APS

Palo Verde Nuclear Generating Station

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102-05324-CDM/SAB/RJR
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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, 3
Docket No. STN 50-528/529/530
10 CFR 50.55a(a)(3)(i) Alternative Repair Request for Reactor Coolant System Hot Leg Alloy 600 Small-Bore Nozzles (Relief Request 31, Revision 1)

As committed to in APS letter 102-05237-CDM/SAB/RJR, dated March 25, 2005, Palo Verde Nuclear Generating Station (PVNGS) Engineering has completed reconciling the Westinghouse WCAP-15973-P, Revision 01, analysis with the non-Westinghouse analysis used to support the previous repairs of RCS hot leg Alloy 600 small-bore nozzles.

As a result of this reconciliation and pursuant to 10 CFR 50.55a(a)(3)(i), Arizona Public Service Company (APS) is proposing the same alternatives to the requirements of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1992 Edition, 1992 Addenda, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components", identified and discussed in the March 25, 2005 letter. Revision 1 of this request is for the previously repaired Alloy 600 nozzles identified below. Specifically, APS is proposing alternatives to the required flaw characterization (IWA-3300) and successive inspections (IWB-2420). This Relief Request references the methods and bases of Westinghouse Topical Report WCAP-15973-P, Revision 01, dated May 2004, and is being tracked by APS as Inservice Inspection (ISI) Program Relief Request 31, Revision 1.

Relief Request 31, Revision 1, adds the following previously repaired PVNGS Alloy 600 small-bore reactor coolant system (RCS) hot leg nozzles as follows: Unit 1 - 27 nozzles, Unit 2 - 9 nozzles, and Unit 3 - 27 nozzles (63 total) to those submitted in APS letter

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dated March 25, 2005. The 63 nozzles were replaced under the Palo Verde Alloy 600 replacement program, from approximately October 1999 to April 2003. Regarding Unit 2; 10 nozzles were addressed under Relief Request 31, Revision 0, in the spring of 2005 and 8 nozzles were repaired in 1991 via a full nozzle repair. Details of the 10 CFR 50.55a request are contained in the enclosure to this letter.

Attachment 1 of the enclosure addresses the conditions of the final safety evaluation for Westinghouse Topical Report WCAP-15973-P, issued January 12, 2005. Since the time at start-up conditions for Unit 3 slightly exceed the assumptions in the Westinghouse Topical Report, APS has included in Attachment 1, information specific as to how this affects the results of the analysis. Attachment 2 of the enclosure restates the regulatory commitment made to support Relief Request 31, Revision 0.

This letter makes no new commitments to the NRC. If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

David Mauldin

CDM/SAB/RJR/ca

Enclosure: Relief Request 31, Revision 1 - Alternative Repair Request for Reactor Coolant System Hot Leg Alloy 600 Small-Bore Nozzles

Attachment 1: APS' Response to the Conditions of the Final Safety Evaluation for Topical Report WCAP-15973-P, Issued January 12, 2005

Attachment 2: Regulatory Commitment Related to Relief Request 31, Revision 1

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

Enclosure

Relief Request 31, Revision 1
Alternative Repair Request for Reactor Coolant System Hot Leg Alloy 600 Small-Bore Nozzles

Relief Request No. 31, Revision 1

Alternative Repair Request for Reactor Coolant System Hot Leg Alloy 600 Small-Bore Nozzles

Background Information

On May 20, 2004, the Westinghouse Owners Group (WOG) submitted Topical Report (TR) WCAP-15973-P, Revision 01, "Low-alloy Steel Component Corrosion Analysis Supporting Small-diameter Alloy 600/690 Nozzle Repair/Replacement Program" to the NRC staff for review. The WOG was seeking the staff's approval of the Westinghouse TR in order that licensees seeking relief to use half-nozzle or mechanical nozzle seal assembly (MNSA) repair/replacement techniques may reference the Westinghouse TR as part of their basis for using the alternate repair methods on leaking Alloy 600 nozzles in the reactor coolant pressure boundary (RCPB).

On January 12, 2005, the NRC staff issued a final safety evaluation (SE) that found WCAP-15973-P, Revision 01, acceptable for referencing in licensing applications for Combustion Engineering designed pressurized water reactors to the extent specified and under the limitations delineated in the Westinghouse TR and in the associated SE. The SE defines the basis for acceptance of the Westinghouse TR and in Section 4.4 requires licensees proposing to use the half-nozzle and MNSA repairs submit the required information contained in the Westinghouse TR by the conditions of the SE, to the NRC, as a relief request in accordance with 10 CFR 50.55a.

This request pertains to the previously repaired Palo Verde Nuclear Generating Station (PVNGS) Alloy 600 small-bore reactor coolant system (RCS) hot leg nozzles as follows: Unit 1 - 27 nozzles, Unit 2 - 9 nozzles, and Unit 3 - 27 nozzles (63 total). These 63 nozzles were replaced under the Palo Verde Alloy 600 replacement program, from approximately October 1999 to April 2003. Additionally, APS has reconciled the Westinghouse WCAP-15973-P Rev. 01 and the Westinghouse supplemental analysis provided in APS letter 102-05247, dated April 14, 2005, with the non-Westinghouse analysis used to support previous repairs of RCS hot leg alloy 600 small-bore nozzles. Attachment 1 to this enclosure contains APS' response to the questions contained in Section 4.0 "Conclusion and Conditions," of the SE. Attachment 2 of the enclosure lists the regulatory commitment made to support this request. The Westinghouse supplemental analysis was submitted in APS letter 102-05247, dated April 14, 2005.

I. ASME Code Component(s) Affected

PVNGS Unit:	1, 2, 3
Component numbers:	B9.32
Description:	RCS Hot Leg Instrument and Sampling Nozzles
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 **IWA-4310** of ASME Section XI, 1992 Edition, 1992 Addenda states in part that the "defects shall be removed or reduced in size in accordance with this Paragraph." Furthermore, IWA-4310 allows, "...the defect removal area and any remaining portion of the flaw may be evaluated and the component accepted in accordance with the appropriate flaw evaluation rules of Section XI or the design rules of either the Construction Code, or Section III, when the Construction Code was not Section III."

The evaluation of the remaining portion of the flaw further requires successive examination as stated in **IWB-2420**, "Successive Inspections".

IV. Reason For Request

During fabrication of the reactor coolant system (RCS) piping, Alloy 600 small-bore nozzles were welded to the interior of the RCS hot leg. Industry experience has shown that cracks may develop in the nozzle or in the weld metal joining the nozzles to the reactor coolant pipe and lead to leakage of the reactor coolant fluid. The cracks are caused by primary water stress corrosion cracking (PWSCC).

The original design of each PVNGS unit's RCS contained a total of 27 Alloy 600 small-bore hot leg penetrations. These penetrations include pressure taps, sampling line and RTD thermowell nozzles. The 63 nozzles which are the subject of this request were replaced under the Palo Verde Alloy 600 replacement program, from approximately October 1999 to April 2003.

The total removal of all Alloy 600 small-bore nozzle and/or Alloy 82/182 weld material would have required accessing the internal surface of the reactor coolant piping and grinding out the attachment weld and any remaining nozzle. Such an activity would result in high radiation exposure to the personnel involved. Grinding within the pipe also exposes personnel to other safety hazards such as those associated with confined spaces. The analysis in the Westinghouse TR has shown that any cracks in the nozzle or attachment weld and vessel/piping carbon steel base metal will not affect structural integrity or propagate through the reactor coolant pressure boundary; therefore, there is no increase in the level of quality or safety as a result of removing the nozzle or the attaching weld metal.

V. Proposed Alternative and Basis for Use

Pursuant to 10 CFR 50.55a(a)(3)(i), APS is proposing alternatives to the required flaw characterization (IWA-3300) and successive inspections (IWB-2420). APS did not remove the remnant nozzle or its attachment weld.

In lieu of fully characterizing/sizing the existing cracks, APS assumed worst case cracks in the alloy 600 base and weld material and used a methodology similar to that presented in Westinghouse WCAP-15973-P for determining the following:

1. Determining the overall general/crevice corrosion rate for the internal surfaces of the low-alloy or carbon steel materials that will now be exposed to the reactor coolant and for calculating the amount of time the ferritic portions of the vessel or piping would be acceptable if corrosive wall thinning had occurred.

2. Calculating the thermal-fatigue crack-growth life of existing flaws in the Alloy 600 nozzles and/or Alloy 82/182 weld material into the ferritic portion of the vessels or piping.

3. Providing an acceptable bases and arguments for concluding that unacceptable growth of the existing flaw by stress corrosion into the vessel or piping is improbable.

APS has reviewed the bases and arguments presented in the Westinghouse TR for the overall general/crevice corrosion rate, thermal-fatigue crack-growth life of existing flaws, and the bases for concluding that growth of the existing flaw by stress corrosion into the vessels or piping is improbable. APS finds that the Westinghouse bases and arguments can be applied to the previously repaired Unit 1, 2, and 3 hot leg small-bore nozzles. APS has evaluated these assumptions using appropriate flaw evaluation rules of Section XI and determined that the results demonstrate compliance with ASME Section XI criteria for the expected 40 years of plant life. As a result, APS is also requesting relief from the successive inspections required by IWB-2420 based on the Westinghouse TR and supplemental analysis.

APS has determined that the proposed alternatives will provide an acceptable level of quality and safety and are within the analysis boundaries provided in WCAP-15973-P, Revision 1. APS' responses to the conditions of the final safety evaluation are included in Attachment 1 to this enclosure.

VI. Duration of Proposed Alternative

APS has confirmed, as stated in response to Question 4.1-2 that from the time of half nozzle implementation until March 2005, the percentage of time in Cold Shutdown conditions is less than the Westinghouse TR analysis value for Unit 1, 2, and 3. The percentage of time in Start-up conditions is less than the Westinghouse TR analysis value for Unit 1 and 2. However, for Unit 3, the percentage of time in Start-up conditions is greater than the Westinghouse TR analysis value.

For Unit 3, the percentage of time during start-up conditions exceeded the Westinghouse TR analysis value. However, the associated corrosion analysis demonstrates that the conditions are acceptable for the remainder of plant life, including life extension. See attachment 1 for the results of the corrosion analysis.

APS requests that this relief be granted for PVNGS Unit 1, 2, and 3 and that the relief remain in effect for the remainder of plant life (40 year original life plus 20 year life extension). The commitment below requires APS to track the time at cold shutdown to assure the allowable bore diameter is not exceeded over the life of the plant.

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 and supported by the TR 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).

VIII. Commitment

APS reaffirms its commitment to continue to track the time at cold shutdown conditions for each unit against the assumptions made in the corrosion analysis so that the overall general/crevice corrosion rate does not exceed the rate presented in WCAP-15973-P, Revision 1, such that the allowable bore diameter is not exceeded over the life of the plant.

Attachment 1

APS' Response to the Conditions of the Final Safety Evaluation for Topical Report WCAP-15973-P, Issued January 12, 2005

Attachment 1

APS' Response to the Conditions of the Final Safety Evaluation for Topical Report WCAP-15973-P, Issued January 12, 2005

The safety evaluation issued for the Westinghouse topical report stated that the staff's review of the methods in Topical Report (TR) WCAP-15973-P, Revision 01, indicates that the Westinghouse Owners Group's (WOG) methods and analyses in the Westinghouse TR are generally acceptable. To use the Westinghouse TR as a reference, the safety evaluation required the following information be addressed:

4.1 General Corrosion Assessment

Licensees seeking to use the methods of the Westinghouse TR will need to perform the following plant specific calculations in order to confirm that the ferritic portions of the vessels or piping within the scope of the Westinghouse TR will be acceptable for service throughout the licensed lives of their plants (40 years if the normal licensing basis plant life is used or 60 years if the facility is expected to be approved for extension of the operating license):

NRC Question:

1. Calculate the minimum acceptable wall thinning thickness for the ferritic vessel or piping that will adjoin to the MNSA repair or half-nozzle repair.

   APS Response:

   Section 2.4 of the Westinghouse TR, determined the maximum allowable hole size relative to (1) the reduction in the effective weld shear area, and (2) the required area of reinforcement for the nozzle bore holes.

   The maximum corroded hole diameter identified in the Westinghouse TR has been verified to apply to Palo Verde Unit 1, 2, and 3. As for the second hole size, Palo Verde was used in the Westinghouse TR as the limiting hot leg pipe nozzle.

NRC Question:

2. Calculate the overall general corrosion rate for the ferritic materials based on the calculational methods in the Westinghouse TR, the general corrosion rates listed in the Westinghouse TR for normal operations, startup conditions (including hot standby conditions), and cold shutdown conditions, and the respective plant-specific times (in-percentage of total plant life) at each of the operating modes.

   APS Response:

   The assumptions in the Westinghouse TR analysis, regarding times at each of the operation modes, are as follows:

- Normal Operation: 88%,
- Startup Condition: 2%,
- Cold Shutdown Condition: 10%

APS has reviewed the operating history for PVNGS Unit 1, 2, and 3 from when the first hot leg nozzle repair was implemented and has determined the percentage of total plant time spent at each of the operating modes as follows:

Percentage of Time at Respective Modes of Operation

Mode of Operation	Unit 1	Unit 2	Unit 3
Normal Operations	93.54%	90.22%	90.59%
Startup Conditions	0.93%	1.34%	2.38%
Cold Shutdown Conditions	5.53%	8.44%	7.03%

(PVNGS Technical Specifications Table 1.1-1 defines Cold Shutdown as a cold leg temperature of ≤210° F)

Using unit specific percentages and Equation No.1 of the Westinghouse TR, the calculated corrosion rate (CR) in mills per year (mpy) are shown below:

Unit 1

- CR = (0.9354)(0.4 mpy) + (.0093)(19.0 mpy) +(0.0553)(8.0 mpy) = 0.993 mpy

Unit 2

- CR = (0.9022)(0.4 mpy) + (.0134)(19.0 mpy) +(0.0844)(8.0 mpy) = 1.291 mpy

Unit 3

- CR = (0.9059)(0.4 mpy) + (.0238)(19.0 mpy) +(0.0703)(8.0 mpy) = 1.377 mpy

Thus, the projected corrosion rates for PVNGS Unit 1, 2, and 3 do not exceed the Westinghouse TR corrosion rate of 1.53 mpy.

NRC Question:

3. Track the time at cold shutdown conditions to determine whether this time does not exceed the assumptions made in the analysis. If these assumptions are exceeded, the licensees shall provide a revised analysis to the NRC, and provide a discussion on whether volumetric inspection of the area is required.

APS Response:

APS has confirmed, as stated in response to Question 4.1-2 that from the time of half nozzle implementation until March 2005, the percentage of time in Cold Shutdown conditions is less than the Westinghouse TR analysis value for Unit 1, 2, and 3. The percentage of time in Start-up conditions is less than the Westinghouse TR analysis value for Unit 1 and 2. However, for Unit 3, the percentage of time in Start-up conditions is greater than the Westinghouse TR analysis value.

Unit 3 has been in Start-up conditions 2.38% of the time versus the Westinghouse TR analysis value of 2%. The respective Unit 3 corrosion rate is 1.377 mpy. Based on this corrosion rate, the Unit 3 hot leg piping will reach the allowable diameter 58 years from the date of the repair. Since the Unit 3 repairs began in 2000, the allowable diameter would be reached in 2058.

Unit 3 began operation in 1988. An anticipated plant life of 60 years will be reached in 2048 (40 year original life plus 20 year life extension). Therefore, the maximum allowable diameter will not be exceeded during the life of the plant. As a result, volumetric inspection of the area is not required.

APS has previously committed to tracking the time at cold shutdown to assure the allowable diameter is not exceeded over the life of the plant (see Attachment 2).

NRC Question:

4. Calculate the amount of general corrosion-based thinning for the vessels or piping over the life of the plant, as based on the overall general corrosion rate calculated in Step 2 and the thickness of the ferritic vessel or piping that will adjoin to the MNSA repair or half-nozzle repair.

APS Response:

The Unit specific corrosion rates are used to calculate the amount of general corrosion over a 60-year period.

Unit 1
Corrosion = (0.000993 inch/year) (60 years)
= 0.05958 inch (radially, relative to penetration)
= 0.11916 inch (diametrically, relative to penetration)

Unit 2
Corrosion = (0.001291 inch/year) (60 years)
= 0.07746 inch (radially, relative to penetration)
= 0.15492 inch (diametrically, relative to penetration)

Unit 3
Corrosion = (0.001377 inch/year) (60 years)
= 0.08262 inch (radially, relative to penetration)
= 0.16524 inch (diametrically, relative to penetration)

NRC Question:

5. Determine whether the vessel or piping is acceptable over the remaining life of the plant by comparing the worst case remaining wall thickness to the minimum acceptable wall thickness for the vessel or pipe.

APS Response:

Unit 1
Diameter of penetration in 60 years = (0.11916 inch) + (1.120 inch) = 1.240 inch

Unit 2
Diameter of penetration in 60 years = (0.15492 inch) + (1.120 inch) = 1.275 inch

Unit 3
Diameter of penetration in 60 years = (0.16524 inch) + (1.120 inch) = 1.285 inch

The allowable diameter is 1.280 inch. The calculated Unit 3 diameter is 1.285 inch over a 60 year period. The respective corrosion rate reflects that the allowable diameter would be reached in 58 years from the date of the earliest repair. Since Unit 3 repairs began in 2000, the allowable diameter would be reached in 2058. With commercial operation beginning in 1988 and the anticipated end of plant life of 60 years being reached in 2048, the maximum allowable diameter will not be exceeded during the life of the plant.

4.2 Thermal-Fatigue Crack Growth Assessment

Licensees seeking to reference this TR for future licensing applications need to demonstrate that:

NRC Question:

1. The geometry of the leaking penetration is bounded by the corresponding penetration reported in Calculation Report CN-CI-02-71, Revision 01.

APS Response:

APS has reconciled the Westinghouse WCAP-15973-P Revision. 01 analysis and the Westinghouse supplemental analysis provided in APS letter 102-05247, dated April 14, 2005, with the non-Westinghouse analysis used to support previous repairs of RCS hot leg alloy 600 small-bore nozzles. APS has determined that the Westinghouse WCAP analysis is applicable to the previously repaired hot leg nozzles in Units 1, 2, and 3. The dimensions of the previously repaired nozzles are bounded by the values presented in Table 2 below.

The geometry of the leaking penetration identified in the referenced calculation (page 17) and the PVNGS nozzle geometry is compared below.

	Westinghouse Calc	PVNGS
Base metal thickness:	3.75 in	3.75 in
Inside radius to base metal:	21 in	21 in
Cladding thickness	0.25 in	0.19 in

Westinghouse has provided APS a plant specific calculation using PVNGS geometry. This calculation evaluates the crack growth for the APS specific hot leg borehole geometry and concludes that the final crack sizes computed for Palo Verde specific dimensions do not impact the conclusions of the original referenced calculation.

Table 1: Hot Leg Piping Crack Dimensions from CN-CI-02-71 Rev 01
(Borehole Diameter Used Is 0.997")

Depth Or Length	Initial (in)	Axial Final (in)	Axial Allowable (in)	Circumferential Final (in)	Circumferential Allowable (in)
Depth	0.938	0.984	> 1.3	1.001	> 1.3
Length	0.762	0.791	> 1.1	0.802	> 1.1

Table 2: Hot Leg Piping Crack Dimensions using PVNGS Dimensions
(Borehole Diameter Used Is 1.120")

Depth Or Length	Initial (in)	Axial Final (in)	Axial Allowable (in)	Circumferential Final (in)	Circumferential Allowable (in)
Depth	0.950	0.999	> 1.3	1.017	> 1.3
Length	0.762	0.793	> 1.1	0.805	> 1.1

It can be seen by comparing the final crack sizes in Tables 2 with those in Table 1 and those reported in References 1 and 2 that the effect of the change in the initial flaw depth from 0.938" to 0.950" and in the borehole diameter from 0.997" to 1.120" on the final crack sizes is very small and considered insignificant. Final crack sizes computed with the Palo Verde specific dimensions do not impact the conclusions made in References 1 and 2. The symbol > used under the maximum allowable crack sizes in the above tables is to be interpreted as the crack sizes which are still stable under the hot leg applied loading.

NRC Question:

2. The plant-specific pressure and temperature profiles in the pressurizer water space for the limiting curves (cooldown curves) do not exceed the analyzed profiles shown in Figure 6-2 (a) of Calculation Report CN-CI-02-71, Revision 01, as stated in Section 3.2.3 of the SE.

APS Response:

APS is not requesting relief from the ASME requirements for the pressurizer in this request.

NRC Question:

3. The plant-specific Charpy USE data shows a USE value of at least 70 ft-lb to bound the USE value used in the analysis. If the plant-specific Charpy USE data does not exist and the licensee plans to use Charpy USE data from other plants' pressurizers and hot-leg piping, then justification (e.g., based on statistical or lower bound analysis) has to be provided.

APS Response:

The request of USE data is not applicable to PVNGS since elastic-plastic fracture mechanics was not applied to the hot leg nozzles in the Westinghouse TR. Furthermore, Palo Verde Units 1, 2, and 3 are bounded by the linear elastic fracture mechanics analysis in Calculation Report CN-CI-02-71, Revision 01, since the highest hot leg pipe RT_{ndt} amongst all Palo Verde units is 20° F versus the 30° F value used in the Westinghouse TR.

4.3 Stress Corrosion Crack Growth Assessment

Licensees seeking to implement MNSA repairs or half-nozzle replacements may use the WOG's stress corrosion assessment as the bases for concluding that existing flaws in the weld metal will not grow by stress corrosion if they meet the following conditions:

NRC Question:

1. Conduct appropriate plant chemistry reviews and demonstrate that a sufficient level of hydrogen overpressure has been implemented for the RCS, and that the contaminant concentrations in the reactor coolant have been typically maintained at levels below 10 ppb for dissolved oxygen, 150 ppb for halide ions, and 150 ppb for sulfate ions.

APS Response:

A review of plant chemistry records show that the halide /sulfate concentrations levels have been maintained below 150 ppb for chloride, fluoride, and sulfate over the two operating cycles prior to the repair. Oxygen levels are maintained below 10 ppb during power operation and below 100 ppb during plant startups [RCS temperature >250°F]. There is no oxygen limit when the RCS temperature is below 250°F.

An RCS hydrogen overpressure of ≥ 15 cc/kg is established prior to criticality (hard hold point) and is maintained in a range of 25 to 50 cc/kg in Modes 1 and 2. In Modes 1 and 2, RCS hydrogen is a Control Parameter with Action Level 1 outside the range of 25 – 50 cc/kg, an Action Level 2, less than 15 cc/kg, and an Action Level 3 less than 5 cc/kg. Chemistry administrative control procedures do not allow critical reactor operation with the RCS hydrogen concentration less than 15 cc/kg without immediate corrective action. The nominal operating band for RCS hydrogen is 25 to 50 cc/kg.

Thus the conclusion reached in the Westinghouse TR with respect to stress corrosion cracking, applies to PVNGS.

NRC Question:

2. During the outage in which the half-nozzle or MNSA repairs are scheduled to be implemented, licensees adopting the TR's stress corrosion crack growth arguments will need to review their plant-specific RCS coolant chemistry histories over the last two operating cycles for their plants, and confirm that these conditions have been met over the last two operating cycles.

   APS Response:

   The review identified in the response above was completed for the two operating cycles prior to the repair.

4.4 Other Considerations

The WOG's general corrosion rates for normal operations, startups, and cold shutdown conditions, as applied in Equation 1 of the TR, are considered by the staff to be acceptable, as long as the existing corrosion data used to determine the bounding rates is applicable. If additional laboratory or field data becomes available that invalidates the TR's general corrosion rate values for normal operations, startups, and cold shutdown conditions, the WOG should send in an addendum to the TR that evaluates the impact of the new data of the corrosion rate values for normal operations, startups, and cold-shutdown conditions, and that provides a new overall general corrosion rate assessment for the ferritic components under assessment. The WOG's thermal fatigue crack growth analysis is only applicable to the evaluation of a single flaw. Should the WOG desire to extend the scope of its thermal-fatigue crack growth analysis to the analysis of multiple cracks in near proximity to one another, the WOG is requested to submit an appropriate addendum to the TR that provides the new thermal-fatigue crack growth assessment for the multiple flaw orientation. The scope of WCAP-15973-P, Revision 01, does not address any welding considerations for the MNSA or half-nozzle designs. Licensees seeking to implement half-nozzle replacements or MNSA repairs of their Alloy 600 nozzles will need to assess the welding aspects of the design and may need to submit a relief request to implement the alternatives to the requirements of the ASME Code, Section XI as required by 10 CFR 50.55a.

The staff's review of the corrections to the flaw evaluation, changes in corrosion rate and clarification of the stress corrosion cracking in carbon and low alloy steels to WCAP-15973-P, Revision 01, indicates that the changes in the evaluation and analyses are generally acceptable. The requirements addressed in Section 4.0 of this SE must be addressed, along with the following, when this TR is used as the basis for the corrosion and fatigue crack growth evaluation when implementing a half-nozzle or MNSA repair:

NRC Question:

1. Licensees using the MNSA repairs as a permanent repair shall provide resolution to the NRC concerns addressed in the NRC letter dated December 8, 2003, from H. Berkow to H. Sepp (ADAMS Accession No. ML033440037) concerning the analysis of the pressure boundary components to which the MNSA is attached, and the augmented inservice inspection program.

   APS Response:

   APS is not currently planning on using a MNSA as a permanent repair.

NRC Question:

2. Currently, half-nozzle and MNSA repairs are considered alternatives to the ASME Code, Section XI. Therefore, licensees proposing to use the half-nozzle and MNSA repairs shall submit the required information contained in WCAP-15973-P, Revision 01, by the conditions of this SE, to the NRC as a relief request in accordance with 10 CFR 50.55a.

   APS Response:

   This letter provides APS' response to the conditions of the SE as a relief request in accordance with 10 CFR 50.55a.

References:

1. Westinghouse Report CN-CI-02-71, Rev.1, "Summary of Fatigue Crack Growth Evaluation Associated with Small Diameter Nozzles in CEOG Plants", dated 3/31/04.

2. Westinghouse Report WCAP-15973-P, Rev.1, "Low-Alloy Steel Component Corrosion Analysis Supporting Small-Diameter Alloy 600/690 Nozzle Repair/Replacement Programs", dated May 2004.

3. 102-05237, "10 CFR 50.55a(a)(3)(i) Alternative Repair Request for Reactor Coolant System Hot Leg Alloy 600 Small-Bore Nozzles (Relief Request 31)," dated March 25, 2005.

4. 102-05247, "Response to Request for Information Related to Relief request 31," dated April 14, 2005

5. APS drawing E-246-812-3, Revision 3, "RTD Nozzles Replacement Arizona Public Service I & II Piping,' dated June 5, 1984.

6. APS drawing E-246-813-3, Revision 3, "RTD Nozzles Replacement Arizona Public Service III Piping,' dated June 5, 1984.

Attachment 2

Regulatory Commitments Related to Relief Request 31 Revision 1

The following table identifies the action previously committed to by APS. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments. Please direct questions regarding these commitments to Thomas N. Weber at (623) 393-5764.

REGULATORY COMMITMENT	DUE DATE	Tracking #
APS reaffirms its commitment to track the time at cold shutdown conditions against the assumptions made in the corrosion analysis to assure that the allowable bore diameter is not exceeded over the life of the plant. If the analysis assumptions are exceeded, APS shall provide a revised analysis to the NRC and provide a discussion on whether volumetric inspection of the area is required.	Active – ongoing (no due date)	RCTSAI 2782964