APS

Palo Verde Nuclear
Generating Station

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

102-05177-CDM/SAB/GAM
November 11, 2004

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

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Docket Nos. STN 50-528, 50-529, and 50-530
10 CFR 50.55a(a)(3)(i) Request for Alternative to a 10 CFR 50.55a(c) Reactor Coolant Pressure Boundary ASME Section III Code Case 1361-2 Parameter (ISI Relief Request 30)

Pursuant to 10 CFR 50.55a(a)(3)(i), Arizona Public Service Company (APS) requests NRC approval of a proposed alternative to a 10 CFR 50.55a(c), Reactor Coolant Pressure Boundary, ASME Section III Code Case parameter. Specifically, APS requests approval of an alternative to ASME Section III, Sub-Section NB-3356, Code Case 1361-2, "Socket Welds, Section III," to allow a diametral clearance (cMAX) of 0.062 inch between replacement pressurizer heater sleeves and heater sheaths instead of 0.045 inch as specified in the Code Case. Details of the 10 CFR 50.55a request are enclosed. This reactor coolant pressure boundary relief request is being tracked by APS as Inservice Inspection (ISI) Program Relief Request 30.

APS requests approval of this relief request by November 19, 2004, in order to support startup of PVNGS Unit 3 from the current refueling outage. The need for this relief request was recently identified, and this condition has been entered in the PVNGS corrective action program.

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

Sincerely,

David Mauldin

CDM/SAB/GAM

A047

Enclosure: 10 CFR 50.55a(a)(3)(i) Request for Alternative to a 10 CFR 50.55a(c) Reactor Coolant Pressure Boundary ASME Section III Code Case 1361-2 Parameter

Attachments:

1. Structural Integrity Calculation Package, File No. PV-04Q-329
2. Structural Integrity Calculation Package, File No. PV-04Q-330

cc:	B. S. Mallett	NRC Region IV Regional Administrator
	M. B. Fields	NRC NRR Project Manager
	N. L. Salgado	NRC Senior Resident Inspector for PVNGS

ISI Relief Request No. 30

10 CFR 50.55a(a)(3)(i) Request for Alternative to a 10 CFR 50.55a(c) Reactor Coolant Pressure Boundary ASME Section III Code Case 1361-2 Parameter

Background Information

Each Palo Verde Nuclear Generating Station (PVNGS) unit has a pressurizer containing 36 heater sleeves attached to the bottom head. In the last Unit 2 refueling outage and the current Unit 3 refueling outage, the original Alloy 600 heater sleeves were replaced with Alloy 690 heater sleeves to address concerns with primary water stress corrosion cracking. The Alloy 600 sleeves in the Unit 1 pressurizer are scheduled to be replaced with Alloy 690 sleeves in the next Unit 1 refueling outage (fall 2005).

It has been determined that the diametral clearances between the replacement Alloy 690 pressurizer heater sleeves and the heater sheaths may be as great as 0.062 inch in order to enable the insertion of the heaters into the sleeves after sleeve replacement. PVNGS UFSAR Table 5.2-3, "NRC Regulatory Guide 1.84 Code Cases Used on PVNGS," identifies that ASME Section III Code Case 1361-2 was used for the original pressurizer assembly (heater sleeve to heater sheath fillet weld). In Figure 1 of Code Case 1361-2, the cMAX diametral clearance between connecting parts is specified as 0.045 inch. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i) APS proposes an alternative of 0.062 inch in lieu of the 0.045 inch cMAX diametral clearance specified in Code Case 1361-2. The other requirements specified in Code Case 1361-2 for joint configuration are met with the increased diametral clearance with no appreciable increase in stress. As discussed in this relief request, this proposed alternative would provide an acceptable level of quality and safety and would therefore meet the requirements of 10 CFR 50.55a(a)(3)(i).

I. ASME Code Component(s) Affected

PVNGS Units:	1, 2 and 3
Component number:	B4.20
Description:	Pressurizer Heater Sleeves, 36 per Unit.
Code Class:	1

II. Applicable Code Addition and Addenda

The Second 10-year inservice inspection interval code for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 is the American Society of Mechanical Engineers (ASME) Code, Section XI, 1992 Edition, 1992 Addenda.

The construction code for PVNGS Units 1, 2, and 3 is ASME Section III, 1971 Edition, and 1973 Winter Addenda.

The installation code for PVNGS Units 1, 2, and 3 is ASME Section III, 1974 Edition, and 1975 Winter Addenda.

III. Applicable Code Requirements

Sub-article NB-3356 ASME Section III 1971 Edition, and 1973 Winter Addenda states in part: "Fillet welds shall not be used in vessels for joints of Categories A, B, C or D **(NB-3351)**."

Code Case 1361-2 States in part:

"Appurtenances with outside diameter equal to that of 2-inch standard pipe size and less may be constructed using weld joints in accordance with Fig. 1, provided the following requirements are met:

1) The design of the joint shall be such that stresses will not exceed the limits described in NB-3220 and tabulated in tables I-1.1 and I-1.2.
2) A fatigue strength reduction factor of not less than 4 shall be used in the fatigue analyses of the joints.
3) The finished welds shall be examined by a magnetic particle or by a liquid Penetrant method in accordance with Section V and the Acceptance Standards of NB-5000.
4) End closure connections may be made with fillet welds or partial penetration welds provided the conditions stated above are met.

Figure 1 note cMAX = diametral clearance between connecting parts
cMAX = 0.045 in."

IV. Reason For Request

The PVNGS Unit 2 heater sleeve replacement project (fall 2003) identified challenges in sleeve alignment and subsequent installation of heaters. As a result, a significantly longer duration than originally projected was required for sleeve welding. In an attempt to resolve the heater insertion challenges, the inside diameter of the replacement sleeve was increased from 1.273 inch to 1.300 inch. The heater insertion challenges were essentially resolved utilizing the increased sleeve diameter. Ultimately, less radiation dose was incurred since substantially less time was spent by personnel on the working platform.

The Unit 3 heater sleeve replacement project (fall 2004) incorporated the same heater sleeve inside diameter (1.300 inch). All heaters were inserted into the pressurizer on the initial attempt without rework, and therefore there was no additional dose to personnel on the working platform due to rework.

V. Proposed Alternative and Basis for Use

Pursuant to 10 CFR 50.55a(a)(3)(i), APS proposes alternatives to Code Case 1361-2 by using a maximum 0.062 inch (0.055 inch nominal) diametral clearance between the pressurizer heater and heater sleeve in lieu of the Code Case requirement of 0.045 inch (cMax). This proposed alternative would provide an acceptable level of quality and safety and thus would meet the requirements of 10 CFR 50.55a(a)(3).

The original PVNGS pressurizer stress reports prepared by Combustion Engineering (CE) evaluated the integrity of the heater sleeve-to-heater sheath fillet weld applying internal pressure and the effects of steady state temperature. The original construction for the heater sleeve was Alloy 600. The original construction for the heater sheath was either Alloy 600 or SA 213, Type 316. The materials of construction for the sleeve and heater sheath utilized in the PVNGS pressurizers for the new design now fall into two category types as follows:

1. A replacement sleeve made out of Alloy 690 material is used in combination with Alloy 600 for the heater sheath material.

2. A replacement sleeve made out of Alloy 690 material is used in combination with SA 213, Type 316 stainless steel for the heater sheath material.

The original fillet weld connected a sleeve with an ID of 1.273 inch and an OD of 1.66 inch, and a heater sheath with an OD of 1.245 inch. The resulting fillet weld had a leg of 0.1875 inch with a nominal diametral clearance between the parts of 0.028 inch.

The new design replacement heater sleeve has an ID of 1.30 inch and an OD of 1.66 inch, with the same heater sheath OD of 1.245 inch. The fillet weld size connecting these parts is the same as the original construction, namely a 0.1875 inch leg. However, the maximum diametral clearance is 0.062 inch (0.055 inch nominal). The reason for the increased diametral clearance is explained in section IV of this relief request.

The original stress reports from CE modeled the fillet weld with a nominal design clearance between the parts of 0.028 inches using finite element analysis (FEA) techniques. Subsequent analyses by Structural Integrity Associates, Inc. (SI),

provided as attachments 1 and 2, evaluates the same fillet weld with a maximum diametral clearance between the parts of 0.062 inches (0.055 inch nominal). The later analyses utilize the results from the original CE stress report to determine acceptability of the replacement heater sleeve/sheath weld configuration. In the SI Report, the loads and weld cross sectional properties are modified by a ratio factor that takes into account the change in diametral clearance between the parts. The results of the SI evaluation demonstrate compliance with the ASME Code NB-3220 allowables for Primary Membrane, Primary Membrane plus Bending, Primary plus Secondary and Fatigue stresses. See the attached SI calculation packages for further details.

It should be noted that the subject welds received a liquid penetrant examination in accordance with ASME Section III, Class I requirements. The results of these non-destructive examinations were acceptable.

Code Case 1361-2 was approved in March of 1972. At that time, the ASME Code did not prepare a basis document for their Code Case assumptions as it is being done presently. Thus, the basis for the diametral clearance requirement of 0.045 inch in Code Case 1361-2 is not specified. However, it is surmised that by maintaining the clearance between the parts relatively small, the amount of bending stresses that can be imparted on the fillet weld due to deflection of the parts are negligible. The manner in which the PVNGS pressurizer heaters are held in place, fixed at one end by the fillet weld and supported at the other end by two consecutive heater support plates satisfies this criteria (i.e., minimizes bending stresses at the fillet weld, see Figure 1). The clearance between the heater and heater support plates is nominally 0.037 inch (1.282 inch minus 1.245 inch).

Based on the above discussion, the reconfigured weld joint is acceptable from a stress/fatigue perspective for remaining plant life and potential life extension.

VI. Duration of Proposed Alternative

APS requests that the 10 CFR 50.55a(a)(3)(i) relief for the alternative to the cMAX value in Code Case 1361-2 for the pressurizer sleeves be granted for each PVNGS unit and that the relief remain in effect for the remainder of plant life.

VII. 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 proposed alternative discussed in this relief request would provide an acceptable level of quality and safety as the reconfigured weld joint is acceptable from a stress/fatigue perspective. In addition, the subject welds received a liquid penetrant examination in accordance with ASME Section III, Class I requirements with acceptable results. Therefore, APS requests that the proposed alternative be authorized pursuant to 10 CFR 50.55a(a)(3)(i).

APS requests NRC approval of the proposed relief request by November 19, 2004, to support startup of Unit 3 from the current refueling outage.

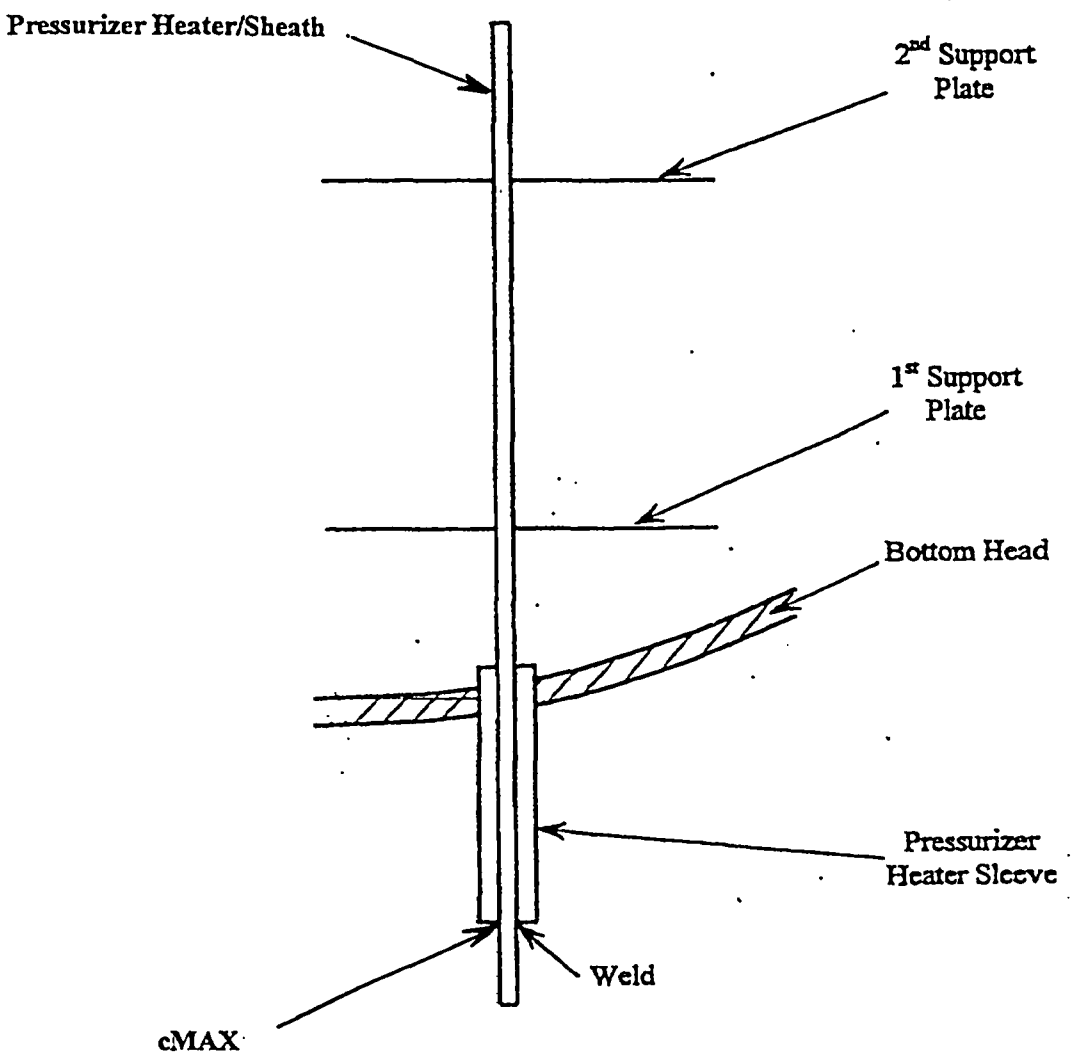

Figure 1 (Simplified)