10 CFR 50.55a

A subsidiary of Pinnacle West Capital Corporation

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102-06029-DCM/SAB/RJR
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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Reference: U.S. Nuclear Regulatory Commission letter, "Final Safety Evaluation for Pressurized Water Reactor Owners Group (PWROG) Topical Report (TR) WCAP-16168-NP, Revision 2, 'Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval' (TAC No. MC9768)," dated May 8, 2008.

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528, 50-529, and 50-530
Request for Relief from the American Society of Mechanical Engineers (ASME) Code, Section XI, Reactor Vessel Weld Inspection Frequency – Relief Request No. 40

Pursuant to 10 CFR 50.55a(a)(3)(i), Arizona Public Service Company (APS) hereby requests Nuclear Regulatory Commission (NRC) approval to increase the interval for performing the volumetric examination of certain reactor vessel pressure-retaining and full penetration welds at PVNGS Units 1, 2, and 3.

In the referenced letter, the NRC approved the Westinghouse Topical Report that provided the technical justification and regulatory basis for decreasing the frequency of volumetric examination by extending the ASME inservice inspection interval from the current 10 years to 20 years for ASME examination categories B-A and B-D reactor vessel welds. The required plant-specific information and justification to support the proposed inspection schedule is contained in the enclosure to this letter.

APS has concluded that the proposed alternative provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a(a)(3)(i).

A047
NRR

No commitments are being made to the NRC by this letter. Should you need further information regarding this relief request, please contact Russell A. Stroud, Licensing Section Leader, at (623) 393-5111.

Sincerely,

DCM/RAS/RJR/gat

Enclosure: Relief Request 40

cc: E. E. Collins Jr. NRC Region IV Regional Administrator
J. R. Hall NRC NRR Project Manager
R. I. Treadway NRC Senior Resident Inspector

ENCLOSURE

Relief Request 40

10 CFR 50.55a Relief Request Number 40
Palo Verde Units 1, 2, and 3

Proposed Alternative
in Accordance with 10 CFR 50.55a(a)(3)(i)
--Alternative Provides Acceptable Level of Quality and Safety--

Background

On May 8, 2008, the NRC staff issued the Final Safety Evaluation (Reference 1) related to the Westinghouse Topical Report (TR) WCAP-16168-NP, Revision 2. The NRC found that WCAP-16168-NP, Revision 2, was acceptable for referencing in licensing applications for Combustion Engineering designed pressurized water reactors when requesting a decrease in frequency of inspections by extending the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (BPV) Code, Section XI, inservice inspection (ISI) interval from the current 10 years to 20 years for Category B-A and B-D reactor vessel welds. APS used Westinghouse Topical Report WCAP-16168-NP-A, Revision 2 (Reference 2) in the development of this submittal.

Previously, the Nuclear Regulatory Commission (NRC) staff approved Arizona Public Service Company's (APS') Relief Request (RR) No. 34, which deferred the volumetric examination requirement for certain reactor vessel pressure-retaining welds at Palo Verde, Units 1, 2, and 3, for one fuel cycle. The NRC's approval of RR No. 34 is documented by ADAMS Accession Nos. ML062490513, ML071140033, and ML082590556. Based upon the approved RR No. 34, the reactor vessel volumetric examinations were completed or scheduled as follows:

Unit 1	spring of 2010 (scheduled)
Unit 2	spring of 2008 (completed)
Unit 3	spring of 2009 (completed)

1.0 ASME Code Component(s) Affected

The affected components are the Palo Verde Units 1, 2 and 3 reactor vessels. The following ASME BPV Code, Section XI, examination categories and item numbers are from Table IWB-2500-1.

Code Class: 1

Examination Category	Item No	Description
Pressure Retaining Welds in Reactor Vessel:		
B-A	B1.11	Circumferential Shell Welds
B-A	B1.12	Longitudinal Shell Welds
B-A	B1.22	Meridional Shell Welds (Bottom Head only)
B-A	B1.30	Shell-to-Flange Weld
Full Penetration Welded Nozzles in Vessels:		

B-D	B3.90	Nozzle-to-Vessel Welds
B-D	B3.100	Nozzle Inner Radius Areas

2.0 Applicable Code Edition and Addenda

The third 10-year Interval Inservice Inspection (ISI) Program Plan complies with the 2001 Edition, 2003 Addenda, of the ASME BPV Code.

3.0 Applicable Code Requirement

Subarticle IWA-2432, "Inspection Program B," states, in part, that the inspection intervals shall comply with the following, except as modified by IWA-2430(d) and that inspection intervals are 10 year intervals.

Subarticle IWA-2430, "Inspection Intervals," (d) states, in part, that for components inspected under Program B, each of the inspection intervals may be extended or decreased by as much as 1 year. Adjustments shall not cause successive intervals to be altered by more than 1 year from the original pattern of intervals.

Subarticle IWB-2412, "Inspection Program B," requires volumetric examination of essentially 100% of the reactor pressure vessel pressure-retaining welds identified in Table IWB-2500-1 once every 10-year interval.

4.0 Reason for Request

APS is requesting this relief because the extension of the reactor vessel (RV) ISI interval to 20 years will prevent an estimated 2.98 man-rem of exposure and save APS considerable costs in outage duration and funding while providing an acceptable level of quality and safety.

5.0 Proposed Alternative and Basis for Use

APS proposes to defer the ASME Code required subject examinations of the Palo Verde Units 1, 2, and 3 reactor vessel pressure-retaining and full penetration examination categories B-A and B-D welds.

Unit 1
The first inspection of these welds in Unit 1 was performed in 1999 with the next scheduled inspection originally due in 2009. However, the second inspection was deferred until 2010 by RR No. 34. APS is requesting deferral of the second inspection until 2016 plus or minus one refueling cycle which is consistent with the information provided to the Staff in the Pressurized Water Reactor Owners Group (PWROG) letter OG-06-356 (Reference 3).

Unit 2
The second inspection of these welds in Unit 2 was performed in 2008 with the next scheduled inspection due in 2018. APS is requesting deferral of the third

inspection until 2027 plus or minus one refueling cycle which is consistent with the PWROG letter OG-06-356.

Unit 3
The second inspection of these welds was performed in 2009 with the next scheduled inspection due in 2019. APS is requesting deferral of the third inspection until 2028 plus or minus one refueling cycle. This is a deviation from the information provided to the Staff in the PWROG letter OG-06-356.

This deviation is a result of APS complying with the requirements of RR No. 34 by performing the required examinations in 2009. Extending the Unit 3 reactor vessel volumetric weld examinations to the 2013 date proposed in PWROG letter OG-06-356 would have required an approved ASME relief request. APS determined that a second relief request to obtain a one fuel cycle deferral similar to the one previously obtained in RR No. 34 was not appropriate. It would, therefore, have been necessary to obtain a relief request by demonstrating that each of the Palo Verde plant specific parameters is bounded by the corresponding pilot plant parameters used in Westinghouse Topical Report WCAP-16168-NP-A, Revision 2, for Combustion Engineering Plants. This plant specific evaluation was not completed until March of 2009, which did not allow for sufficient time for APS to prepare and submit a relief request with subsequent NRC review in advance of the April 2009 Unit 3 refueling outage. Therefore, APS performed the volumetric weld examinations during the Unit 3 outage in April of 2009 and is now requesting to defer the third inspection required by the ASME Code for the reactor vessel welds in Unit 3 from 2019 to 2028.

The methodology used to demonstrate the acceptability of extending the ISI examinations for categories B-A and B-D welds based on a negligible change in risk is contained in Westinghouse Topical Report WCAP-16168-NP-A, Revision 2. This methodology was used to develop a pilot plant analysis for Westinghouse, Combustion Engineering, and Babcock and Wilcox reactor vessel designs and is an extension of the work that was performed as part of the Nuclear Regulatory Commission Pressurized Thermal Shock (PTS) Risk Re-Evaluation (Reference 4). The critical parameters for demonstrating that this pilot plant analysis is applicable on a plant specific basis, as identified in WCAP-16168-NP-A, Revision 2, are identified in the attached tables. By demonstrating that each plant specific parameter is bounded by the corresponding pilot plant parameter, the application of the methodology to Palo Verde reactor vessel is acceptable. The comparison of pilot plant parameters and plant specific parameters is shown in the attachment to this request.

6.0 Duration of Proposed Alternative

This request proposes deferral of the volumetric examination requirement for certain Palo Verde reactor vessel pressure-retaining and full penetration welds identified in Section 1.0 of this request until 2016 for Unit 1, 2026 for Unit 2, and 2027 for Unit 3, plus or minus 1 refueling cycle.

	Last Inspection Date	PWROG Scheduled Date[1]	Proposed Inspection Date
Palo Verde Unit 1	1999	2016	2016
Palo Verde Unit 2	2008	2008	2027
Palo Verde Unit 3	2009	2013	2028

1. These dates were based on information available in 2006.

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 APS proposed extension of the inservice inspection interval for these examinations is based upon the alternative schedule being a negligible change in risk, as a result of satisfying the risk criteria in Regulatory Guide 1.174, and that the alternative schedule will continue to provide 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).

8.0 References

1. U.S. Nuclear Regulatory Commission letter, "Final Safety Evaluation for Pressurized Water Reactor Owners Group (PWROG) Topical Report (TR) WCAP-16168-NP, Revision 2, 'Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval' (TAC No. MC9768)," dated May 8, 2008 (ADAMS Nos. ML081060051 and ML081060045).

2. Westinghouse Topical Report WCAP-16168-NP-A, Revision 2, "Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval," dated June 2008.

3. Pressurized Water Reactor Owners Group letter No. OG-06-356, "Plan for Plant Specific Implementation of Extended Inservice Inspection Interval per WCAP-16168-NP, Revision 1, 'Risk-Informed Extension of the Reactor Vessel In-Service Inspection Interval.' MUHP 5097-99, Task 2059," dated October 31, 2006.

4. NUREG-1847, "Recommended Screening Limits for Pressurized Thermal Shock," dated March 2007.

5. SECY-07-0104, "Proposed Rulemaking – Alternative Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events (RIN 3150-AI01)," dated June 25, 2007.

9.0 Precedent

Waterford Unit 3	June 12, 2009	ML091210375
Palisades Nuclear Plant	February 11, 2009	ML090120896
Calvert Cliffs	February 18, 2009	ML090490853
Verbal authorization for Relief Requests ISI-020 & 021		
Written Approval	April 8, 2009	ML090920077
DC Cook	March 3, 2009	ML090720704
Verbal authorization for Relief Requests ISIR-29 & 30		

Attachment to Relief Request 40

The following tables are taken from calculation CN-PCAM-07-11, Implementation of WCAP-16168-NP-A, Revision 2 for Palo Verde Units 1, 2, and 3, dated March 11, 2009.

Table 2.1-1 Critical Parameters for the Application of Bounding Analysis Palo Verde Unit 1

Parameter	Pilot Plant Basis	Plant Specific Basis	Additional Evaluation Required
Dominant Pressurized Thermal Shock (PTS) Transients in the NRC PTS Risk Study are applicable	NRC PTS Risk Study	PTS Generalization Study	No
Through Wall Cracking Frequency (TWCF)	3.16E-07 Events per year	6.82E-13 Events per year	No
Frequency and Severity of Design Basis Transient	13 heatup/cooldowns per year	Bounded by 13 heatup/cooldowns per year	No
Cladding Layers (Single/Multiple)	Single Layer	Single Layer	No

Table 2.1-2 Additional Information Pertaining to Reactor Vessel Inspection Palo Verde Unit 1

Inspection methodology	ASME Section XI and Regulatory Guide 1.150.
Number of past inspections	1 inspection has been performed to date on the Category B-A and B-D welds
Number of indications found	All indications in the reactor vessel are acceptable per Section XI IWB-3500. There is one flaw in the inner 1" of the Unit 1 reactor vessel beltline. It is located in the plate material and is circumferential in orientation. The through wall extent of this flaw provided is 0.174 in. Based on the volume of plate inspected in the beltline region for Palo Verde Unit 1, 29.83 flaws of this size are acceptable per the proposed PTS Rule in SECY-07-0104, June 25, 2007 (ADAMS Accession Number ML070570141) (Reference 5).
Proposed inspection schedule for balance of plant life	The second inservice inspection was scheduled for 2008, but was deferred until 2010 by Relief Request No. 34. Upon approval of this request, the second inspection will be performed in 2016.

Table 2.1-3 Details of TWCF Calculation- Palo Verde Unit 1 @ 60 EFPY								
Inputs								
Reactor Coolant System Temperature, T_{RCS}[°F]:			N/A		T_{wall} [inches]:		11.19	
#	Region/Component Description	Material /Flux Type	Cu [wt%]	Ni [wt%]	CF [°F]	R.G. 1.99 Pos.	Un-Irradiated $RT_{NDT}(u)$ [°F]	Fluence [10^{19} Neutron/cm^2, E>1 MeV]
1	Plate M-6701-2	A 533B	0.060	0.610	37	1.1	40	2.84
2	Plate M-6701-1	A 533B	0.070	0.660	44	1.1	30	2.84
3	Plate M-6701-3	A 533B	0.060	0.610	37	1.1	40	2.84
4	Plate M-4311-3	A 533B	0.030	0.640	20	1.1	-20	2.84
5	Plate M-4311-1	A 533B	0.040	0.650	26	1.1	-10	2.84
6	Plate M-4311-2	A 533B	0.030	0.620	20	1.1	-40	2.84
7	Axial Weld 101-124A	Linde 0091	0.070	0.030	35.45	1.1	-50	1.67
8	Axial Weld 101-124B	Linde 0091	0.070	0.030	35.45	1.1	-50	2.21
9	Axial Weld 101-124C	Linde 0091	0.070	0.030	35.45	1.1	-50	2.21
10	Axial Weld 101-142A	Linde 0091	0.040	0.040	27.8	1.1	-80	1.67
11	Axial Weld 101-142B	Linde 0091	0.040	0.040	27.8	1.1	-80	2.21
12	Axial Weld 101-142C	Linde 0091	0.040	0.040	27.8	1.1	-80	2.21
13	Circ. Weld 101-171	Linde 124	0.050	0.070	34.05	1.1	-70	2.84

Outputs						
Methodology Used to Calculate ΔT_{30}:			Regulatory Guide 1.99, Revision 2			
	Controlling Material Region # (From Above)	RT_{MAX-XX} [R]	Fluence [10^{19} Neutron/cm^2, E>1 MeV]	Fluence Factor	ΔT_{30} [°F]	$TWCF_{95-XX}$
Axial Weld – AW	1,3	544.65	2.21	1.215	44.96	3.59E-17
Circumferential Weld - CW	1,3	546.97	2.84	1.278	47.28	8.02E-28
Plate – PL	1,3	546.97	2.84	1.278	47.28	2.73E-13
$TWCF_{95-TOTAL}$ ($\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{CW}TWCF_{95-CW}$):						6.82E-13

Table 2.2-1 Critical Parameters for the Application of Bounding Analysis Palo Verde Unit 2			
Parameter	Pilot Plant Basis	Plant Specific Basis	Additional Evaluation Required
Dominant Pressurized Thermal Shock (PTS) Transients in the NRC PTS Risk Study are applicable	NRC PTS Risk Study	PTS Generalization Study	No
Through Wall Cracking Frequency (TWCF)	3.16E-07 Events per year	7.00E-13 Events per year	No
Frequency and Severity of Design Basis Transient	13 heatup/cooldowns per year	Bounded by 13 heatup/cooldowns per year	No
Cladding Layers (Single/Multiple)	Single Layer	Single Layer	No

Table 2.2-2 Additional Information Pertaining to Reactor Vessel Inspection Palo Verde Unit 2	
Inspection methodology	ASME Section XI and Regulatory Guide 1.150.
Number of past inspections	2 inspections have been performed to date on the Category B-A and B-D welds
Number of indications found	All indications in the reactor vessel are acceptable per Section XI IWB-3500. There are no flaws in the Unit 2 beltline. Therefore, the ISI results are acceptable per the flaw limits of the proposed PTS Rule in SECY-07-0104, June 25, 2007 (ADAMS Accession Number ML070570141) (Reference 5).
Proposed inspection schedule for balance of plant life	The third inspection is currently scheduled for 2018. It is proposed that the third inservice inspection be performed in 2027.

Table 2.2-3 Details of TWCF Calculation- Palo Verde Unit 2 @ 60 EFPY								
Inputs								
Reactor Coolant System Temperature, T_{RCS}[°F]:			N/A		T_{wall} [inches]:		11.19	
#	Region/Component Description	Material /Flux Type	Cu [wt%]	Ni [wt%]	CF [°F]	R.G. 1.99 Pos.	Un-Irradiated $RT_{NDT}(u)$ [°F]	Fluence [10^{19} Neutron/cm^2, E>1 MeV]
1	Plate F-765-5	A 533B	0.030	0.650	20	1.1	10	3.14
2	Plate F-765-6	A 533B	0.040	0.670	26	1.1	10	3.14
3	Plate F-765-4	A 533B	0.030	0.670	20	1.1	-20	3.14
4	Plate F-773-1	A 533B	0.030	0.670	20	1.1	10	3.14
5	Plate F-773-2	A 533B	0.040	0.640	26	1.1	0	3.14
6	Plate F-773-3	A 533B	0.050	0.660	31	1.1	-60	3.14
7	Axial Weld 101-124A	Linde 124	0.060	0.040	33.6	1.1	-60	1.89
8	Axial Weld 101-124B	Linde 124	0.060	0.040	33.6	1.1	-60	2.46
9	Axial Weld 101-124C	Linde 124	0.060	0.040	33.6	1.1	-60	2.46
10	Axial Weld 101-142A	Linde 124	0.090	0.040	44.2	1.1	-80	1.89
11	Axial Weld 101-142B	Linde 124	0.090	0.040	44.2	1.1	-80	2.46
12	Axial Weld 101-142C	Linde 124	0.090	0.040	44.2	1.1	-80	2.46
13	Circ. Weld 101-171	Linde 124	0.030	0.070	26.55	1.1	-30	3.14
Outputs								
Methodology Used to Calculate ΔT_{30}:				Regulatory Guide 1.99, Revision 2				
	Controlling Material Region # (From Above)	RT_{MAX-XX} [R]	Fluence [10^{19} Neutron/cm^2, E>1 MeV]		Fluence Factor	ΔT_{30} [°F]	$TWCF_{95-XX}$	
Axial Weld – AW	2	501.97	2.46		1.242	32.28	3.59E-17	
Circumferential Weld - CW	2	503.54	3.14		1.302	33.85	8.02E-28	
Plate – PL	2	503.54	3.14		1.302	33.85	2.76E-15	
$TWCF_{95-TOTAL}$ ($\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{CW}TWCF_{95-CW}$):							7.00E-15	

Table 2.3-1 Critical Parameters for the Application of Bounding Analysis Palo Verde Unit 3			
Parameter	Pilot Plant Basis	Plant Specific Basis	Additional Evaluation Required
Dominant Pressurized Thermal Shock (PTS) Transients in the NRC PTS Risk Study are applicable	NRC PTS Risk Study	PTS Generalization Study	No
Through Wall Cracking Frequency (TWCF)	3.16E-07 Events per year	2.27E-15 Events per year	No
Frequency and Severity of Design Basis Transient	13 heatup/cooldowns per year	Bounded by 13 heatup/cooldowns per year	No
Cladding Layers (Single/Multiple)	Single Layer	Single Layer	No

Table 2.3-2 Additional Information Pertaining to Reactor Vessel Inspection Palo Verde Unit 3	
Inspection methodology	ASME Section XI and Regulatory Guide 1.150.
Number of past inspections	2 inspections have been performed to date on the Category B-A and B-D welds
Number of indications found	All indications in the reactor vessel are acceptable per Section XI IWB-3500. There are no flaws in the Unit 3 beltline. Therefore, the ISI results are acceptable per the flaw limits of the proposed PTS Rule in SECY-07-0104, June 25, 2007 (ADAMS Accession Number ML070570141) (Reference 5).
Proposed inspection schedule for balance of plant life	The third inspection is currently scheduled for 2019. It is proposed that the third inspection be performed in 2028.

Table 2.3-3 Details of TWCF Calculation- Palo Verde Unit 3 @ 60 EFPY								
Inputs								
Reactor Coolant System Temperature, T_{RCS}[°F]:				N/A		T_{wall} [inches]:		11.19
#	Region/Component Description	Material /Flux Type	Cu [wt%]	Ni [wt%]	CF [°F]	R.G. 1.99 Pos.	Un-Irradiated RT_{NDT}(u) [°F]	Fluence [10^{19} Neutron/cm^2, E>1 MeV]
1	Plate F-6407-4	A 533B	0.040	0.620	26	1.1	-30	3.32
2	Plate F-6407-5	A 533B	0.050	0.610	31	1.1	-20	3.32
3	Plate F-6407-6	A 533B	0.040	0.610	26	1.1	-20	3.32
4	Plate F-6411-1	A 533B	0.040	0.640	26	1.1	-40	3.32
5	Plate F-6411-2	A 533B	0.040	0.650	26	1.1	0	3.32
6	Plate F-6411-3	A 533B	0.040	0.660	26	1.1	-60	3.32
7	Axial Weld 101-124A	Linde 124	0.030	0.060	25.9	1.1	-50	1.52
8	Axial Weld 101-124B	Linde 124	0.030	0.060	25.9	1.1	-50	2.70
9	Axial Weld 101-124C	Linde 124	0.030	0.060	25.9	1.1	-50	2.70
10	Axial Weld 101-142A	Linde 124	0.040	0.070	30.65	1.1	-50	1.52
11	Axial Weld 101-142B	Linde 124	0.040	0.070	30.65	1.1	-50	2.70
12	Axial Weld 101-142C	Linde 124	0.040	0.070	30.65	1.1	-50	2.70
13	Circ. Weld 101-171	Linde 124	0.050	0.070	34.05	1.1	-70	3.32

Outputs						
Methodology Used to Calculate ΔT_{30}:			Regulatory Guide 1.99, Revision 2			
	Controlling Material Region # (From Above)	RT_{MAX-XX} [R]	Fluence [10^{19} Neutron/cm^2, E>1 MeV]	Fluence Factor	ΔT_{30} [°F]	$TWCF_{95-XX}$
Axial Weld – AW	5	492.59	2.70	1.265	32.90	3.59E-17
Circumferential Weld - CW	5	493.87	3.32	1.315	34.18	8.02E-28
Plate – PL	5	493.87	3.32	1.315	34.18	8.71E-16
$TWCF_{95-TOTAL}$ ($\alpha_{AW}TWCF_{95-AW} + \alpha_{PL}TWCF_{95-PL} + \alpha_{CW}TWCF_{95-CW}$):						2.27E-15