10 CFR 50.55a

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

102-05784-DCM/RJR
December 21, 2007

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
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
Third Ten-Year Interval Inservice Inspection Program
Request for Relief from ASME Code Requirements – Relief Requests Nos. 20 and 21.

By letter no. 102-05641, dated February 8, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML070470525), Arizona Public Service Company (APS) informed the NRC that it would be implementing the 2001 Edition through the 2003 Addenda of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, IWA-4000, "Repair/Replacement Activities," for Palo Verde, Unit 2's third 10-year Inservice Inspection (ISI) interval which started on March 18, 2007. That letter also requested approval to transition Palo Verde Units 1 and 3 to the same Edition and Addenda of the Code which was approved in a letter from the NRC dated June 21, 2007, ADAMS Accession No. ML071560008.

By this letter, APS is submitting for review and approval the two ISI relief requests listed below. These requests were previously approved for Palo Verde's second inservice inspection interval.

Relief Request (RR)	Approved	ADAMS Accession No.
20	September 25, 2003	ML032690956
21	September 25, 2003	ML032690956

APS has updated these requests to reflect the requirements of the 2001 Edition through the 2003 Addenda of the ASME Code. The enclosure to this letter contains the revised relief requests.

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The first relief request (RR 20) would allow use of an embedded flaw repair technique to repair cracks on the inside diameter (ID) of control element drive mechanisms (CEDM). The second relief request (RR 21) would allow use of an embedded flaw repair technique to repair cracks on the outside diameter (OD) of the CEDM as well as repair cracks on the J-groove attachment welds. The proposed alternative methods of embedded flaw repair provide an acceptable level of quality and safety.

When revising Relief Requests 20 and 21, APS reconciled the differences in the Code year used in the original Westinghouse documents with the current Codes for Palo Verde. This information is included in the attachment to the enclosure.

APS requests the Staff's review of Relief Requests 20 and 21, which are being submitted as a contingency should APS identify the need to perform reactor head nozzle repairs using the embedded flaw repair technique, to support the PVNGS Unit 2 spring 2008, refueling outage. Start-up is currently scheduled for May 1, 2008.

This letter does not make any commitments to the NRC. If you have any questions or require additional information, please contact Glenn A. Michael at (623) 393-5750.

Sincerely,

D.C. Morris

TNW/GAM/RJR/gat

Enclosure

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

ENCLOSURE

Request for Relief from ASME Code Requirements for the Third 10-YEAR ISI Interval

Relief Request 20
Use of an Embedded Flaw Repair Technique to Repair Cracks on the Inside Diameter (ID) of Control Element Drive Mechanisms (CEDM)

ASME Code Component(s) Affected

Component number:	None
Description:	Control Element Drive Mechanism nozzle penetration (97) Reactor Head Vent nozzle penetration (1)
Code Class:	1

Applicable Code Edition and Addenda

Third 10-year inservice inspection interval code for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3: The American Society of Mechanical Engineers (ASME) Code, Section XI, 2001 Edition through the 2003 Addenda.

Construction Code for PVNGS Units 1, 2, and 3: ASME Section III, 1971 Edition, 1973 Winter Addenda.

Installation Code for PVNGS Units 1, 2, and 3: ASME Section III, 1974 Edition, 1975 Winter Addenda.

Applicable Code Requirements

2001 Edition through the 2003 Addenda

IWA-4412 Defect Removal

> Defect removal shall be accomplished in accordance with the requirements of IWA-4420.

IWA-4420 Defect Removal Requirements
IWA-4421 General Requirements

> Defects shall be removed or mitigated in accordance with the following requirements:
> *(c)* Defect removal or mitigation by welding or brazing shall be in accordance with IWA-4411.

The current rules do not allow welding over or embedding an existing flaw.

Proposed Alternative:

As an alternative to the rules of IWA-4421(c) contained in ASME Code, Section XI of the 2001 Edition through the 2003 Addenda which does not allow welding over or

embedding an existing flaw, it is requested that the NRC approve the use of the proposed alternative method presented to the NRC by Westinghouse Electric Company, LLC. on December 13, 2001, and supplemented by letters dated August 29, 2002, November 13, 2002, and May 16, 2003. In these letters Westinghouse Electric Company (Westinghouse) introduced and submitted licensing Topical Report (TR) WCAP-15987-P, Revision 2, "Technical Basis for the Embedded Flaw Process for Repair of Reactor Vessel Head Penetrations," to the NRC for review and approval. The topical report was approved by NRC letter "Acceptance for Referencing – Topical Report WCAP-15987-P, Revision 2, 'Technical Basis for the Embedded Flaw Process for Repair of Reactor Vessel Head Penetrations'," dated July 3, 2003 (ADAMS Accession No. ML031840237).

APS will be using the Westinghouse Topical Report and will follow the Conditions and Limitations identified in Section 5.0 of the NRC approval letter.

APS will be using Reference 5 of the Westinghouse Topical Report Safety Evaluation: R. J. Barrett (NRC) letter to A. Marion (NEI), "Flaw Evaluation Guidelines," April 11, 2003, for characterization of flaws (ADAMS ML030980322).

Basis for Alternative Requirements:

APS will be performing inspections of the vessel head penetrations in accordance with the commitments made in response to NRC Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles." In the event that any of these inspections indicate flaws in these penetrations, it will be necessary to repair such flaws. Pursuant to 10 CFR 50.55a(a)(3)(i), the alternative is proposed on the basis that it will provide an acceptable level of quality and safety. Additionally, the removal of the flaw and rewelding of the cavity will involve substantially more radiation exposure depending on the size and location of the flaw and whether temper bead welding rules have to be followed. The increase in exposure is estimated to be between 15 rem and 40 rem depending on radiation conditions and the complexity of the repair.

The embedded flaw repair technique is considered a permanent repair for the following reasons:

1. As long as a Primary Water Stress Corrosion Cracking (PWSCC) flaw remains isolated from the primary water (PW) environment, it cannot propagate. Since Alloy 52 weldment is considered highly resistant to PWSCC, a new PWSCC crack cannot initiate and grow through the Alloy 52 overlay to reconnect the PW environment with the embedded flaw. Structural integrity of the affected J-groove attachment weld will be maintained by the remaining unflawed portion of the weld.

2. The residual stresses produced by the embedded flaw technique have been measured and found to be relatively low. This was documented in the attachment to a letter from E. E. Fitzpatrick, Indiana Michigan Power Company (I&M), to the Nuclear Regulatory Commission (NRC) Document Control Desk, "Reactor -Vessel Head Penetration Alternate Repair Techniques," AEP:NRC:1218A, dated March 12, 1996. The low residual stresses indicate that no new cracks will initiate and grow in the area adjacent to the repair weld.

3. As identified in Westinghouse letter LTR-NRC-01-41, "ASME Section XI Inservice Inspection Program Relief Requests – Alternative Repair Technique," dated December 13, 2001, the repair is made with Alloy 52 weld material. After the weld repair is completed, its integrity is verified by liquid penetrant inspection. The only known mechanisms for cracking of the weld used to embed a flaw, or the surrounding region, is fatigue. The calculated fatigue usage in this region is very low because the reactor vessel head region is isolated from the transients which affect the hot leg or cold leg piping. The thickness of the weld has been set to provide a permanent embedment of the flaw, without adding sufficient weld to increase the residual stresses. This ensures that the embedded flaw repair will not affect areas nearby to the repair.

Duration of Proposed Alternative:

The duration of the proposed alternative is for the third inspection interval of Palo Verde Units 1, 2, and 3.

Third Interval Start Dates:

Unit 2 – March 18, 2007 Unit 3 – January 11, 2008 Unit 1 – July 18, 2008

Precedent:

Relief Request 20 was previously approved by the NRC for use by Palo Verde on September 25, 2003 (ADAMS Accession No. ML032690956) based on the 1992 Edition, 1992 Addenda of ASME Code, Section XI.

Recently, the NRC approved a similar submittal for Byron Station (ADAMS Accession No. ML071290011, dated May 23, 2007) to use the Westinghouse repair methodology documented in WCAP-15987-P, Revision 2-A.

Relief Request 20
Use of an Embedded Flaw Repair Technique to Repair Cracks on the Inside Diameter (ID) of Control Element Drive Mechanisms (CEDM)

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."

APS considers the embedded flaw repair technique to be an alternative to Code requirements that provides an acceptable level of quality and safety, as required by 10 CFR 50.55a(a)(3)(i).

APS requests the Staff's review of Relief Request 20, which is being submitted as a contingency, to support the PVNGS Unit 2 spring 2008, refueling outage. Start-up is currently scheduled for May 1, 2008. Should APS identify the need to perform repairs using the embedded flaw repair technique, APS may request expedited approval of this Code alternative.

References:

1. Westinghouse letter LTR-NRC-01-41, dated December 13, 2001, ASME Section XI Inservice Inspection Program Relief Requests – Alternative Repair Techniques, from H. A. Sepp, Manager Regulatory and Licensing Engineering, Westinghouse Electric Company, LLC. to S. J. Collins, NRC.

2. Westinghouse Topical Report, WCAP-15987-P, Revision 2-A, "Technical Basis for the Embedded Flaw Process for Repair of Reactor Vessel Head Penetrations", dated December 2003.

Relief Request 21
Use of an Embedded Flaw Repair Technique to Repair Cracks on the Outside Diameter (OD) of Control Element Drive Mechanisms (CEDM)

ASME Code Component(s) Affected

Component number: None
Description: Control Element Drive Mechanism nozzle penetration (97)
Reactor Head Vent nozzle penetration (1)

Code Class: 1

Applicable Code Edition and Addenda

Third 10-year inservice inspection interval code for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3: The American Society of Mechanical Engineers (ASME) Code, Section XI, 2001 Edition through the 2003 Addenda.

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Defects shall be removed or mitigated in accordance with the following requirements:
(c) Defect removal or mitigation by welding or brazing shall be in accordance with IWA-4411.

The current rules do not allow welding over or embedding an existing flaw.

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APS will be using the Westinghouse Topical Report and will follow the Conditions and Limitations identified in Section 5.0 of the NRC approval letter.

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Basis for Alternative Requirements:

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2. The residual stresses produced by the embedded flaw technique have been measured and found to be relatively low. This was documented in the attachment to a letter from E. E. Fitzpatrick, Indiana Michigan Power Company (I&M), to the Nuclear Regulatory Commission (NRC) Document Control Desk, "Reactor -Vessel Head Penetration Alternate Repair Techniques," AEP:NRC:1218A, dated March 12, 1996. The low residual stresses indicate that no new cracks will initiate and grow in the area adjacent to the repair weld.

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Duration of Proposed Alternative:

The duration of the proposed alternative is for the third inspection interval of Palo Verde Units 1, 2, and 3.

Third Interval Start Dates:

Unit 2 – March 18, 2007 Unit 3 – January 11, 2008 Unit 1 – July 18, 2008

Precedent:

Relief Request 21 was previously approved by the NRC for use by Palo Verde on September 25, 2003 (ADAMS Accession No. ML032690956) based on the 1992 Edition, 1992 Addenda of ASME Code, Section XI.

Recently, the NRC approved a similar submittal for Byron Station (ADAMS Accession No. ML071290011, dated May 23, 2007) to use the Westinghouse repair methodology as documented in WCAP-15987-P, Revision 2-A.

Relief Request 21
Use of an Embedded Flaw Repair Technique to Repair Cracks on the Outside Diameter (OD) of Control Element Drive Mechanisms (CEDM)

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."

APS considers the embedded flaw repair technique to be an alternative to Code requirements that provides an acceptable level of quality and safety, as required by 10 CFR 50.55a(a)(3)(i).

APS requests the Staff's review of Relief Request 21, which is being submitted as a contingency, to support the PVNGS Unit 2 spring 2008, refueling outage. Start-up is currently scheduled for May 1, 2008. Should APS identify the need to perform repairs using the embedded flaw repair technique, APS may request expedited approval of this Code alternative.

References:

1. Westinghouse letter LTR-NRC-01-41, dated December 13, 2001, ASME Section XI Inservice Inspection Program Relief Requests – Alternative Repair Techniques, from H. A. Sepp, Manager Regulatory and Licensing Engineering, Westinghouse Electric Company, LLC. to S. J. Collins, NRC.

2. Westinghouse Topical Report, WCAP-15987-P, Revision 2-A, "Technical Basis for the Embedded Flaw Process for Repair of Reactor Vessel Head Penetrations", dated December 2003.

Attachment to Relief Requests 20 and 21

RECONCILIATION OF CODE YEARS

Attachment to Relief Requests 20 and 21

RECONCILIATION OF CODE YEARS

The discussion that follows is a comparison between the Code sections identified in the APS request, and the Code sections identified in the approved Westinghouse topical report. APS Code years are the 2001 Edition through the 2003 Addenda for Section XI, and 1974 Edition through the1975 Winter Addenda for Section III. The Westinghouse Codes for Section XI and Section III are the 1989 Edition. The following is a technical discussion reconciling the topical report to Code years identified above.

IWA-4120

1989 Section XI, IWA-4120, "Rules and Requirements," states in part that repairs shall be performed in accordance with the Owner's Design Specification and the original Construction Code of the component or system. It also allows 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 those requirements, the applicable alternative requirements of IWA-4500 and the following may be used (IWB-4000 for Class 1 components; IWC-4000 for Class 2 components; IWD-4000 for Class 3 components; IWE-4000 for Class MC components; or IWF-4000 for component supports).

2001 Section XI, IWA-4221 Construction Code and Owner's Requirements [equivalent Section to above] states in part that repair/replacement activities shall meet the Owner's Requirements and shall meet the Construction Code specified. Construction Code Cases may also be used. All or portions of later different Construction Codes may be used as listed.

Analysis of 1989 to 2001: The Code requirements are essentially identical.

NB-4453.1

1989 Section III, NB-4453.1, "Defect Removal," states that defects may be removed by mechanical means or by thermal gouging processes. The area prepared for repair shall be examined by a liquid penetrant or magnetic particle method in accordance with NB-5110, and meet the acceptance standards of NB-5340 or NB-5350. This examination is not required where defect elimination removes the full thickness of the weld and where the backside of the weld joint is not accessible for removal of examination materials.

1974 with 1975 Winter Addenda Section III, NB-4453.1, "Defect Removal," states that unacceptable defects shall be removed by mechanical means or by thermal gouging processes. The area prepared for repair shall be examined and comply with the requirements of NB-5340 or NB-5350. Partial penetration welds, such as tube to tube sheet welds and those described in NB-3352.4 (d), where defect removal essentially removes the full thickness of the weld, need only be examined visually to the satisfaction of the Inspector to determine suitability of rewelding.

RECONCILIATION OF CODE YEARS

Analysis of 1989 to 1974 W75:

These two versions of the Code are essentially the same. The 1989 version is somewhat less restrictive in the requirement to remove defects. However, the proposed method of repair is to embed the defect with a weld overlay which will prevent further growth of the defect. The defect will be isolated from the reactor coolant.

NB-4453.2

1989 Section III, NB-4453.2, "Requirements for Welding Material, Procedures, and Welders," states in part that the weld repair shall be made using welding material, welders, and welding procedures qualified in accordance with NB-4125 and NB-4300.

1974 with 1975 Winter Addenda Section III, NB-4453.2, "Requirements for Welding Material, Procedures, and Welders," states in part that the weld repair shall be made using welding material, welders, and welding procedures qualified in accordance with NB-4125 and NB-4300.

Analysis of 1989 to 1974 W75:

The wording is the same and there is no difference. The proposed repair process satisfies these requirements.

NB-4453.3

1989 Section III, NB-4453.3, "Blending of Repaired Areas," states that after repair, the surface shall be blended uniformly into the surrounding surface.

1974 with 1975 Winter Addenda Section III, NB-4453.3, "Blending of Repaired Areas," states that after repair, the surface shall be blended uniformly into the surrounding surface.

Analysis of 1989 to 1974 W75:

The wording is the same and there is no difference. The proposed repair process satisfies these requirements.

RECONCILIATION OF CODE YEARS

NB-4453.4

1989 Section III, NB-4453.4, "Examination of Repair Welds," requires that the examination of a weld repair shall be repeated as required for the original weld, except that when the defect was originally detected by the liquid penetrant or magnetic particle method, and when the repair cavity does not exceed the lesser of 3/8 in. or 10% of the thickness, it need only be reexamined by the liquid penetrant or magnetic particle method.

1974 with 1975 Winter Addenda Section III, NB-4453.4, "Examination of Repair Welds," requires the examination of weld repairs shall be repeated as required for the original weld except that repair of defects originally detected by magnetic particle or liquid penetrant methods, when the repair cavities do not exceed the lesser of 3/8 in. or 10% of the thickness, need only be reexamined by a magnetic particle or liquid penetrant method.

Analysis of 1989 to 1974 W75:

Section III, NB-4453.4 of the 1989 Code is the same as the 1974 W75 version. Both stipulate that the repairs be examined in accordance with the original weld requirements. However, APS will be using the table provided in Section 5.0 of the NRC letter, "Acceptance for Referencing – Topical Report WCAP-15987-P, Revision 2, 'Technical Basis for the Embedded Flaw Process for Repair of Reactor Vessel Head Penetrations'," dated July 3, 2003, for determining the required repair examinations.

NB-4453.5

1989 Section III, NB-4453.5, "Heat Treatment of Repaired Areas," requires that repairs be heat treated in accordance with NB-4620.

1974 with 1975 Winter Addenda Section III, NB-4453.5, "Heat Treatment of Repaired Areas," requires that repairs be heat treated in accordance with NB-4620.

Analysis of 1989 to 1974 W75: There is no difference. The requirements of this section are satisfied by the proposed alternative method.

IWB-3600

1989 Section XI, Article IWB-3600, Analytical Evaluation of Flaws
2001 Section XI, Article IWB-3600, Analytical Evaluation of Flaws

The flaw evaluation rules given for "vessels" in IWB-3600 were compared and found to be identical between 1989 Edition and 2001 Edition through the 2003 Addenda.

RECONCILIATION OF CODE YEARS

However, this article is not applicable to the proposed method of repair because it contains no acceptance criteria for the configuration and material type in question except that the limit load methodology and safety factors from this article have been used in the analysis.