



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 9, 2012

Mr. Randall K. Edington
Executive Vice President Nuclear/
Chief Nuclear Officer
Mail Station 7602
Arizona Public Service Company
P.O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 –
REQUEST FOR APPROVAL OF PROPOSED CHANGES TO THE REACTOR
PRESSURE VESSEL SURVILLANCE CAPSULE WITHDRAWAL SCHEDULES
(TAC NOS. ME7751, ME7752, AND ME7753)

Dear Mr. Edington:

By letter dated December 9, 2011, Arizona Public Service Company, the licensee for Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3 submitted a request for revision to the reactor vessel (RV) material surveillance capsule withdrawal schedule for PVNGS Units 1, 2, and 3. The proposed changes were submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, "Reactor Vessel Material surveillance Program Requirements," Section III.B.3, which requires that: (1) withdrawal schedules be submitted, as specified in 10 CFR 50.4, and (2) the proposed schedule must be approved by the U.S. Nuclear Regulatory Commission (NRC) prior to implementation

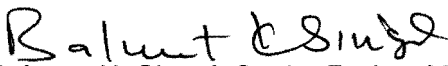
The NRC staff has reviewed the proposed withdrawal schedule for PVNGS, Units 1, 2, and 3, and determined that the changes to the schedule will continue to meet the RV surveillance capsule withdrawal schedule criteria in American Society for Testing and Materials (ASTM) E185-82, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels," and is in compliance with 10 CFR Part 50, Appendix H. The NRC staff, therefore, concludes that the RV withdrawal schedule, as proposed in the licensee's letter dated December 9, 2011, is acceptable for implementation. However, the NRC staff also concludes that the changes in the capsule withdrawal schedules for PVNGS Units 1, 2, and 3 do not completely address License Renewal Commitment No. 17 since the commitment required, in part, that the schedule be modified to withdraw capsules at 72 effective full power years (EFPY), which is not addressed by the proposed schedules. To fulfill License Renewal Commitment No. 17, the licensee will need to submit a revised schedule addressing the withdrawal of the capsules at 72 EFPY prior to the period of extended operation, which begins at midnight on June 1, 2025, for PVNGS Unit 1, April 24, 2026, for PVNGS, Unit 2, and November 25, 2027, for PVNGS, Unit 3.

R. Edington

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The NRC staff's safety evaluation is enclosed. If you have any questions, please contact me at (301) 415-3016 or via e-mail at balwant.singal@nrc.gov.

Sincerely,


Balwant K. Singal, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosure:
As stated

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REACTOR VESSEL SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATION STATION, UNITS 1, 2, AND 3

DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

1.0 INTRODUCTION

By letter dated December 9, 2011 (Reference 1), Arizona Public Service Company, the licensee for Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3, submitted a request for revision to the reactor vessel (RV) material surveillance capsule withdrawal schedule for PVNGS Units 1, 2, and 3. The proposed changes were submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," Section III.B.3, which requires that: (1) withdrawal schedules be submitted, as specified in 10 CFR 50.4, "Written communications," and (2) the proposed schedule must be approved by the U.S. Nuclear Regulatory Commission (NRC) prior to implementation.

The licensee's submittal indicates the purpose of the changes to the withdrawal schedules is to fulfill a license renewal commitment to change the withdrawal schedule to withdraw the next capsule at a fluence equivalent to the (RV clad-to-base metal fluence at 60 calendar years of operation or 54 effective full power years (EFPY), and to withdraw the remaining standby capsules at a fluence equivalent to the RV clad-to-base metal fluence at 80 calendar years of operation or 72 EFPY.

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.60, "Acceptance criteria for fracture prevention measures for lightwater nuclear power reactors for normal operation," require light-water reactors (LWRs) to meet the RV materials surveillance program requirements set forth in Appendix H to 10 CFR Part 50.

Appendix H to 10 CFR Part 50 provides the NRC staff's criteria for the design and implementation of RV material surveillance programs for operating LWRs. The rule, in part, requires RV surveillance program designs and withdrawal schedules to meet the requirements of the edition of American Society for Testing and Materials (ASTM) Standard Practice E185, "Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactors," that is current on the issue date of the American Society of Mechanical Engineers

Enclosure

Boiler and Pressure Vessel Code (ASME Code) to which the RV was purchased, although later editions of ASTM E185 may be used inclusive of the 1982 Edition of ASTM E185 (ASTM E185-82). The rule also requires proposed RV surveillance programs to be submitted to the NRC and approved prior to implementation. The applicable criteria in ASTM E185-82 are discussed in Section 3.1 of this safety evaluation (SE).

For plants applying for license renewal, Section XI.M31 of NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," (Reference 2), provides guidance for RV surveillance programs for the period of extended operation. The PVNGS Units 1, 2, and 3 License Renewal Application (LRA) dated December 11, 2008 (Reference 3), referenced Revision 1 of the GALL Report (GALL Report, Revision 1). Criteria 5 and 6 of the GALL Report, Revision 1, Section XI.M31 relate to surveillance capsule withdrawal schedules. Criterion 5 recommends that if an applicant has a surveillance program that consists of capsules with a projected fluence of less than the 60-year fluence at the end of 40 years, at least one capsule is to remain in the RV and is tested during the period of extended operation. The applicant may either delay withdrawal of the last capsule or withdraw a standby capsule during the period of extended operation to monitor the effects of long-term exposure to neutron irradiation.

Criterion 6 recommends, in part, that if an applicant has a surveillance program that consists of capsules with a projected fluence exceeding the 60-year fluence at the end of 40 years, the applicant withdraws one capsule at an outage in which the capsule receives a neutron fluence equivalent to the 60-year fluence and tests the capsule in accordance with the requirements of ASTM E185. Additional recommendations apply under Criterion 6 if capsules are either left in the RV after 40 years or for monitoring RV exposure conditions if all capsules have been removed.

Section 3.0.3.2.10 of the NRC Safety Evaluation Report (SER) related to the license renewal of PVNGS, Units 1, 2, and 3, April 2011 (Reference 4), documented the NRC staff's conclusion that Criterion 5 was applicable since no capsules would reach the 60-year RV fluence before the end of 40 years (32 EFPY). The licensee made an enhancement to the program to meet the recommendations of Criterion 5, which was captured by LRA Commitment No. 17. Section 2.1 of the licensee's submittal stated that the PVNGS Units 1, 2, and 3 LRA contained the following item in Commitment No. 17 in Table A4-1, as reflected in Appendix A of the related SER:

Prior to the period of extended operation: The [reactor pressure vessel surveillance program] schedule will be revised to withdraw the next capsule at the equivalent clad-base metal exposure of approximately 54 EFPY expected for the 60-year period of operation, and to withdraw remaining standby capsules at equivalent clad-base metal exposures not exceeding the 72 EFPY expected for a possible 80-year second period of extended operation. This withdrawal schedule is in accordance with NUREG-1801, Section XI.M31, item 6, and with the ASTM E 185-82 criterion which states that capsules may be removed when the capsule neutron fluence is between one and two times the limiting fluence calculated for the vessel at the end of expected life. This schedule change must be approved by the NRC, as required by 10 CFR 50 Appendix H.

3.0 TECHNICAL EVALUATION

3.1 Evaluation Criteria of ASTM Standard Practice E185-82

Table 1 of ASTM E185-82 requires that either a minimum of three, four, or five surveillance capsules be removed from the RVs, based on the limiting amount of the shift in the reference transition of the nil-ductility temperature (limiting ΔRT_{NDT}) that is projected to occur at the clad-vessel interface location of the RV at the end-of-licensed plant life (EOL). ASTM E185-82 establishes the following criteria for determining the minimum number of capsules that are to be removed in accordance with a withdrawal schedule and the number of capsules that are to be tested:

- For plants with projected RT_{NDT} shifts (i.e., ΔRT_{NDT}) less than 100 degrees Fahrenheit ($^{\circ}F$) (56 degrees Celsius ($^{\circ}C$)), three capsules are required to be removed from the RV and the first two capsules are required to be tested (for dosimetry, tensile-ductility, Charpy-V impact toughness, and alloying chemistry).
- For plants with projected ΔRT_{NDT} between 100 $^{\circ}F$ (56 $^{\circ}C$) and 200 $^{\circ}F$ (111 $^{\circ}C$), four surveillance capsules are to be removed from the RV and the first three capsules are required to be tested.
- For plants with projected ΔRT_{NDT} above 200 $^{\circ}F$ (111 $^{\circ}C$), five surveillance capsules are required to be removed from the RV and the first four capsules are required to be tested.
- Standard Practice ASTM E185-82 permits the last scheduled surveillance capsules in three-, four-, or five-capsule withdrawal schedules to be removed without the implementation of testing. However, licensees who opt to pull their final required capsules without the implementation of testing are required by the Standard Practice to hold the capsules in storage.

Table 1 of ASTM Standard Practice E185-82 also provides specific criteria for removal of surveillance capsules. The removal times are based on criteria that the surveillance capsules be removed after a certain amount of power operation has elapsed or at various times when the RV shell is projected to achieve certain levels of neutron fluence. The intent of the Standard Practice is to achieve a set of testing data over a range of neutron fluences for the RV that bounds the current life of the plant. Of key importance are the removal criteria for the final capsule required for capsule withdrawal. For the final capsule that is required for removal, ASTM E185-82 requires that the capsule be removed at a time when the neutron fluence projected for the capsule is between the limiting fluence value projected for the RV at the EOL and two times that value.

The applicant indicated that, based on information from the LRA for PVNGS, Units 1, 2, and 3, the maximum ΔRT_{PTS} at EOL for PVNGS Units 1, 2, and 3, are 57.7 $^{\circ}F$, 54 $^{\circ}F$, and 40.7 $^{\circ}F$, respectively. The NRC staff verified that these ΔRT_{PTS} values are consistent with the LRA (Reference 5) and that the values were approved in the SER (Reference 4). The applicant stated that in this context, ΔRT_{PTS} is equivalent to ΔRT_{NDT} . The NRC staff agrees that ΔRT_{PTS} is equivalent to ΔRT_{NDT} for this purpose since ASTM E185-82 specifies that for the purpose of

determining the number of capsules required, ΔRT_{NDT} at the clad-base metal interface is used. The method for calculation of ΔRT_{PTS} in 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events," is identical to the method of calculation of ΔRT_{NDT} specified by NRC Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," May 1988 (Reference 6), with the additional restriction that it is calculated using the fluence at the clad-to-base metal interface, whereas ΔRT_{NDT} may be calculated at any depth within the RV wall. Since the maximum ΔRT_{NDT} for the PVNGS Units 1, 2, and 3 RVs is less than 100 °F, the ASTM E185-82 criteria would require three surveillance capsules to be withdrawn, and two of the three to be tested.

3.2 Changes Proposed to the Withdrawal Schedule for PVNGS, UNITS 1, 2, and 3

In the enclosure to its submittal (Reference 1), the licensee provided markups of Updated Final Safety Analysis Report (UFSAR) Tables 5.3-18, 5.3-19, and 5.3-19A, for PVNGS Units 1, 2, and 3, respectively, which contain the capsule number, azimuthal location, scheduled removal time expressed as a range of EFPY, and base metal material included. The attachment to Reference 1 also contains markups of UFSAR Tables 5.3-13, 5.3-14, and 5.3-15 for PVNGS Units 1, 2, and 3, respectively, which contain the withdrawal schedules expressed as a range of EFPY for each capsule plus information on the location, materials, and specimen type for each capsule. Tables 3.2-1, 3.2-2, and 3.2-3 of Reference 1 contain the capsule number, azimuthal location in degrees, lead factor, withdrawal EFPY (actual or projected), and neutron fluence (actual or projected). For each unit, actual EFPY and neutron fluence values are provided for the capsules that have been withdrawn to date (three capsules for PVNGS, Unit 1 and two capsules each for PVNGS, Units 2 and 3). The only actual change to the current schedule is a change in the scheduled EFPY range of withdrawal for the 310-degree capsule for each unit such that the minimum allowable withdrawal EFPY results in a capsule fluence equivalent to the EOL (54 EFPY) peak RV neutron fluence at the clad-base metal interface.

Tables 1, 2, and 3 below provides the capsule number, azimuthal location, lead factor, and the current and proposed surveillance capsule withdrawal schedules in terms of EFPY and fluence, for PVNGS Units 1, 2, and 3. The information for the proposed withdrawal schedules is based on Tables 3.2-1, 3.2-2, and 3.2-3 from the licensee's submittal (for the capsule lead factors and fluences), and UFSAR Tables 5.3-13, 5.3-14, 5.3-15, 5.3-18, 5.3-19, and 5.3-19A from the licensee's submittal (for withdrawal EFPY range for the last capsule). The information on the current withdrawal schedules is based on the (original) information provided in UFSAR Tables 5.3-18, 5.3-19, and 5.3-19A and the current estimated neutron fluence and EFPY at withdrawal for the last capsule is from the most recent surveillance capsule reports for each unit (References 7, 8, and 9).

Table 1 - PVNGS, Unit 1 - Current and Proposed Withdrawal Schedule

Capsule (a)	Location (degrees) ^(a)	Lead Factor (a)	Current Schedule		Proposed Schedule	
			Withdrawal EFPY	Fluence (n/cm ²) (E >1.0 MeV) (Actual/ Estimated)	Withdrawal EFPY	Fluence (n/cm ²) (E >1.0 MeV) (Actual/ Estimated)
3	137	1.34	4.57 ^(b)	3.65x10 ¹⁸ ^(b)	4.57 ^(e)	3.65x10 ¹⁸ ^(e)
1	38	1.33	9.76 ^(b)	6.28x10 ¹⁸ ^(b)	9.76 ^(e)	6.28x10 ¹⁸ ^(e)
5	230	1.35	13.83 ^(b)	8.76x10 ¹⁸ ^(b)	13.83 ^(e)	8.76x10 ¹⁸ ^(e)
6	310	1.35	23.7 ^(c) (18-24) ^(d)	1.49x10 ¹⁹ ^(c)	40 ^(g) (40-44) ^(f)	2.56x10 ¹⁹ ^{(g)(h)}
2	43	1.35	Standby ^(d)		Standby ^(f)	
4	142	1.35	Standby ^(d)		Standby ^(f)	

- (a) From Table 3.2-1 of Reference 1.
- (b) Actual values from Table 7-1 of WCAP-16374-NP (Reference 7).
- (c) Estimated value from Table 7-1 of WCAP-16374-NP (Reference 7).
- (d) Current schedule from Table 5.3-18 of Attachment 1 to Reference 1.
- (e) Actual values from Table 3.2-1 of Reference 1.
- (f) Proposed schedule from Table 5.3-18 of Attachment to Reference 1.
- (g) Estimated value from Table 3.2-1 of Reference 1.
- (h) Pre-power uprate peak RV neutron fluence was 2.51x10¹⁹ n/cm².

Table 2 - PVNGS, Unit 2 - Current and Proposed Withdrawal Schedule

Capsule (a)	Location (degrees) ^(a)	Lead Factor ^(a)	Current Schedule		Proposed Schedule	
			Withdrawal EFPY	Fluence (n/cm ²) (E >1.0 MeV) (Actual/ Estimated)	Withdrawal EFPY	Fluence (n/cm ²) (E >1.0 MeV) (Actual/ Estimated)
3	137	1.38	4.54 ^(b)	3.87x10 ¹⁸ ^(b)	4.54 ^(e)	3.87x10 ¹⁸ ^(e)
5	230	1.39	14.35 ^(b)	9.92x10 ¹⁸ ^(b)	14.35 ^(e)	9.92x10 ¹⁸ ^(e)
6	310	1.39	23.4 ^(c) (18-24) ^(d)	1.66x10 ¹⁹ ^(c)	39 ^(g) (39-43) ^(f)	2.83x10 ¹⁹ ^(g)
1	38	1.37	Standby		Standby ^(f)	
2	43	1.38	Standby		Standby ^(f)	
4	142	1.37	Standby		Standby ^(f)	

- (a) From Table 3.2-2 of Reference 1.
- (b) Actual values from Table 7-1 of WCAP-16524-NP (Reference 8).
- (c) Estimated value from Table 7-1 of WCAP-16524-NP (Reference 8).
- (d) Current schedule from Table 5.3-19 of Attachment 1 to Reference 1.
- (e) Actual values from Table 3.2-2 of Reference 1.
- (f) Proposed schedule from Table 5.3-19 of Attachment to Reference 1.
- (g) Estimated value from Table 3.2-2 of Reference 1.

Table 3 - PVNGS, Unit 3 - Current and Proposed Withdrawal Schedule

Capsule (a)	Location (degrees) ^(a)	Lead Factor ^(a)	Current Schedule		Proposed Schedule	
			Withdrawal EFPY	Fluence (n/cm ²) (E >1.0 MeV) (Actual/ Estimated)	Withdrawal EFPY	Fluence (n/cm ²) (E >1.0 MeV) (Actual/ Estimated)
4	137	1.28	4.44 ^(b)	3.48x10 ¹⁸ ^(b)	4.44 ^(e)	3.48x10 ¹⁸ ^(e)
5	230	1.31	13.75 ^(b)	9.07x10 ¹⁸ ^(b)	13.75 ^(e)	9.07x10 ¹⁸ ^(e)
6	310	1.31	24.9 ^(c) (18-24) ^(d)	1.71x10 ¹⁹ ^(c)	42 ^(g) (42-46) ^(f)	2.99x10 ¹⁹ ^{(g)(h)}
2	43	1.30	Standby		Standby ^(f)	
3	142	1.28	Standby		Standby ^(f)	
1	38	1.28	Standby		Standby ^(f)	

- (a) From Table 3.2-3 of Reference 1.
- (b) Actual values from Table 7-1 of WCAP-16449-NP (Reference 9).
- (c) Estimated value from Table 7-1 of WCAP-16449-NP (Reference 9).
- (d) Current schedule from Table 5.3-19A of Attachment 1 to Reference 1.
- (e) Actual values from Table 3.2-3 of Reference 1.
- (f) Proposed schedule from Table 5.3-19A of Attachment to Reference 1.
- (g) Estimated value from Table 3.2-3 of Reference 1.
- (h) Pre-power uprate peak RV fluence was 2.93x10¹⁹ n/cm².

The footnotes to Tables 3.2-1, 3.2-2, and 3.2-3 of Reference 1 indicate that the 54-EFPY peak RV clad-to-base metal fluence values are from a revised neutron fluence analysis accounting for power uprate described in WCAP-16835-NP, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3; Basis for RCS [Reactor Coolant System] Pressure and Temperature Limits Report" (Reference 10), and approved by the NRC staff in License Amendment No. 178 dated February 25, 2010 (Reference 11). These neutron fluence values are slightly greater than the peak RV clad-to-base metal neutron fluences reported in the most recent surveillance capsule reports for PVNGS, Units 1 and 3 (References 7 and 9), while the neutron fluence values in Reference 7 and the most recent surveillance capsule report for PVNGS, Unit 2 (Reference 8), are identical.

The estimated neutron fluence values corresponding to withdrawal of the 310-degree capsule in Tables 3.2-1, 3.2-2, and 3.2-3 of Reference 1 are for the minimum EFPY value for the range of proposed withdrawal EFPY. Since a range of EFPY is permitted for the withdrawal in the proposed schedule, the NRC staff calculated the neutron fluence corresponding to the maximum EFPY value based on the neutron fluence information provided in Tables 1-2, 1-3, and 1-4 of Reference 10. Using the results of this calculation, the NRC staff confirmed that the neutron fluence corresponding to the maximum allowable EFPY value for the 310-degree capsule for each unit would be between one and two times the maximum neutron fluence at the RV clad-to-base metal interface at EOL. For each unit, withdrawal of the 310-degree capsule at the maximum EFPY allowed would result in a ratio of the capsule fluence to the RV clad-base metal interface EOL neutron fluence of approximately 1.1, which is well within the range specified in ASTM E185-82 and is, therefore, acceptable.

The NRC staff notes that the proposed surveillance capsule withdrawal schedules for PVNGS, Units 1, 2, and 3, do not address the requirement of LRA Commitment No. 17 to withdraw the remaining standby capsules at equivalent clad-base metal exposures not exceeding 72 EFPY. Therefore, although the proposed change fulfills the first part of Commitment No. 17 to withdraw a capsule at a neutron fluence equivalent to the peak RV fluence at 60 years (54 EFPY), the NRC staff concludes that Commitment No. 17 is not completely fulfilled by the proposed changes. To fulfill Commitment No. 17, the licensee will need to submit a revised schedule addressing the withdrawal of the capsules at 72 EFPY prior to the period of extended operation, which begins at midnight on June 1, 2025, for PVNGS Unit 1, April 24, 2026, for PVNGS, Unit 2, and November 25, 2027, for PVNGS, Unit 3.

The NRC staff reviewed the proposed withdrawal schedule for PVNGS, Units 1, 2, and 3 against the criteria of ASTM E185-82. The NRC staff concludes that the proposed withdrawal schedule is acceptable because the last capsule for each unit will be withdrawn at a neutron fluence at least once and less than twice the EOL RV fluence, which meets the criterion of ASME E185-82 for a three-capsule schedule.

4.0 CONCLUSION

The NRC staff has reviewed the licensee's proposed surveillance capsule withdrawal schedule for PVNGS, Units 1, 2, and 3, as provided in the proposed changes to UFSAR Tables 5.3-13, 5.3-14, 5.3-15, 5.3-18, 5.3-19, and 5.3-19A, included in the Enclosure to Reference 1, and concludes that the changes to the schedule will continue to meet the RV surveillance capsule withdrawal schedule criteria in ASTM E185-82, and is in compliance with 10 CFR Part 50, Appendix H. The NRC staff concludes, therefore, that the RV surveillance capsule withdrawal schedule, as proposed in the Enclosure to Reference 1, is acceptable for implementation. However, the NRC staff also concludes that the changes in the capsule withdrawal schedules for PVNGS Units 1, 2, and 3 do not completely address LRA Commitment No. 17 since the commitment required the schedule to be modified to withdraw capsules at 72 EFPY, which is not addressed by the proposed schedules. To fulfill Commitment No. 17, the licensee will need to submit a revised schedule addressing the withdrawal of the capsules at 72 EFPY prior to the period of extended operation, which begins at midnight on June 1, 2025, for PVNGS Unit 1, April 24, 2026, for PVNGS, Unit 2, and November 25, 2027, for PVNGS, Unit 3.

5.0 REFERENCES

1. Mims, D. C., Arizona Public Service Company, letter to U.S. Nuclear Regulatory Commission, "Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3 Docket Nos. STN 50-528, 50-529, and 50-530 Request for Approval of Proposed Changes to the Reactor Pressure Vessel Surveillance Capsule Withdrawal Schedules," dated December 9, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML11356A086).
2. U.S. Nuclear Regulatory Commission, NUREG-1801, "Generic Aging Lessons Learned (GALL) Report, July 2001 (ADAMS Accession Nos. ML012060392, ML012060539, and ML012060521); NUREG-1801, Revision 1, September 2005 (ADAMS Accession Nos. ML052770419 and ML052110006).

3. Mims, D. C., Arizona Public Service Company, letter to U.S. Nuclear Regulatory Commission, "Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3, Docket Nos. STN 50-528, 50-529, and 50-530, License Renewal Application," dated December 11, 2008 (ADAMS Accession No. ML083510627).
4. U.S. Nuclear Regulatory Commission, NUREG-1961, "Safety Evaluation Report Related to the License Renewal of Palo Verde Nuclear Generating Station, Units 1, 2, and 3," April 2011 (ADAMS Accession No. ML11095A011).
5. Arizona Public Service Company, "Chapter 4: Time-Limited Aging Analysis," (ADAMS Accession No. ML083510615), from the Palo Verde Nuclear Generating Station, Units 1, 2, and 3 License Renewal Application (Reference 3).
6. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," May 1988 (ADAMS Accession No. ML003740284).
7. Westinghouse Electric Company, LLC, WCAP-16374-NP, Revision 0, "Analysis of Capsule 230° from Arizona Public Service Company Palo Verde Unit 1 Reactor Vessel Radiation Surveillance Program," February 2005 (*not publicly available*).
8. Westinghouse Electric Company, LLC, WCAP-16524-NP, Revision 0, "Analysis of Capsule 230° from Arizona Public Service Company Palo Verde Unit 2 Reactor Vessel Radiation Surveillance Program," February 2006 (ADAMS Accession No. ML061040593).
9. Westinghouse Electric Company, LLC, WCAP-16449-NP, Revision 0, "Analysis of Capsule 230° from Arizona Public Service Company Palo Verde Unit 3 Reactor Vessel Radiation Surveillance Program," August 2005 (*not publicly available*).
10. Westinghouse Electric Company, LLC, WCAP-16835-NP, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3; Basis for RCS Pressure and Temperature Limits Report," June 2008 (ADAMS Accession No. ML090641016).
11. Hall, J. R., U.S. Nuclear Regulatory Commission, letter to Randall K. Edington, Arizona Public Service Company, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 – Issuance of Amendments RE: Relocation of Certain Technical Specification Requirements to the Pressure and Temperature Limits Report," dated February 25, 2010 (ADAMS Accession No. ML100480188).

Principal Contributor: Jeffrey C. Poehler

Date: April 9, 2012

R. Edington

- 2 -

The NRC staff's safety evaluation is enclosed. If you have any questions, please contact me at (301) 415-3016 or via e-mail at balwant.singal@nrc.gov.

Sincerely,

/RA/

Balwant K. Singal, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosure:
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