temperbead Technique to be used, involving the establishment and maintenance of a preheat temperature of 300°F minimum and an interpass temperature of 450°F maximum. The completed weld requires a post hydrogen weld bake-out (soak) at 300°F for a minimum of 4 hours after welding. Final NDE of the repair requires liquid penetrant inspection and radiography, with ultrasonic inspection used if radiography is impractical.

Proposed Alternative:

As an alternative to the Temper Bead Technique rules contained in the 1992 ASME Section XI, IWA-4500, it is requested that the NRC approve the use of the proposed alternative method presented to the NRC by Westinghouse Electric Company, LLC. (Reference 1) with the following exception:

- In the attachment to letter LTR-NRC-02-5, page 5 Section 4.0 (b) APS would add the following: "For partial penetration welds the repair weld shall be examined progressively using liquid penetrant method in accordance with NB-5245 of ASME Section III".

Basis for Alternative Requirements:

APS believes the proposed alternative provides an equal or better repair method. Several organizations including EPRI have conducted research on the use of ambient temperature machine Gas-Tungsten Arc Welding (GTAW) temperbead technique. This effort is documented in EPRI Report GC-111050, Ambient Temperature Preheat for Machine GTAW Temperbead Applications (Reference 2). The EPRI report indicates that repair welds performed with an ambient temperature temperbead procedure which utilizes a machine GTAW process exhibit mechanical properties equivalent or better than those of the surrounding base material.

Section 3.0, Welding Preheat/Post-Weld Bake, of Reference 2 discusses the principal cracking concerns associated with the need to preheat a weld or weldment substrate. However, when using a process such as the one proposed in Reference 1, the heat of the deposited weld layers is precisely controlled to provide sufficient heat to temper each previously deposited weld layer. This tempering, as stated in Reference 2, will produce requisite material strength and toughness properties without a need for any post-weld heat treatment.

APS believes that the preheat and post weld bake requirements for the reactor vessel head are considered a hardship for the following reasons.

1. Preheat, interpass, and postweld soak temperatures must be monitored which requires thermocouples be welded to the RPV head.

2. Heating blankets and thermal insulation must be installed and removed.

3. Thermocouples and stud welds would be removed by grinding and the removal areas examined by the liquid penetrant or magnetic particle method.

The radiation exposures to worker personnel for set-up, monitoring, and removal of preheat/post-weld bake equipment is unjustified. Repair welds performed using an ambient temperature temperbead procedure which utilizes a machine GTAW process

exhibit mechanical properties equivalent or better than those of the surrounding base material. Using the proposed method of repair, it is estimated between 11 and 13 person-rem could be saved on each required repair.

Conclusion(s):

Repairs to pressure vessel component weldments requiring welding within 1/8 inch of the ferritic base metal has typically involved the use of the temper bead requirements of Paragraph IWA-4500 of Section XI of the ASME Code. These rules specify that the repair be performed using the manual SMAW welding technique and include both preheat and post weld bake-out.

In the case of repairs to the reactor vessel head penetration "J" groove attachment welds, where welding within 1/8 inch of the vessel material is required, APS proposes to use the repair method presented to the NRC by Westinghouse Electric Company, LLC. (Reference 1) with the following exception:

- In the attachment to letter LTR-NRC-02-5, page 5 Section 4.0 (b) APS would add the following: "For partial penetration welds the repair weld shall be examined progressively using liquid penetrant method in accordance with NB-5245 of ASME Section III".

APS has shown in this submittal that use of this alternative repair method will provide an acceptable level of quality and safety, and compliance with the specified requirements of IWA-4500 would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Reference(s):

1. Westinghouse letter LTR-NRC-02-6, "ASME Section XI Inservice Inspection Program Relief Request – Alternative Repair Techniques," dated February 18, 2002, from H. A. Sepp, Manager Regulatory and Licensing to D. Holland, USNRC.

2. EPRI Report GC-111050, Ambient Temperature Preheat for Machine GTAW Temperbead Applications, November 1998.

3. 1992 Edition, 1992 Addenda of The American Society of Mechanical Engineers Code, Section III, NB-5345 and NB-4622; Section XI, IWA-4170, IWA-4310, and IWA-4500.