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102-05923-DCM/RAS/MWF
November 13, 2008

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 Request for Amendments to Technical Specification (TS) 3.5.5, Refueling Water Tank (RWT), to Increase the RWT Minimum Water Level for Units 1 and 3 and Incorporate Editorial Changes for Units 1, 2, and 3

Pursuant to 10 CFR 50.90, Arizona Public Service Company (APS) hereby requests to amend PVNGS Operating License Nos. NPF-41, NPF-51, and NPF-74, by amending the PVNGS Technical Specifications that are incorporated as Appendix A to the Operating Licenses for PVNGS Units 1, 2, and 3. As detailed further in Enclosure 1 to this letter, the proposed amendments would modify Technical Specification (TS) 3.5.5, Refueling Water Tank (RWT), for PVNGS Units 1 and 3 to increase the minimum required RWT level indications and the corresponding borated water volumes in TS Figure 3.5.5-1 by 3 percent. In addition, the proposed amendments would incorporate editorial changes to TS Figure 3.5.5-1 for PVNGS Units 1, 2, and 3 to provide consistent formatting of the RWT volumetric values provided in the figure.

Enclosure 1 to this letter provides a detailed description of, and reason for, the proposed TS changes, as well as technical and regulatory evaluations of the changes. The evaluations of these changes in Enclosure 1 include the basis for a determination that the proposed amendments do not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c). Proposed TS page markups and retyped TS pages are included as Attachments 1 and 2, respectively, to Enclosure 1. An informational copy of the affected TS Bases page markups is also provided as Attachment 3 to Enclosure 1.

The substantive changes proposed herein to TS 3.5.5 for Units 1 and 3 are materially the same as those previously approved by the Nuclear Regulatory Commission (NRC) for PVNGS Unit 2. Specifically, the NRC issued PVNGS License Amendment No. 169 on May 9, 2008 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML081270305), approving a similar change to TS 3.5.5 for PVNGS

A001
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Unit 2 (under exigent circumstances) to increase the RWT minimum water level by 3 percent.

The NRC issued PVNGS License Amendment No. 169 in response to APS application dated April 10, 2008 (ADAMS Accession No. ML081080116), as supplemented by APS letter dated April 30, 2008 (ADAMS Accession No. ML081280495). The supplemental letter dated April 30, 2008, provided a response to an NRC request for additional information (RAI) that clarified the application subsequently approved by the NRC. This RAI response previously provided for the approved TS 3.5.5 change for PVNGS Unit 2 is pertinent to the TS amendments proposed herein for Units 1 and 3. Therefore, to facilitate the NRC's review, the RAI questions and APS response to each question are provided as Enclosure 2 to this letter.

Approval of the proposed amendments is requested by September 30, 2009. Once approved, the amendments shall be implemented within 60 days.

In accordance with the PVNGS Quality Assurance Program, the Plant Review Board and the Offsite Safety Review Committee have reviewed and concurred with these proposed amendments. By copy of this letter, this submittal is being forwarded to the Arizona Radiation Regulatory Agency (ARRA) pursuant to 10 CFR 50.91(b)(1).

No commitments are being made to the NRC by this letter. If there are any questions or if additional information is needed, please contact Russell A. Stroud, Licensing Section Leader, at (623) 393-5111.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 11/13/08
(Date)

Sincerely,

D.C. Mims

DCM/RAS/MWF/gat

Enclosures

1. Evaluation of the Proposed Change (with attachments)
2. Response to NRC Request for Additional Information Previously Addressed for PVNGS Unit 2 Exigent Refueling Water Tank Technical Specification Change

cc:	E. E. Collins Jr.	NRC Region IV Regional Administrator
	B. K. Singal	NRC NRR Project Manager
	R. I. Treadway	NRC Senior Resident Inspector for PVNGS
	A. V. Godwin	Arizona Radiation Regulatory Agency (ARRA)
	T. Morales	Arizona Radiation Regulatory Agency (ARRA)

ENCLOSURE 1

Evaluation of the Proposed Change

Subject: **Request for Amendments to Technical Specification 3.5.5, Refueling Water Tank (RWT), to Increase the RWT Minimum Water Level for Units 1 and 3 and Incorporate Editorial Changes for Units 1, 2, and 3**

ATTACHMENTS:

1. Technical Specification Markup
2. Retyped Technical Specification
3. Technical Specification Bases Markups

1. SUMMARY DESCRIPTION

This evaluation supports an Arizona Public Service Company (APS) request to amend Operating Licenses NPF-41, NPF-51, and NPF-74 by amending the PVNGS Technical Specifications that are incorporated as Appendix A to the Operating Licenses for PVNGS Units 1, 2, and 3. The proposed amendments would modify Technical Specification (TS) 3.5.5, Refueling Water Tank (RWT), to increase the minimum required RWT level indications and the corresponding borated water volumes in TS Figure 3.5.5-1 by 3 percent for Units 1 and 3. This change will ensure that there is adequate water volume available in the RWT to ensure that the engineered safety feature (ESF) pumps and the new containment recirculation sump strainers will meet their design functions during loss of coolant accidents (LOCAs). In addition, the proposed amendments would incorporate editorial changes to TS Figure 3.5.5-1 to provide consistent formatting of the RWT volumetric values provided in the figure for Units 1, 2, and 3.

2. DETAILED DESCRIPTION

As indicated in the attachments to this evaluation, the proposed amendments involve a substantive component and an editorial component. The substantive component entails the proposed revision of TS 3.5.5 for Units 1 and 3 to raise the required minimum RWT level indications and the corresponding water volume values shown in TS Figure 3.5.5-1 by 3 percent. This change revises the minimum level indications and the corresponding water volumes used to determine operability of the RWT from 210 °F through 600 °F (i.e., to ensure that there is adequate volume available for the design functions of the RWT). This change will ensure that there is adequate water volume in the containment to meet the functional requirements of the ESF pumps and the containment sump strainers for applicable design basis accidents and break scenarios. The RWT water volumes corresponding to the TS Figure 3.5.5-1 level instrument readings include margin to ensure the minimum required RWT water volumes are maintained available.

New larger containment sump strainers were installed in Unit 1 in the spring of 2007 and in Unit 3 in the fall of 2007. As a result of containment flooding calculation validation efforts in response to Nuclear Regulatory Commission (NRC) Generic Letter (GL) 2004-02 (Reference 6.1), APS reevaluated the flooding calculations and associated minimum RWT water levels for PVNGS. For the majority of the pipe break locations in the containment, the existing TS minimum RWT levels and corresponding water volumes were verified to be adequate to ensure sufficient flood level for strainer submergence and ESF pump operation. However, a more limiting break scenario was identified that results in the current TS minimum RWT Levels, as shown in TS Figure 3.5.5-1, being non-conservative. This may result in the strainers not being fully submerged post-LOCA at the time of the recirculation actuation signal (RAS) for this break scenario. There is no operability concern for any of the PVNGS units because the RWT minimum level in PVNGS Units 1 and 3 is being administratively controlled 3 percent above the current TS Figure 3.5.5-1 levels, and as detailed further below, the TS minimum RWT water level for PVNGS Unit 2 already has been increased by 3 percent as requested herein for Units 1 and 3.

The reevaluation of the TS minimum RWT levels was noted in an APS supplemental response to NRC GL 2004-02 dated February 29, 2008 (Reference 6.2, Paragraph 3.g.12). Based on the reevaluation, by letters dated April 10, 2008 (Reference 6.3), and April 30, 2008 (Reference 6.4), APS requested NRC approval of a change (under exigent circumstances) to the TS RWT minimum water level for Unit 2. The exigent circumstances were warranted for Unit 2, as it entered into a refueling outage on March 29, 2008, and during this outage the new containment sump strainers were installed as part of APS' commitments related to GL 2004-02. Without the expedited amendment, the 10 CFR 50.59 evaluation for the Unit 2 strainers modification could not be completed and Unit 2 entry into Mode 4 would have been significantly delayed. The NRC approved the exigent change for Unit 2 in PVNGS License Amendment No. 169, issued May 9, 2008 (Reference 6.5).

The changes proposed herein to TS 3.5.5 for Units 1 and 3 are materially the same as the PVNGS Unit 2 change previously approved by the NRC in Amendment No. 169. It should be noted that the minimum RWT water level issue was not known when the new containment sump strainers for Units 1 and 3 were installed during their 2007 outages. Thus, TS changes similar to that approved for Unit 2 had not been requested for Units 1 and 3. However, as a result of the discovery of this issue, and consistent with the guidance in NRC Administrative Letter 98-10 (Reference 6.6), the RWT minimum levels in PVNGS Units 1 and 3 are being administratively controlled 3 percent above the current TS Figure 3.5.5-1 levels while this license amendment is pursued.

The editorial component of the proposed amendment serves to provide consistent formatting of the volumetric values provided in TS Figure 3.5.5-1 for PVNGS Units 1, 2, and 3. Specifically, TS Figure 3.5.5-1 currently uses two different formats to designate the volume information provided. It either provides only the whole digits above one thousand followed by a "K" to designate a multiplier of one thousand (e.g., 600K), or the full volume numbers are written out (e.g., 600,000). For consistency, the volume information provided in the figure is changed such that it is presented in full number format.

3. TECHNICAL EVALUATION

The licensing basis for the new larger containment sump strainers is described in PVNGS Updated Final Safety Analysis Report (UFSAR) Section 6.2.2.2.2 (Reference 6.7). The containment recirculation sumps provide for the collection of reactor coolant and chemically reactive spray solutions following a LOCA. Thus, the sumps serve as water sources to effect long-term recirculation for the functions of residual heat removal, emergency core cooling, and containment atmosphere cleanup.

During post-LOCA recirculation, the suction supply for the emergency core cooling system (ECCS) and containment spray system (CSS) pumps is provided by two containment recirculation sumps, one for each safety-related train. The sumps are located on the lowest floor in the containment building and are physically separated to preclude simultaneous damage to both. At a specified RWT level, both the high pressure safety injection (HPSI) and the CSS pump suctions are automatically switched from the RWT to the containment recirculation sumps by a RAS from the engineered safety features actuation system (ESFAS).

UFSAR Section 6.2.2.2.2.G states that for the new sump strainer design: "With the horizontal cassette pocket (specialty) design, the strainers consist of both vertical and horizontal flow paths through the screening elements. All pockets are submerged at the minimum post-LOCA flood level."

TS Bases B 3.5.5 states that this limiting condition for operation (LCO) ensures that sufficient water volume exists in the containment sump to support continued operation of the engineered safety features pumps at the time of transfer to the recirculation mode of cooling and that insufficient water inventory in the RWT could result in insufficient cooling capacity of the ECCS when the transfer to the recirculation mode occurs.

As indicated in Section 2 above, the containment flooding calculations for PVNGS have been reevaluated (Reference 6.8) as a result of efforts in response to NRC GL 2004-02 (Reference 6.1). For the majority of the pipe break locations in the containment, the existing TS minimum RWT levels and corresponding water volumes are adequate to ensure sufficient flood level for strainer submergence and ESF pump operation. However, a more limiting break scenario has been identified that results in the current TS minimum RWT levels as shown in TS Figure 3.5.5-1 being non-conservative. This may result in the strainers not being fully submerged post-LOCA at the time of the RAS for this break scenario.

The scenario of concern is a small break LOCA involving a break at the top of the pressurizer. This break has a limited cross section and results in the reactor coolant system (RCS) pressure remaining above 600 psia which limits the spillage to the containment floor from the RCS and does not allow the safety injection (SI) tanks to inject.

In the evaluation of this scenario, the flood water source is limited to the volume of water in the RWT and considers potential flood volume losses from water diverted to the chemical volume and control system and water postulated to be held on wetted surfaces and delayed in containment. The strainers were designed based on a minimum flood level elevation of 84'-6". This minimum flood level ensures that the strainers are submerged to prevent vortexing and that adequate net positive suction head is available to support continued ESF pump operation after the switchover to recirculation. The evaluation shows that the minimum flood level equates to 543,200 gallons (at 600 °F) of water delivered from the RWT to the RCS and containment prior to the RAS for the small break scenario. To ensure the required delivered volume is available, the minimum RWT indicated level is conservatively set at 83 percent of scale (at 600 °F). This indicated level conservatively considers instrument inaccuracies for the indicators used to verify RWT level, the switchover for RAS, and average RCS temperature.

The analyses for determining the new minimum required RWT level and associated water volume are based on current design information and assumptions that in many cases provide an inherent margin in the analyses (References 6.8 and 6.9). Some of these assumptions include:

- The flooding calculation used inputs and assumptions that minimize credited spillage volumes and maximize hold up volumes.
- The water available from the RWT was limited to the upper limit of a RAS initiation signal. This conservatively assumes the RWT outlet check valves close on a high back pressure condition, which may not exist in some break scenarios.
- The instrument analysis used post-seismic conditions for establishing instrument uncertainties that are slightly larger than normal.
- Uncertainty for electrical instruments (the current to voltage converter and indicator in particular) was used that is greater than past operating experience has shown.
- The minimum required RWT level is established based on flooding to Elevation 84'-6" for the limiting flooding scenario (i.e., a small break LOCA at the top of the pressurizer). For this scenario, ESF pump flow would be lower and generated debris would be significantly less than for the design basis large break LOCA. However, the suction line head losses from the design basis large break LOCA were assumed.

The required minimum flood level of Elevation 84'-6" is approximately 2 inches above the top of the sump strainers. It is expected that further testing would demonstrate acceptable strainer performance (no vortexing) at a flood level below Elevation 84'-6" for the small break LOCA.

The impacts of the increased minimum RWT water volume on maximum containment flood level and sump pH were evaluated. The calculated maximum containment flood level is based on the RWT water level associated with the bottom of the RWT overflow nozzle. This change does not revise the location of the RWT overflow nozzle and there is no change in the calculated maximum flood level. As a result, the proposed change has no impact on the qualification of equipment above the maximum containment flood level.

The impact of the proposed change on post-LOCA sump pH was evaluated and found to be bounded by the current analysis for post-LOCA sump pH. In that analysis, the calculated minimum post-LOCA sump pH is based on the maximum RWT water level associated with the bottom of the RWT overflow nozzle. The maximum flood level is not affected by this change. In addition, the change is conservative with respect to the calculated maximum post-LOCA sump pH since it is increasing the minimum required RWT volume. Specifically, the maximum post-LOCA sump pH is calculated based on an assumed minimum RWT level (to minimize sump boron concentration and required Tri-Sodium Phosphate), since a lower assumed minimum RWT level would result in a higher calculated maximum pH. Thus, the current calculated maximum post-LOCA sump pH remains bounding for the proposed increase in the TS minimum RWT water level.

The editorial changes have no technical effect on the information being provided and only provide consistency in the format used to represent volumetric values.

4. REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 50 Appendix A (Reference 6.10), General Design Criterion (GDC) 13, "Instrumentation and Control," requires instrumentation and control to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges. The proposed change modifies the TS limits surveilled by the operators to ensure that the ECCS, CSS and containment recirculation strainers will continue to operate as designed for all accident conditions.

10 CFR 50 Appendix A, GDC 16, "Containment Design," requires a reactor containment and associated systems be provided to establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to ensure the containment design conditions important to safety are not exceeded for as long as postulated accident conditions require. The proposed change modifies the minimum water volume contained in the RWT, which will ensure that the CSS and containment recirculation strainers will continue to operate as designed to maintain the integrity of the containment for all accident conditions.

10 CFR 50 Appendix A, GDC 35, "Emergency Core Cooling," requires abundant emergency core cooling be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts. The proposed change modifies the minimum water volume contained in the RWT, which will ensure that the ECCS and containment recirculation strainers will continue to operate as designed to maintain the integrity of the core for all accident conditions.

10 CFR 50 Appendix A, GDC 38, "Containment Heat Removal," requires a system to remove heat from the reactor containment be provided. The system function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any LOCA and maintain them at acceptably low levels. The proposed change modifies the minimum water volume contained in the RWT, which will ensure that the CSS and containment recirculation strainers will continue to operate as designed to maintain the required heat removal from the containment for all accident conditions.

Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," Revision 0 dated June 1974 (Reference 6.11), describes criteria and methods acceptable to the NRC staff for implementing NRC requirements, including GDC 35 and GDC 38, with respect to the water source for emergency core cooling and containment heat removal. Consistent with this regulatory guide and the NRC GDC, the proposed change modifies the minimum water volume contained in the RWT to ensure that the water sources available for long term cooling and containment heat removal are adequate for all design basis accident conditions.

NUREG/CR-6874, "GSI-191: Experimental Studies of Loss-of-Coolant-Accident-Generated Debris Accumulation and Head Loss with Emphasis on the Effects of Calcium Silicate Insulation," dated May 2005 (Reference 6.12), addresses the issue of debris accumulation on the containment sump screen/strainer and consequential loss of ECCS pump net positive suction head. Consistent with NUREG/CR-6874, the change proposed herein to the minimum RWT water level has been established with consideration for potential debris accumulation to ensure there is adequate head for the ECCS and CSS to operate as designed in all design basis accidents.

NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents At Pressurized-Water Reactors," dated September 13, 2004 (Reference 6.1), required licensees to evaluate the potential for adverse effects of post-accident debris blockage on recirculation functions of the ECCS and CSS, and to implement any plant modifications identified as being necessary. As discussed in Section 2 above, as a result of containment flooding calculation validation efforts in response to NRC GL 2004-02, APS reevaluated the containment flooding calculations and associated minimum RWT water levels for PVNGS. The resultant change proposed herein to the TS minimum RWT water level has been established with consideration for potential post-accident debris blockage to ensure that there is adequate water level at the containment recirculation sump strainers for the ECCS and CSS to operate as designed in all design basis accidents.

4.2 Precedent

The substantive changes proposed herein to TS 3.5.5 for PVNGS Units 1 and 3 are materially the same as those previously approved by the NRC for PVNGS Unit 2.

Specifically, by APS letter dated April 10, 2008 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML081080116; Reference 6.3), as supplemented by APS letter dated April 30, 2008 (ADAMS Accession No. ML081280495; Reference 6.4), APS requested NRC approval of a similar change to TS 3.5.5 for PVNGS Unit 2 (under exigent circumstances) to increase the RWT minimum water level by 3 percent. The NRC approved that exigent change in License Amendment No. 169, issued May 9, 2008 (ADAMS Accession No. ML081270305; Reference 6.5).

4.3 No Significant Hazards Consideration Determination

As described below, APS has determined that the TS amendments proposed herein do not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c). This determination is based on evaluation with respect to the specific criteria of 10 CFR 50.92(c) as follows:

1. Do the proposed amendments involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed substantive change will increase the TS RWT minimum water level for PVNGS Units 1 and 3 by 3 percent to ensure that there is adequate water volume available at the containment recirculation sumps for the limiting small break LOCA scenario. As detailed in Sections 2 and 3 of this evaluation, this change ensures sufficient flood level for strainer submergence and ESF pump operation.

   The RWT water volume is not an initiator of any accident previously evaluated. As a result, the probability of an accident previously evaluated is not affected. The proposed change does not alter or prevent the ability of structures, systems, and components from performing their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits.

   The effect of the proposed changes in RWT minimum water level on containment flood level, equipment qualification, and containment sump pH remain within the limits assumed in the design and accident analyses. The calculated maximum containment flood level is based on the RWT water level associated with the bottom of the RWT overflow nozzle. This change does not revise the location of the RWT overflow nozzle and there is no change in the calculated maximum flood level. As a result, the proposed change has no impact on the qualification of equipment above the maximum containment flood level.

   The impact of the proposed change on post-LOCA sump pH was evaluated and found to bounded by the current analysis for post-LOCA sump pH. In that analysis, the calculated minimum post-LOCA sump pH is based on the maximum RWT water level associated with the bottom of the RWT overflow nozzle. The maximum flood level is not affected by this change. In addition, the change is conservative with respect to the calculated maximum post-LOCA sump pH since it is increasing the minimum required RWT volume. Specifically, the maximum post-LOCA sump pH is calculated based on an assumed minimum RWT level (to minimize sump boron concentration and required Tri-Sodium Phosphate), since a lower assumed minimum RWT level would result in a higher calculated maximum pH. Thus, the current calculated maximum post-LOCA sump pH remains bounding for the proposed increase in the TS minimum RWT level.

The proposed change does not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. Further, the proposed change does not increase the types or amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposures. The proposed change is consistent with the safety analysis assumptions and resultant consequences.

The proposed editorial TS changes are made only to ensure consistency in the formatting of volumetric values and would not materially affect the intent or content of the TS. As such, the editorial changes do not affect the probability or consequences of an accident previously evaluated.

Therefore, the proposed amendments do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Do the proposed amendments create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed change to raise the required RWT minimum water level does not change a design function or operation of structures, systems, and components. The proposed change does not create new failure mechanisms, malfunctions, or accident initiators not already considered in the design basis. The proposed change does not involve a physical alteration of the plant (i.e., no new or different components or physical changes are involved with this change) or a change in the methods governing normal plant operation. Finally, the proposed change does not alter any assumptions made in the safety analysis.

   The proposed editorial TS changes are made only to ensure consistency in the formatting of volumetric values and would not materially affect the intent or content of the TS. As such, the editorial changes do not create the possibility of an accident.

Therefore, the proposed amendments do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Do the proposed amendments involve a significant reduction in a margin of safety?

   Response: No.

   The proposed change to raise the required RWT minimum water level does not alter the manner in which safety limits, limiting safety system settings or limiting conditions for operation are determined. The safety analysis acceptance criteria are not affected by this change. The proposed change will not result in plant operation in a configuration outside of the design basis.

   The proposed editorial TS changes are made only to ensure consistency in the formatting of volumetric values and would not materially change the intent of the TS. As such, the editorial changes do not modify any margin of safety.

   Therefore, the proposed amendments do not involve a significant reduction in a margin of safety.

Based on the above, APS concludes that the proposed amendments do not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

5. ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendments would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendments do not involve (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendments meet the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendments.

6. REFERENCES

6.1 NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004 (ADAMS Accession No. ML042360586).

6.2 APS Letter No. 102-05819 to NRC, "Supplemental Response to NRC Generic Letter 2004-02, 'Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors'," dated February 29, 2008 (ADAMS Accession No. ML080710546).

6.3 APS Letter No. 102-05844 to NRC, "Request for Amendment to Technical Specification 3.5.5, Refueling Water Tank (RWT), to Increase the RWT Minimum Water Level for Unit 2 Under Exigent Circumstances," dated April 10, 2008 (ADAMS Accession No. ML081080116).

6.4 APS Letter No. 102-05852 to NRC, "Response to Request for Additional Information Regarding Request for Amendment to Technical Specification 3.5.5, Refueling Water Tank (RWT), to Increase the RWT Minimum Water Level for Unit 2 Under Exigent Circumstances," dated April 30, 2008 (ADAMS Accession No. ML081280495).

6.5 NRC Letter to APS, "Palo Verde Nuclear Generating Station, Unit 2 – Issuance of Exigent Amendment Re: Revised Minimum Water Level for Technical Specification 3.5.5, Refueling Water Tank (TAC NO. MD8496)," dated May 9, 2008 (ADAMS Accession No. ML081270305).

6.6 NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications That Are Insufficient to Assure Plant Safety," December 29, 1998.

6.7 PVNGS UFSAR Section 6.2.2.2.2, "Containment Recirculation Sump Screens – New Design (Unit(s) With DMWO 2822654)."

6.8 PVNGS Calculation No. 13-MC-SI-0804, "Containment Building Water Level During LOCA," Revision 6.

6.9 PVNGS Calculation No. 13-JC-CH-0209, "Refueling Water Tank Level Measurement," Revision 8.

6.10 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants."

6.11 Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," Revision 0, June 1974.

6.12 NUREG/CR-6874, "GSI-191: Experimental Studies of Loss-of-Coolant-Accident-Generated Debris Accumulation and Head Loss with Emphasis on the Effects of Calcium Silicate Insulation," May 2005.

ENCLOSURE 1, ATTACHMENT 1

Technical Specification Markup

Page:
3.5.5-3
Attached Figure

Replace with ATTACHED FIGURE

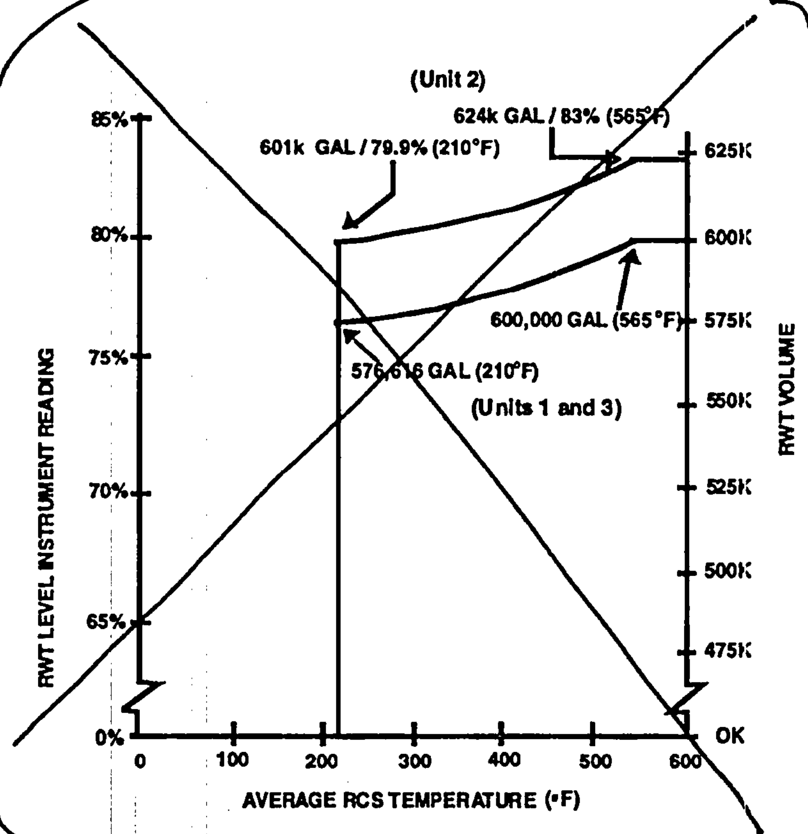

FIGURE 3.5.5-1
Minimum Required RWT Volume

Replacement Figure For Figure 3.5.5-1

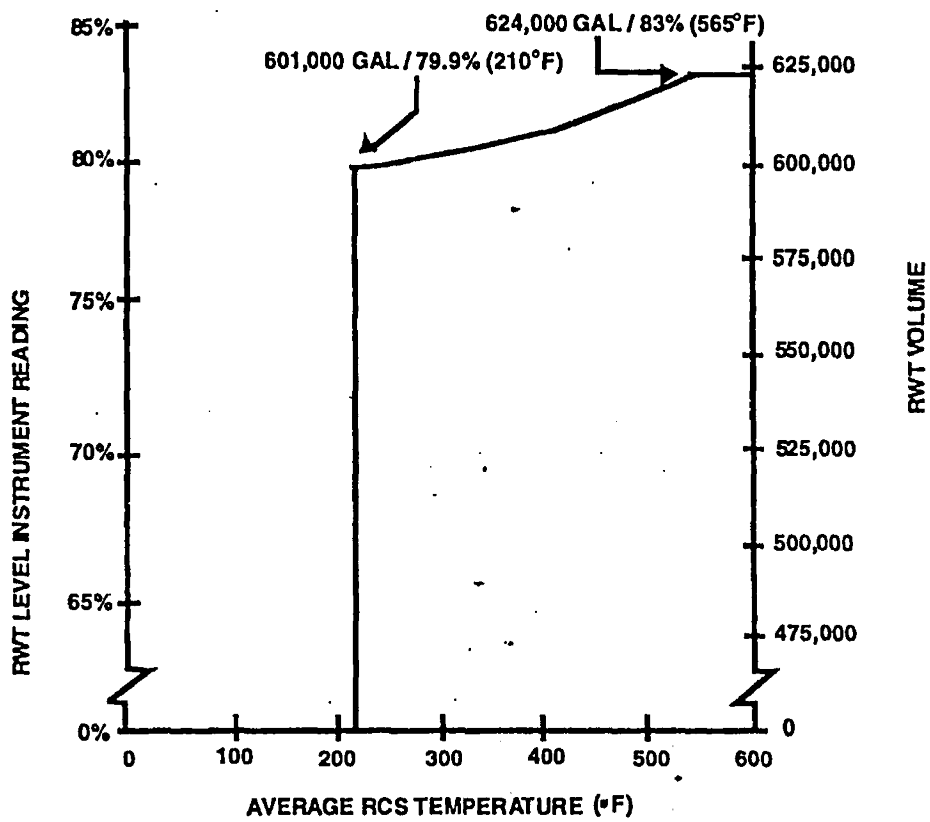

FIGURE 3.5.5-1
Minimum Required RWT Volume

ENCLOSURE 1, ATTACHMENT 2

Retyped Technical Specification

Page:
3.5.5-3

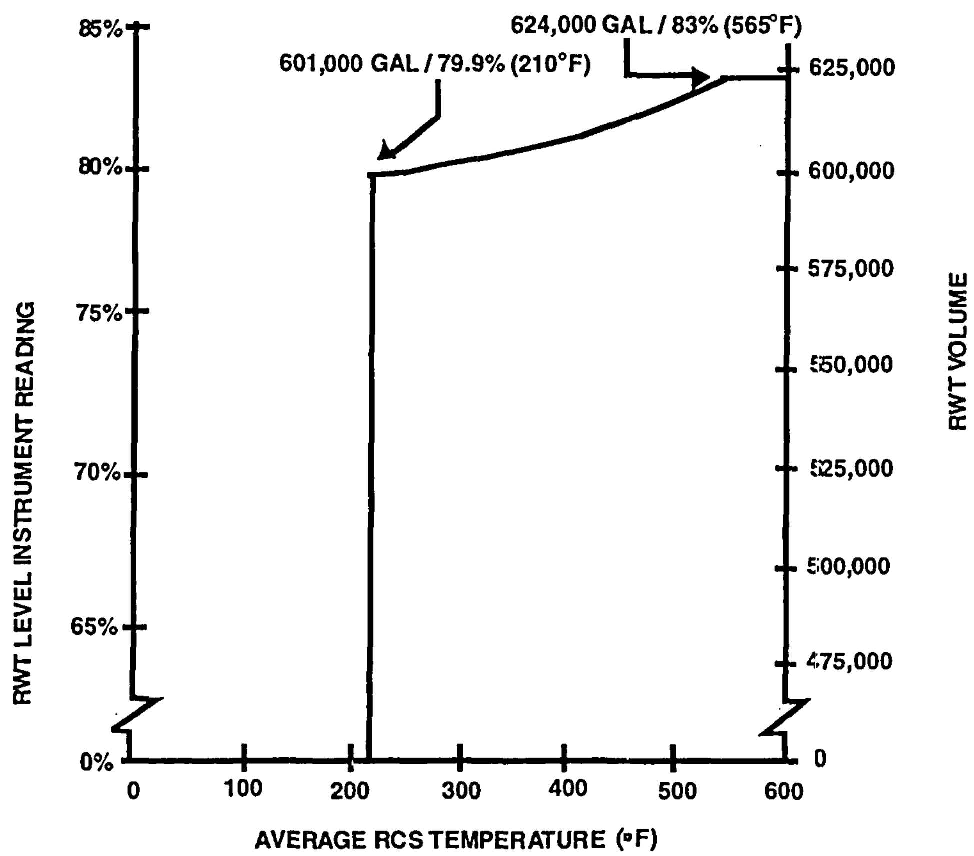

FIGURE 3.5.5-1
Minimum Required RWT Volume

ENCLOSURE 1, ATTACHMENT 3

Technical Specification Bases Markups

Pages:
B 3.5.5-1
B 3.5.5-2
B 3.5.5-3
B 3.5.5-4
B 3.5.5-5
B 3.5.5-6
B 3.5.5-7
B 3.5.5-8
B 3.5.5-9
B 3.5.5-10
B 3.5.5-11
B 3.5.5-12
B 3.5.5-13
B 3.5.5-14
B 3.5.5-15
B 3.5.5-16

~~B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)~~

~~B 3.5.5 Refueling Water Tank (RWT)~~

~~BASES (Units 1 & 3 only)~~

~~BACKGROUND~~

~~The RWT supports the ECCS and the Containment Spray System by providing a source of borated water for Engineered Safety Feature (ESF) pump operation.~~

~~The RWT supplies two ECCS trains by separate, redundant supply headers. Each header also supplies one train of the Containment Spray System. A motor operated isolation valve is provided in each header to allow the operator to isolate the usable volume of the RWT from the ECCS after the ESF pump suction has been transferred to the containment sump following depletion of the RWT during a Loss of Coolant Accident (LOCA). A separate header is used to supply the Chemical and Volume Control System (CVCS) from the RWT. Use of a single RWT to supply both trains of the ECCS is acceptable since the RWT is a passive component, and passive failures are not assumed to occur coincidently with the Design Basis Event during the injection phase of an accident. Not all the water stored in the RWT is available for injection following a LOCA; the location of the ECCS suction piping in the RWT will result in some portion of the stored volume being unavailable.~~

~~The High Pressure Safety Injection (HPSI), Low Pressure Safety Injection (LPSI), and containment spray pumps are provided with recirculation lines that ensure each pump can maintain minimum flow requirements when operating at shutoff head conditions. These lines discharge back to the RWT, which vents to the Fuel Building Ventilation System. When the suction for the HPSI and containment spray pumps is transferred to the containment sump, this flow path must be isolated to prevent a release of the containment sump contents to the RWT. If not isolated, this flow path could result in a release of contaminants to the atmosphere and the eventual loss of suction head for the ESF pumps.~~

~~This LCO ensures that:~~

~~a. The RWT contains sufficient borated water to support the ECCS during the injection phase;~~

~~(continued)~~

~~BASES (Units 1 & 3 only)~~

~~BACKGROUND (continued)~~

~~b. Sufficient water volume exists in the containment sump to support continued operation of the ESF pumps at the time of transfer to the recirculation mode of cooling; and~~

~~c. The reactor remains subcritical following a LOCA.~~

~~Insufficient water inventory in the RWT could result in insufficient cooling capacity of the ECCS when the transfer to the recirculation mode occurs. Improper boron concentrations could result in a reduction of SDM or excessive boric acid precipitation in the core following a LOCA, as well as excessive caustic stress corrosion of mechanical components and systems inside containment.~~

~~The RWT also provides a source of borated water to the charging system for makeup to the RCS to compensate for contraction of the RCS coolant during plant cooldown while maintaining adequate shutdown margin. Although this charging system boration function is not required to be in a Technical Specification LCO per 10 CFR 50.36(c)(2)(ii) criteria, the RWT volume requirements of Figure 3.5.5-1 include this function in order to provide the plant operators with a single requirement for RWT volume.~~

~~For hot zero power temperature of 565 degrees F, the RWT volume requirement of 600,000 gallons will ensure adequate shutdown margin during a subsequent cooldown. For power levels greater than zero, with a corresponding increase in average RCS temperature, the volume of borated water to maintain the shutdown margin is the same as at zero power. Contraction requirements are greater at higher average RCS temperatures; however, the additional contraction is accommodated by an acceptable reduction in pressurizer level. Consequently, for operation at average RCS temperatures greater than 565 degrees F, the minimum volume required in the RWT is constant at 600,000 gallons.~~

~~(continued)~~

~~BASES (Units 1 & 3 only)~~

~~APPLICABLE SAFETY ANALYSES~~

~~During accident conditions, the RWT provides a source of borated water to the HPSI, LPSI and containment spray pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Ref. 1). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of Bases B 3.5.3, "ECCS — Operating," and B 3.6.6, "Containment Spray." These analyses are used to assess changes to the RWT in order to evaluate their effects in relation to the acceptance limits.~~

~~The volume limit of Figure 3.5.5-1 for the ESF function is based on two factors:~~

~~a. A required volume of 558,978 gallons (138' 11") must be available to provide inventory to the ESF pumps prior to reaching a low level switchover to the containment sump for recirculation. This ESF Reserve Volume ensures that the ESF pump suction will not be aligned to the containment sump until the point at which 75% of the minimum design flow of one HPSI pump is capable of meeting or exceeding the decay heat boil off rate.~~

~~b. A required volume of 576,616 gallons to ensure that sufficient water will be transferred to the sump for adequate net positive suction head to support continued ESF pump operation after the switchover to recirculation occurs.~~

~~By time of recirculation, the water level in the containment sump must be sufficient to provide adequate Net Positive Suction Head (NPSH) for both trains of HPSI, LPSI, and containment spray pumps operating at runout conditions. Accounting for LPSI pump operation is conservative because these pumps trip automatically upon RAS and are not~~

~~(continued)~~

~~BASES (Units 1 & 3 only)~~

~~APPLICABLE SAFETY ANALYSES (continued)~~

~~required during recirculation. The minimum containment sump level can be achieved considering only the inventory specified in the RWT plus limited contributions from safety injection tanks and the reactor coolant. The resultant containment water inventory is further reduced due to the effects of evaporation and flashing of post-accident fluid; holdup in containment atmosphere, subcompartments, and reservoirs due to containment spray operation; and diversions of RWT to the CVCS via the high suction nozzle. Leakages from injection and recirculation equipment to areas outside the containment during the first 24 hours of the event are expected to be small in comparison with the overall conservatism in the analysis and are therefore neglected. Consistent with the positions in Regulatory Guides 1.1 and 1.82, no credit was taken for containment pressure in calculating available NPSH.~~

~~The 4000 ppm limit for minimum boron concentration was established to ensure that, following a LOCA with a minimum level in the RWT, the reactor will remain subcritical in the cold condition following mixing of the RWT and RCS water volumes. Small break LOCAs assume that all control rods are inserted, except for the Control Element Assembly (CEA) of highest worth, which is withdrawn from the core. Large break LOCAs assume that all CEAs remain withdrawn from the core. The most limiting case occurs at beginning of core life.~~

~~The maximum boron limit of 4400 ppm in the RWT is based on boron precipitation in the core following a LOCA. With the reactor vessel at saturated conditions, the core dissipates heat by pool nucleate boiling. Because of this boiling phenomenon in the core, the boric acid concentration will increase in this region. If allowed to proceed in this manner, a point will be reached where boron precipitation will occur in the core. Post LOCA emergency procedures direct the operator to establish simultaneous hot and cold leg injection to prevent this condition by establishing a forced flow path through the core regardless of break location. These procedures are based on the minimum time in which precipitation could occur, assuming that maximum boron concentrations exist in the borated water sources used for injection following a LOCA. Boron concentrations in the RWT in excess of the limit could result in precipitation earlier than assumed in the analysis.~~

~~(continued)~~

~~BASES (Units 1 & 3 only)~~

~~APPLICABLE SAFETY ANALYSES (continued)~~

~~The upper limit of 120°F and the lower limit of 60°F on RWT temperature are the limits assumed in the accident analysis. Although RWT temperature affects the outcome of several analyses, the upper and lower limits established by the LCO are not limited by any of these analyses.~~

~~The RWT ESF function satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).~~

~~LCO~~

~~The RWT ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a Design Basis Accident (DBA) and to cool and cover the core in the event of a LOCA, that the reactor remains subcritical following a DBA, and that an adequate level exists in the containment sump to support ESF pump operation in the recirculation mode.~~

~~To be considered OPERABLE, the RWT must meet the limits established in the SRs for water volume, boron concentration, and temperature.~~

~~APPLICABILITY~~

~~In MODES 1, 2, 3, and 4, the RWT OPERABILITY requirements are dictated by the ECCS and Containment Spray System OPERABILITY requirements. Since both the ECCS and the Containment Spray System must be OPERABLE in MODES 1, 2, 3, and 4, the RWT must be OPERABLE to support their operation.~~

~~Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops — MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops — MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation — High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation — Low Water Level."~~

~~ACTIONS~~

~~A.1~~

~~With RWT boron concentration or borated water temperature not within limits, it must be returned to within limits within 8 hours. In this condition neither the ECCS nor the Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE condition. The allowed Completion Time of~~

~~(continued)~~

~~ACTIONS~~

~~A.1 (continued)~~

~~8 hours to restore the RWT to within limits was developed considering the time required to change boron concentration or temperature and that the contents of the tank are still available for injection and core cooling.~~

~~B.1~~

~~With RWT borated water volume not within limits, it must be returned to within limits within 1 hour. In this condition, neither the ECCS nor Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the unit in a MODE in which these systems are not required. The allowed Completion Time of 1 hour to restore the RWT to OPERABLE status is based on this condition since the contents of the tank are not available for injection and core cooling.~~

~~C.1 and C.2~~

~~If the RWT cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.~~

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.5.5.1~~

~~RWT borated water temperature shall be verified every 24 hours to be within the limits assumed in the accident analysis. This Frequency has been shown to be sufficient to identify temperature changes that approach either acceptable limit.~~

~~(continued)~~

~~BASES (Units 1 & 3 only)~~

~~SURVEILLANCE REQUIREMENTS~~

~~SR 3.5.5.1 (continued)~~

~~The SR is modified by a Note that eliminates the requirement to perform this Surveillance when ambient air temperatures are within the operating temperature limits of the RWT. With ambient temperatures within this range, the RWT temperature should not exceed the limits.~~

~~SR 3.5.5.2~~

~~The RWT water volume level shall be verified every 7 days in accordance with Figure 3.5.5-1. This Frequency ensures that a sufficient initial water supply is available for injection and to support continued ESF pump operation on recirculation. Since the RWT volume is normally stable and is provided with a Low Level Alarm in the Control Room, a 7 day Frequency is appropriate and has been shown to be acceptable through operating experience.~~

~~SR 3.5.5.3~~

~~Boron concentration of the RWT shall be verified every 7 days to be within the required range. This Frequency ensures that the reactor will remain subcritical following a LOCA and the boron precipitation in the core will not occur earlier than predicted. Further, it ensures that the resulting sump pH will be maintained in an acceptable range such that the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the RWT volume is normally stable, a 7 day sampling Frequency is appropriate and has been shown through operating experience to be acceptable.~~

~~REFERENCES~~

~~1. UFSAR, Chapter 6 and Chapter 15.~~

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Refueling Water Tank (RWT)

BASES ~~(Unit 2 only)~~

BACKGROUND

The RWT supports the ECCS and the Containment Spray System by providing a source of borated water for Engineered Safety Feature (ESF) pump operation.

The RWT supplies two ECCS trains by separate, redundant supply headers. Each header also supplies one train of the Containment Spray System. A motor operated isolation valve is provided in each header to allow the operator to isolate the usable volume of the RWT from the ECCS after the ESF pump suction has been transferred to the containment sump following depletion of the RWT during a Loss of Coolant Accident (LOCA). A separate header is used to supply the Chemical and Volume Control System (CVCS) from the RWT. Use of a single RWT to supply both trains of the ECCS is acceptable since the RWT is a passive component, and passive failures are not assumed to occur coincidently with the Design Basis Event during the injection phase of an accident. Not all the water stored in the RWT is available for injection following a LOCA; the location of the ECCS suction piping in the RWT will result in some portion of the stored volume being unavailable.

The High Pressure Safety Injection (HPSI), Low Pressure Safety Injection (LPSI), and containment spray pumps are provided with recirculation lines that ensure each pump can maintain minimum flow requirements when operating at shutoff head conditions. These lines discharge back to the RWT. The RWT vents to the Fuel Building Ventilation System. When the suction for the HPSI and containment spray pumps is transferred to the containment sump, this flow path must be isolated to prevent a release of the containment sump contents to the RWT. If not isolated, this flow path could result in a release of contaminants to the atmosphere and the eventual loss of suction head for the ESF pumps.

This LCO ensures that:

a. The RWT contains sufficient borated water to support the ECCS during the injection phase;

(continued)

BASES ~~(Unit 2 only)~~

BACKGROUND (continued)

b. Sufficient water volume exists in the containment sump to support continued operation of the ESF pumps at the time of transfer to the recirculation mode of cooling; and

c. The reactor remains subcritical following a LOCA.

Insufficient water inventory in the RWT could result in (1) insufficient cooling capacity of the ECCS, or (2) insufficient water level to support continued ESF pump operation when the transfer to the recirculation mode occurs. Improper boron concentrations could result in a reduction of SDM or excessive boric acid precipitation in the core following a LOCA, as well as excessive caustic stress corrosion of mechanical components and systems inside containment.

The RWT also provides a source of borated water to the charging system for makeup to the RCS to compensate for contraction of the RCS coolant during plant cooldown while maintaining adequate shutdown margin. Although this charging system boration function is not required to be in a Technical Specification LCO per 10 CFR 50.36(c)(2)(ii) criteria, the RWT volume requirements of Figure 3.5.5-1 include this function in order to provide the plant operators with a single requirement for RWT volume.

(continued)

BASES ~~(Unit 2 only)~~

BACKGROUND (continued)

The table below provides the required RWT level at selected RCS average temperature values, corresponding to Figure 3.5.5-1. The RWT volume is the total volume of water in the RWT above the vortex breaker. This volume includes the volumes required to be transferred, as discussed below, an allowance for instrument uncertainty, and the volume that will remain in the RWT after the switch-over to the recirculation mode.

RWT Required Level at RCS Temperatures

RCS Temperature (°F) average	RWT Required Level (%)	RWT Volume * (Gallons)
210	79.9	601,000
250	80.1	603,000
300	80.4	605,000
350	80.8	608,000
400	81.2	611,000
450	81.6	614,000
500	82.1	618,000
565	83.0	624,000
600	83.0	624,000

* The volumes include instrument uncertainty and have been rounded up or down to the nearest 1,000 gallons.

(continued)

BASES ~~(Unit 2 only)~~

APPLICABLE SAFETY ANALYSES

During accident conditions, the RWT provides a source of borated water to the HPSI, LPSI and containment spray pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Ref. 1). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of Bases B 3.5.3, "ECCS – Operating," and B 3.6.6, "Containment Spray." These analyses are used to assess changes to the RWT in order to evaluate their effects in relation to the acceptance limits.

The level limit of Figure 3.5.5-1 for the ESF function is based on the largest of the following four factors:

a. A volume of 476,338 gallons must be transferred to containment via the ESF pumps prior to reaching a low level switchover to the containment sump for recirculation. This ESF Reserve Volume ensures that the ESF pump suction will not be aligned to the containment sump until the point at which 75% of the minimum design flow of one HPSI pump is capable of meeting or exceeding the decay heat boil-off rate.

b. A volume of 543,200 gallons (at 600°F) must be transferred to the RCS and containment for flooding of sump strainers to prevent vortexing and to ensure adequate net positive suction head to support continued ESF pump operation after the switchover to recirculation occurs.

c. A volume of 400,000 gallons must be available for Containment Spray System operation as credited in the containment pressure and temperature analyses.

d. A volume of borated water is needed during ECCS functions to ensure shut down margin (SDM) is maintained. The volume required is similar to that needed for the charging system function of compensating for contraction of the RCS coolant during plant cooldown. The volume required will vary depending upon the event and is bounded by the volume

(continued)

BASES ~~(Unit 2 only)~~

APPLICABLE SAFETY ANALYSES (continued)

needed for a LOCA. The volume needed for boration purposes for a LOCA is smaller than the volumes discussed in a, b, and c above.

The quantities specified above are transfer volumes to be available for delivery to the ESF pumps. They are located between the required level of Figure 3.5.5-1 and the low level switchover to the containment sump for recirculation (RAS). The required level of Figure 3.5.5-1 also considers applicable instrument uncertainty for the indicators used to verify level, the switch that actuates the recirculation actuation signal, and the indicators for average RCS temperature.

The level required by Figure 3.5.5-1 ensures that adequate water volume exists in the tank to provide the transfer volumes discussed above. The temperatures of note on the Figure are (1) 600°F which bounds the highest expected average RCS temperature, (2) 565°F, which corresponds to hot zero power, and (3) 210°F, which is the lowest temperature for Mode 4, when this LCO is applicable. Between 600°F and 565°F the required level is constant for ease of use by operators to have a single value for all hot conditions. Between 565°F and 210°F the required level decreases as the volume required to makeup for RCS coolant contraction decreases.

By time of recirculation, the water level in the containment sump must be sufficient to provide adequate Net Positive Suction Head (NPSH) for both trains of HPSI, LPSI, and containment spray pumps operating at runout conditions. Accounting for LPSI pump operation is conservative because these pumps trip automatically upon RAS and are not required during recirculation. The minimum containment sump level can be achieved considering only the inventory specified in the RWT with no contributions from safety injection tanks and the reactor coolant. The resultant containment water inventory is further reduced due to the effects of evaporation and flashing of post-accident fluid; holdup in containment atmosphere, subcompartments, and reservoirs due to containment spray operation; and diversions of RWT to the CVCS via the high suction nozzle. Leakages from injection and recirculation

(continued)

BASES ~~(Unit 2 only)~~

APPLICABLE SAFETY ANALYSES (continued)

equipment to areas outside the containment during the first 24 hours of the event are expected to be small in comparison with the overall conservatism in the analysis and are therefore neglected. Consistent with the positions in Regulatory Guides 1.1 and 1.82, no credit was taken for containment pressure in calculating available NPSH.

The 4000 ppm limit for minimum boron concentration was established to ensure that, following a LOCA with a minimum level in the RWT, the reactor will remain subcritical in the cold condition following mixing of the RWT and RCS water volumes. Small break LOCAs assume that all control rods are inserted, except for the Control Element Assembly (CEA) of highest worth, which is withdrawn from the core. Large break LOCAs assume that all CEAs remain withdrawn from the core. The most limiting case occurs at beginning of core life.

The maximum boron limit of 4400 ppm in the RWT is based on boron precipitation in the core following a LOCA. With the reactor vessel at saturated conditions, the core dissipates heat by pool nucleate boiling. Because of this boiling phenomenon in the core, the boric acid concentration will increase in this region. If allowed to proceed in this manner, a point will be reached where boron precipitation will occur in the core. Post LOCA emergency procedures direct the operator to establish simultaneous hot and cold leg injection to prevent this condition by establishing a forced flow path through the core regardless of break location. These procedures are based on the minimum time in which precipitation could occur, assuming that maximum boron concentrations exist in the borated water sources used for injection following a LOCA. Boron concentrations in the RWT in excess of the limit could result in precipitation earlier than assumed in the analysis.

The upper limit of 120°F and the lower limit of 60°F on RWT temperature are the limits assumed in the accident analysis. Although RWT temperature affects the outcome of several analyses, the upper and lower limits established by the LCO are not limited by any of these analyses.

The RWT ESF function satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

(continued)

BASES ~~(Unit 2 only)~~

LCO

The RWT ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a Design Basis Accident (DBA) and to cool and cover the core in the event of a LOCA, that the reactor remains subcritical following a DBA, and that an adequate level exists in the containment sump to support ESF pump operation in the recirculation mode.

To be considered OPERABLE, the RWT must meet the limits established in the SRs for water volume, boron concentration, and temperature.

APPLICABILITY

In MODES 1, 2, 3, and 4, the RWT OPERABILITY requirements are dictated by the ECCS and Containment Spray System OPERABILITY requirements. Since both the ECCS and the Containment Spray System must be OPERABLE in MODES 1, 2, 3, and 4, the RWT must be OPERABLE to support their operation.

Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Shutdown Cooling (SDC) and Coolant Circulation - High Water Level," and LCO 3.9.5, "Shutdown Cooling (SDC) and Coolant Circulation - Low Water Level."

ACTIONS

A.1

With RWT boron concentration or borated water temperature not within limits, it must be returned to within limits within 8 hours. In this condition neither the ECCS nor the Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE condition. The allowed Completion Time of 8 hours to restore the RWT to within limits was developed considering the time required to change boron concentration or temperature and that the contents of the tank are still available for injection and core cooling.

(continued)

BASES ~~(Unit 2 only)~~

ACTIONS

B.1

With RWT borated water volume not within limits, it must be returned to within limits within 1 hour. In this condition, neither the ECCS nor Containment Spray System can perform their design functions; therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the unit in a MODE in which these systems are not required. The allowed Completion Time of 1 hour to restore the RWT to OPERABLE status is based on this condition since the contents of the tank are not available for injection and core cooling.

C.1 and C.2

If the RWT cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

RWT borated water temperature shall be verified every 24 hours to be within the limits assumed in the accident analysis. This Frequency has been shown to be sufficient to identify temperature changes that approach either acceptable limit.

The SR is modified by a Note that eliminates the requirement to perform this Surveillance when ambient air temperatures are within the operating temperature limits of the RWT. With ambient temperatures within this range, the RWT temperature should not exceed the limits.

(continued)

BASES ~~(Unit 2 only)~~

SURVEILLANCE REQUIREMENTS

SR 3.5.5.2

The RWT water volume level shall be verified every 7 days in accordance with Figure 3.5.5-1. This Frequency ensures that a sufficient initial water supply is available for injection and to support continued ESF pump operation on recirculation. Since the RWT volume is normally stable and is provided with a Low Level Alarm in the Control Room, a 7 day Frequency is appropriate and has been shown to be acceptable through operating experience.

SR 3.5.5.3

Boron concentration of the RWT shall be verified every 7 days to be within the required range. This Frequency ensures that the reactor will remain subcritical following a LOCA and the boron precipitation in the core will not occur earlier than predicted. Further, it ensures that the resulting sump pH will be maintained in an acceptable range such that the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the RWT volume is normally stable, a 7 day sampling Frequency is appropriate and has been shown through operating experience to be acceptable.

REFERENCES

1. UFSAR, Chapter 6 and Chapter 15.
2. Engineering Calculation 13-JC-CH-0209

ENCLOSURE 2

Response to NRC Request for Additional Information Previously Addressed for PVNGS Unit 2 Exigent Refueling Water Tank Technical Specification Change

In an e-mail from Michael Markley, Nuclear Regulatory Commission (NRC), to Thomas Weber, Arizona Public Service Company (APS), dated April 22, 2008, the NRC requested additional information concerning APS Letter No. 102-05844, "Request for Amendment to Technical Specification 3.5.5, Refueling Water Tank (RWT), to Increase the RWT Minimum Water Level for Unit 2 Under Exigent Circumstances," dated April 10, 2008. In APS Letter No. 102-05852, dated April 30, 2008, APS provided a response to the NRC's request for additional information (RAI) to clarify the original APS application. As this clarifying information is pertinent to the TS amendments proposed for Units 1 and 3 in this submittal, the RAI questions and responses are provided below.

NRC Question 1

Calculation Methodology: Provide documentation (including sample calculations) of the methodology used for establishing the limiting RWT minimum water level and corresponding volume acceptable values for the As-Found and As-Left settings as measured in periodic surveillance testing. Indicate the related Analytical Limits and other limiting design values (and the sources of these values) for the RWT minimum water level and corresponding volume.

APS Response

For consistency of terminology, APS does not consider the volume specified in SR 3.5.5.2 to be the equivalent of an Allowable Value determined by a setpoint calculation.

This License Amendment Request (LAR) is not proposing any changes to the recirculation actuation signal (RAS) trip setpoint or any changes to as-found values associated with RAS or any other instruments of the RWT level channels. APS does, however, acknowledge the fact that the RWT minimum water level and corresponding volume are associated with the RAS setpoint due to the inherent relationship of the design function to transfer the required volume prior to RAS.

The method for establishing RWT minimum water level involves the three major steps described below. These are all described in Calculation 13-JC-CH-0209, Revision 8, "Refueling Water Tank Level Measurement."

(1) Minimum Delivered Volume Determination

The determination of minimum volumes required to be delivered to the reactor coolant system (RCS) and/or containment, includes consideration of where the water is located in the tank (i.e., above or below the boric acid makeup pump [BAMP] suction line). The minimum volumes of water to be delivered to the RCS and/or containment are determined by consideration of all of the associated design functions of the RWT. Their location in the RWT and any other considerations such as net positive suction head (NPSH) are also included in the analysis. These are included as references in Calculation 13-JC-CH-0209, Revision 8.

(2) Instrument Uncertainty Determination

The instrument uncertainty is based on American Nuclear Standards Institute/Instrument Society of America (ANSI/ISA) Standard No. ANSI/ISA-S67.04-1988, "Setpoints for Nuclear Safety-Related Instrumentation," and is consistent with Regulatory Guide (RG) 1.105, "Instrument Setpoints." Palo Verde is committed to Revision 1 of RG 1.105 (see UFSAR section 1.8, Conformance to NRC Regulatory Guides). The random uncertainties are combined using the square-root sum-of-squares method. The bias uncertainties are added, negative with negative and positive with positive so there is no cancellation of bias uncertainties. For the water volumes that must be delivered between the TS minimum level and the RAS, the uncertainties of both the RAS bistable and the control board indicator have been considered. For water volumes above the BAMP suction line, the uncertainties of the indicators and their upstream devices were considered. In all cases the effect of potential temperature variations on the instruments and the potential instrument drift between channel calibrations is included.

(3) Minimum Required Level Determination

The minimum required level is determined by adding each of the volumes, with its associated level, to the instrument uncertainty and using the most demanding as the minimum required level. The most demanding volume and level requirement, including applicable uncertainty, as presently analyzed, is to provide sufficient water to cover the containment recirculation sump strainers. This volume is located between the TS minimum level and the RAS setpoint. The highest required level is at hot RCS conditions, and decreases as RCS average temperature decreases and the corresponding volume requirements for RCS contraction decrease. However, for ease of use by Operations, the level is held constant at the highest level (rounded up to integer value) for the range of RCS temperatures during normal power operations. The required level then decreases consistent with the decrease in volume required for RCS contraction.

The As-Found and As-Left tolerances for the calibration of the indicators used to verify adequate RWT level are determined in Calculation 13-JC-CH-0209, Revision 8. The as-left tolerances are the base accuracy of the instruments. The as-found tolerances include basic instrument accuracy, maintenance and testing equipment accuracy, potential drift, and temperature effect.

NRC Question 2

Measures to Ensure Operability: Describe the measures to be taken to ensure that the associated instrument channel is capable of performing its specified safety functions in accordance with applicable design requirements and associated analyses. Include in your discussion information on the controls you employ to ensure that the As-Left setting after completion of periodic surveillance is consistent with your methodology. Also, discuss the plant corrective action processes (including plant procedures) for restoring channels to operable status when channels are determined to be "inoperable" or "operable but degraded." If the controls are located in a document other than the TS (e.g., plant test procedure), describe how it is ensured that the controls will be implemented.

APS Response

The measures taken to ensure that the associated instrument channel is capable of performing its specified safety functions in accordance with applicable design requirements and associated analyses are anchored in the Palo Verde surveillance program. TS SR 3.3.5.1 requires the RWT level channels to have a CHANNEL CHECK performed every 12 hours, TS SR 3.3.5.2 requires the RWT level channels to have a CHANNEL FUNCTIONAL TEST performed every 92 days, and TS SR 3.3.5.3 requires the RWT level channels to have a CHANNEL CALIBRATION performed every 18 months. The expected instrumentation performance criteria is developed in design engineering setpoint and uncertainty calculations and used to establish acceptance criteria in the associated surveillance test procedures.

The As-Left tolerance bands required by the design engineering setpoint and uncertainty calculations are documented in the surveillance test procedures as being the required acceptance criteria for the As-Left values. The Impact Review Process is the configuration management tool used to ensure alignment between surveillance test As-Left acceptance criteria and that required by the associated calculation methodology. Any values found to be outside the As-Left acceptance criteria must be reset to a value within the As-Left acceptance criteria for the surveillance test to be completed satisfactorily.

Acceptance criteria bands are derived from the design engineering setpoint and uncertainty calculation methodology. If the As-Found value, associated with a setpoint with an Allowable Value (AV) in TS, exceeds the AV then the channel is inoperable and the associated action requirements are followed. If any channel instrument or instrument group As-Found value exceeds the predefined expected performance limit (As-Found band), but the instrument channel is functioning as expected and can be reset to within the As-Left band, then the channel is returned to service and the event is entered into the Corrective Action Program (CAP) for further evaluation and trending. Anytime that it cannot be determined that the instrument is functioning as required, then the instrument is declared inoperable. When a channel is placed in bypass for testing purposes, it is declared inoperable until testing is completed satisfactorily and the channel is removed from bypass.

Both the Surveillance Testing procedure and the Out of Tolerance Program Controls procedure establish controls for the above requirements to identify and document out of tolerance conditions and to enter the CAP.