



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

November 24, 2010

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 -  
ISSUANCE OF AMENDMENTS RE: TECHNICAL SPECIFICATIONS  
CHANGES TO MINIMUM REFUELING WATER TANK VOLUME AND  
SETPOINTS (TAC NOS. ME2842, ME2843, AND ME2844)

Dear Mr. Edington:

The Commission has issued the enclosed Amendment No. 182 to Facility Operating License No. NPF-41, Amendment No. 182 to Facility Operating License No. NPF-51, and Amendment No. 182 to Facility Operating License No. NPF-74 for the Palo Verde Nuclear Generating Station, Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated November 30, 2009, as supplemented by letter dated July 22, 2010.

The amendments would revise Table 3.3.5-1 of TS 3.3.5, "Engineered Safety Features Actuation System (ESFAS) Instrumentation," to raise the refueling water tank (RWT) low level allowable values for the recirculation actuation signal; raise the minimum required RWT volume shown in Figure 3.5.5-1 of TS 3.5.5, "Refueling Water Tank (RWT)"; and implement a time-critical operator action to close the RWT isolation valves, including consideration of a potentially more limiting single failure of a low-pressure safety injection pump to automatically stop, as designed, on a recirculation actuation signal.

R. Edington

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A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

for 

James R. Hall, 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

Enclosures:

1. Amendment No. 182 to NPF-41
2. Amendment No. 182 to NPF-51
3. Amendment No. 182 to NPF-74
4. Safety Evaluation

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

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-528

PALO VERDE NUCLEAR GENERATING STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 182  
License No. NPF-41

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the Arizona Public Service Company (APS or the licensee) on behalf of itself and the Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Southern California Edison Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority dated November 30, 2009, as supplemented by letter dated July 22, 2010, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C(2) of Facility Operating License No. NPF-41 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of the date of issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Michael T. Markley, Chief  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Facility Operating  
License No. NPF-41 and  
Technical Specifications

Date of Issuance: November 24, 2010



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

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-529

PALO VERDE NUCLEAR GENERATING STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 182  
License No. NPF-51

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the Arizona Public Service Company (APS or the licensee) on behalf of itself and the Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Southern California Edison Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority dated November 30, 2009, as supplemented by letter dated July 22, 2010, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

Enclosure 2

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C(2) of Facility Operating License No. NPF-51 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of the date of issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Michael T. Markley, Chief  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Facility Operating  
License No. NPF-51 and  
Technical Specifications

Date of Issuance: November 24, 2010



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

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

DOCKET NO. STN 50-530

PALO VERDE NUCLEAR GENERATING STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 182  
License No. NPF-74

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the Arizona Public Service Company (APS or the licensee) on behalf of itself and the Salt River Project Agricultural Improvement and Power District, El Paso Electric Company, Southern California Edison Company, Public Service Company of New Mexico, Los Angeles Department of Water and Power, and Southern California Public Power Authority dated November 30, 2009, as supplemented by letter dated July 22, 2010, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C(2) of Facility Operating License No. NPF-74 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of the date of issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Michael T. Markley, Chief  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Facility Operating  
License No. NPF-74 and  
Technical Specifications

Date of Issuance: November 24, 2010

ATTACHMENT TO LICENSE AMENDMENT NOS. 182, 182, AND 182

FACILITY OPERATING LICENSE NOS. NPF-41, NPF-51, AND NPF-74

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

Replace the following pages of the Facility Operating Licenses Nos. NPF-41, NPF-51, and NPF-74, and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Operating Licenses

REMOVE

INSERT

Replace Page 5 of Facility Operating License No. NPF-41 with the attached Page 5.

Replace Page 6 of Facility Operating License No. NPF-51 with the attached Page 6.

Replace Page 4 of Facility Operating License No. NPF-74 with the attached Page 4.

Technical Specifications

REMOVE

INSERT

3.3.5-4

3.3.5-4

-

3.3.5-5

3.5.5-3

3.5.5-3

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3.5.5-4

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

(3) Antitrust Conditions

This license is subject to the antitrust conditions delineated in Appendix C to this license.

(4) Operating Staff Experience Requirements

Deleted

(5) Post-Fuel-Loading Initial Test Program (Section 14, SER and SSER 2)\*

Deleted

(6) Environmental Qualification

Deleted

(7) Fire Protection Program

APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended, and as approved in the SER through Supplement 11, subject to the following provision:

APS may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

(8) Emergency Preparedness

Deleted

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\*The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

(3) Antitrust Conditions

This license is subject to the antitrust conditions delineated in Appendix C to this license.

(4) Operating Staff Experience Requirements (Section 13.1.2, SSER 9)\*

Deleted

(5) Initial Test Program (Section 14, SER and SSER 2)

Deleted

(6) Fire Protection Program

APS shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, as supplemented and amended, and as approved in the SER through Supplement 11, subject to the following provision:

APS may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.

(7) Inservice Inspection Program (Sections 5.2.4 and 6.6, SER and SSER 9)

Deleted

(8) Supplement No. 1 to NUREG-0737 Requirements

Deleted

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\*The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

(1) Maximum Power Level

Arizona Public Service Company (APS) is authorized to operate the facility at reactor core power levels not in excess of 3990 megawatts thermal (100% power), in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 182, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into this license. APS shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

(3) Antitrust Conditions

This license is subject to the antitrust conditions delineated in Appendix C to this license.

(4) Initial Test Program (Section 14, SER and SSER 2)

Deleted

(5) Additional Conditions

The Additional Conditions contained in Appendix D, as revised through Amendment No. 171, are hereby incorporated into this license. The licensee shall operate the facility in accordance with the Additional Conditions.

(6) Mitigation Strategy License Condition

APS shall develop and maintain strategies for addressing large fires and explosions and that include the following key areas:

(a) Fire fighting response strategy with the following elements:

1. Pre-defined coordinated fire response strategy and guidance.
2. Assessment of mutual aid fire fighting assets.
3. Designated staging areas for equipment and materials.
4. Command and control.
5. Training of response personnel.

Table 3.3.5-1 (page 1 of 1)  
Engineered Safety Features Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	ALLOWABLE VALUE
1. Safety Injection Actuation Signal		
a. Containment Pressure – High	1,2,3	≤ 3.2 psig
b. Pressurizer Pressure – Low <sup>(a)</sup>		≥ 1821 psia
2. Containment Spray Actuation Signal		
a. Containment Pressure – High High	1,2,3	≤ 8.9 psig
3. Containment Isolation Actuation Signal		
a. Containment Pressure – High	1,2,3	≤ 3.2 psig
b. Pressurizer Pressure – Low <sup>(a)</sup>		≥ 1821 psia
4. Main Steam Isolation Signal <sup>(c)</sup>		
a. Steam Generator #1 Pressure-Low <sup>(b)</sup>	1,2,3	3990 Mwt RTP: ≥ 955 psia <sup>(d)</sup>
b. Steam Generator #2 Pressure-Low <sup>(b)</sup>		3990 Mwt RTP: ≥ 955 psia <sup>(d)</sup>
c. Steam Generator #1 Level-High		≤ 91.5%
d. Steam Generator #2 Level-High		≤ 91.5%
e. Containment Pressure-High		≤ 3.2 psig
5. Recirculation Actuation Signal		
a. Refueling Water Storage Tank Level-Low	1,2,3	≥ 6.9 and ≤ 7.9%
6. Auxiliary Feedwater Actuation Signal SG #1 (AFAS-1)		
a. Steam Generator #1 Level-Low	1,2,3	≥ 25.3%
b. SG Pressure Difference-High		≤ 192 psid
7. Auxiliary Feedwater Actuation Signal SG #2 (AFAS-2)		
a. Steam Generator #2 Level-Low	1,2,3	≥ 25.3%
b. SG Pressure Difference-High		≤ 192 psid

- (a) The setpoint may be decreased to a minimum value of 100 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia or ≥ 140 psia greater than the saturation pressure of the RCS cold leg when the RCS cold leg temperature is ≥ 485°F. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed when pressurizer pressure is ≥ 500 psia. The setpoint shall be automatically increased to the normal setpoint as pressurizer pressure is increased.
- (b) The setpoint may be decreased as steam pressure is reduced, provided the margin between steam pressure and the setpoint is maintained ≤ 200 psig. The setpoint shall be automatically increased to the normal setpoint as steam pressure is increased.
- (c) The Main Steam Isolation Signal (MSIS) Function (Steam Generator Pressure – Low, Steam Generator Level-High and Containment Pressure – High signals) is not required to be OPERABLE when all associated valves isolated by the MSIS Function are closed.
- (d) 1. If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predetermined as-found acceptance criteria band, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. If the as-found instrument channel setpoint is not conservative with respect to the Allowable Value, the channel shall be declared inoperable.
2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance of the UFSAR Trip Setpoint, or within the as left tolerance of a setpoint that is more conservative than the UFSAR Trip Set Point; otherwise the channel shall be declared inoperable. The UFSAR Trip Setpoint and the methodology used to determine 1) the UFSAR Trip Setpoint, 2) the predetermined as found acceptance criteria band, and 3) the as-left setpoint tolerance band are specified in the UFSAR.

Table 3.3.5-1 (page 1 of 1)  
Engineered Safety Features Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	ALLOWABLE VALUE
1. Safety Injection Actuation Signal		
a. Containment Pressure – High	1,2,3	≤ 3.2 psig
b. Pressurizer Pressure – Low <sup>(a)</sup>		≥ 1821 psia
2. Containment Spray Actuation Signal		
a. Containment Pressure – High High	1,2,3	≤ 8.9 psig
3. Containment Isolation Actuation Signal		
a. Containment Pressure – High	1,2,3	≤ 3.2 psig
b. Pressurizer Pressure – Low <sup>(a)</sup>		≥ 1821 psia
4. Main Steam Isolation Signal <sup>(c)</sup>		
a. Steam Generator #1 Pressure–Low <sup>(b)</sup>	1,2,3	3990 Mwt RTP: ≥ 955 psia <sup>(d)</sup>
b. Steam Generator #2 Pressure–Low <sup>(b)</sup>		3990 Mwt RTP: ≥ 955 psia <sup>(d)</sup>
c. Steam Generator #1 Level-High		≤ 91.5%
d. Steam Generator #2 Level-High		≤ 91.5%
e. Containment Pressure-High		≤ 3.2 psig
5. Recirculation Actuation Signal		
a. Refueling Water Storage Tank Level–Low	1,2,3	≥ 9.15 and ≤ 9.65% <sup>(d)</sup>
6. Auxiliary Feedwater Actuation Signal SG #1 (AFAS-1)		
a. Steam Generator #1 Level–Low	1,2,3	≥ 25.3%
b. SG Pressure Difference–High		≤ 192 psid
7. Auxiliary Feedwater Actuation Signal SG #2 (AFAS-2)		
a. Steam Generator #2 Level–Low	1,2,3	≥ 25.3%
b. SG Pressure Difference–High		≤ 192 psid

- (a) The setpoint may be decreased to a minimum value of 100 psia, as pressurizer pressure is reduced, provided the margin between pressurizer pressure and the setpoint is maintained ≤ 400 psia or ≥ 140 psia greater than the saturation pressure of the RCS cold leg when the RCS cold leg temperature is ≥ 485°F. Trips may be bypassed when pressurizer pressure is < 400 psia. Bypass shall be automatically removed when pressurizer pressure is ≥ 500 psia. The setpoint shall be automatically increased to the normal setpoint as pressurizer pressure is increased.
- (b) The setpoint may be decreased as steam pressure is reduced, provided the margin between steam pressure and the setpoint is maintained ≤ 200 psig. The setpoint shall be automatically increased to the normal setpoint as steam pressure is increased.
- (c) The Main Steam Isolation Signal (MSIS) Function (Steam Generator Pressure – Low, Steam Generator Level-High and Containment Pressure – High signals) is not required to be OPERABLE when all associated valves isolated by the MSIS Function are closed.
- (d) 1. If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predetermined as-found acceptance criteria band, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. If the as-found instrument channel setpoint is not conservative with respect to the Allowable Value, the channel shall be declared inoperable.
2. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance of the UFSAR Trip Setpoint, or within the as left tolerance of a setpoint that is more conservative than the UFSAR Trip Set Point; otherwise the channel shall be declared inoperable. The UFSAR Trip Setpoint and the methodology used to determine 1) the UFSAR Trip Setpoint, 2) the predetermined as found acceptance criteria band, and 3) the as-left setpoint tolerance band are specified in the UFSAR.

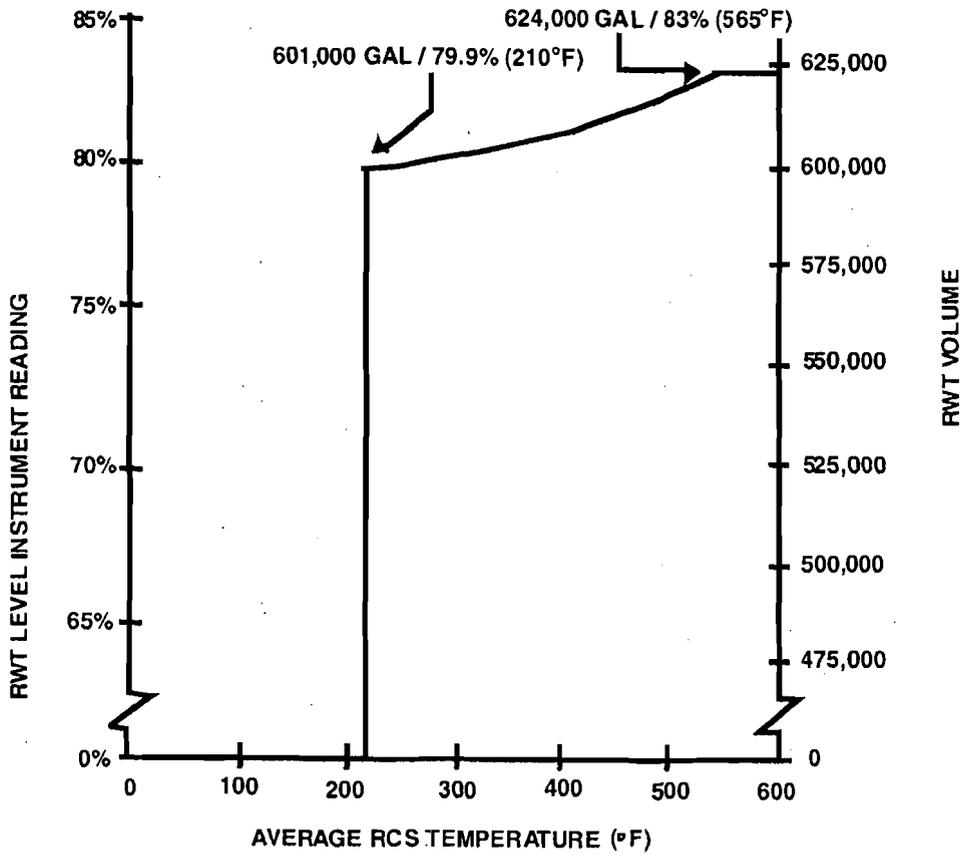


FIGURE 3.5.5-1  
Minimum Required RWT Volume

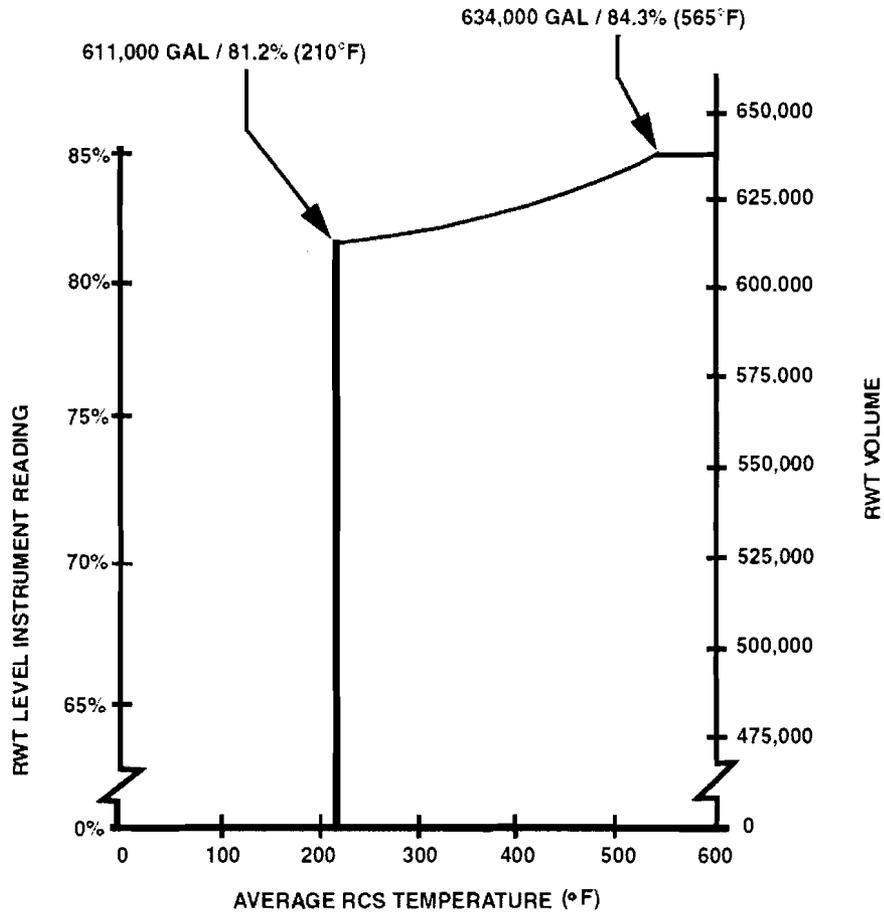


FIGURE 3.5.5-1  
Minimum Required RWT Volume



UNITED STATES  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 182 TO FACILITY OPERATING LICENSE NO. NPF-41,  
AMENDMENT NO. 182 TO FACILITY OPERATING LICENSE NO. NPF-51, AND  
AMENDMENT NO. 182 TO FACILITY OPERATING LICENSE NO. NPF-74  
ARIZONA PUBLIC SERVICE COMPANY, ET AL.  
PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3  
DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

1.0 INTRODUCTION

By application dated November 30, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093450485), as supplemented by letter dated July 22, 2010 (ADAMS Accession No. ML102150034), Arizona Public Service Company (the licensee) requested changes to the Technical Specifications (TSs) for Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3. The supplemental letter dated July 22, 2010, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on April 20, 2010 (75 FR 20629).

The proposed changes would revise Table 3.3.5-1 of TS 3.3.5, "Engineered Safety Features Actuation System (ESFAS) Instrumentation," to raise the refueling water tank (RWT) low level allowable value (AV) for the recirculation actuation signal (RAS); raise the minimum required RWT volume shown in Figure 3.5.5-1 of TS 3.5.5, "Refueling Water Tank (RWT)"; and implement a time-critical operator action to close the RWT isolation valves, including consideration of a potentially more limiting single failure of a low-pressure safety injection pump to automatically stop, as designed, on an RAS.

2.0 REGULATORY EVALUATION

The regulatory requirements, guidance, and generic communications on which the NRC staff based its review and acceptance are the following:

- Section 50.36, "Technical specifications," of Title 10 of the *Code of Federal Regulations* (10 CFR), which states, "Each applicant for a license authorizing

operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section." Specifically, 10 CFR 50.36(c)(3) states, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

- 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," which states in paragraph (b)(5) that after any calculated successful initial operation of the [emergency core cooling system] ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core.
- 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 13, "Instrumentation and control," requires that instrumentation shall be provided 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.
- 10 CFR Part 50, Appendix A, General Design Criterion 20, "Protective system functions," requires the protection system be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.
- 10 CFR Part 50, Appendix A, General Design Criterion 35, "Emergency core cooling," requires that, "A system to provide abundant emergency core cooling shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded."
- 10 CFR Part 50, Appendix A, General Design Criterion 38, "Containment heat removal," requires that, "A system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels."
- NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated

January 11, 2008 (ADAMS Accession No. ML072910759), which seeks to ensure that gas accumulation in system piping is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified.

- NRC Regulatory Guide 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," December 1999 (ADAMS Accession No. ML993560062), which describes a method acceptable to the NRC staff for complying with the NRC's regulations for ensuring that setpoints for safety-related instrumentation are initially within and remain within the TS limits.
- NUREG-1764, Revision 1, "Guidance for the Review of Changes to Human Actions;" September 2007 (ADAMS Accession No. ML072640413), which provides a two-phased approach to reviewing human actions.
- NRC Information Notice 97-78, "Crediting Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," dated October 23, 1997 (ADAMS Legacy Library Accession No. 9710230271), which alerted licensees to instances where licensees implemented changes to the facilities or operations that inappropriately credited operator action in place of automatic system actuations without confirming that the actions could be performed reliably within the time constraints of the relevant scenarios.
- American National Standards Institute/American Nuclear Society (ANSI/ANS) standard 58.8-1984, "Time Response Design Criteria for Nuclear Safety Related Operator Actions," dated September 14, 1984.
- Technical Specification Task Force (TSTF) Improved Standard Technical Specifications Change Traveler TSTF-493, Revision 4, "Clarify Application of Setpoint Methodology for LSSS [Limiting Safety System Setting] Functions."

### 3.0 TECHNICAL EVALUATION

In the initial phase of a loss-of-coolant accident (LOCA), the RWT supplies borated water to both ECCS trains by separate, redundant supply headers. Each header also supplies borated water to one train of the containment spray system (CSS). A motor-operated isolation valve is provided in each header to allow the operator to isolate the RWT from the pump suction for these engineered safety feature (ESF) systems. 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 an RAS from the engineered safety features actuation system (ESFAS). During this post-LOCA recirculation phase, the suction supply for the ECCS and 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 sumps. The switchover must occur before the RWT empties to ensure that air entrainment will not degrade the ESF pump performance, but only after a sufficient amount of water has been transferred from the RWT to ensure adequate pump suction from the containment recirculation sumps.

The licensee has taken a number of actions to address the potential for air entrainment in ESF piping systems, both in response to NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," and previous NRC inspection findings. The licensee's emergency operating procedures (EOPs) were changed to direct a manual trip of the redundant containment spray pump following the start of a LOCA event to maintain higher containment pressure upon a RAS and to provide additional margin with respect to air entrainment from the RWT. To provide additional assurance of acceptable ECCS and containment spray pump performance, the licensee has proposed changes to the PVNGS TSs to further reduce the potential for air entrainment in the suction lines by: raising the allowable value in TS 3.3.5, Table 3.3.5-1, Function 5.a, "Recirculation Actuation Signal Refueling Water Tank Level-Low," raising the minimum required RWT volume in TS 3.5.5, Figure 3.5.5-1, and implementing a time critical operator action to close the RWT isolation valves.

Specifically, the proposed license amendment would:

1. Raise the TS 3.3.5, Table 3.3.5-1, Function 5.a, "Recirculation Actuation Signal Refueling Water Storage Tank Level-Low," AV from " $\geq 6.9$  and  $\leq 7.9\%$ " to " $\geq 9.15$  and  $\leq 9.65\%$ " to ensure that a large water volume is maintained above the RWT vortex breaker during post-accident ECCS recirculation mode (after a RAS) before the RWT is isolated.
2. Apply existing Note d to TS 3.3.5, Table 3.3.5-1, Function 5.a to provide guidance on evaluating as-found conditions and ensuring that setpoints are reset within allowed tolerances for continued operability.
3. Increase TS 3.5.5, Figure 3.5.5-1, minimum required RWT volume values at 210 °F from "601,000 gallons" to "611,000 gallons" and at 565 °F from "624,000 gallons" to "634,000 gallons," to accommodate the proposed (higher) RAS setpoint AVs. The minimum RWT volume between 210 °F and 565 °F shown in TS Figure 3.5.5-1 would be increased proportionally from 611,000 gallons to 634,000 gallons. These changes would ensure that sufficient borated water would be delivered from the RWT during ECCS injection mode before switchover occurs at the proposed higher RAS setpoint.
4. Credit operator action for the time critical closure of RWT isolation valves to isolate the RWT from the ESF pump suction piping after a RAS. To preclude air entrapment during RWT drain down following a RAS, the valves would be required to be closed within 8 minutes after a RAS. The closure of these valves would isolate the RWT before the RWT water level reaches a point where air could be entrained and operation of the ESF pumps could be compromised.

The NRC staff's evaluation of these changes is presented in the following sections.

3.1 TS 3.3.5, Table 3.3.5-1, Function 5.a, "Recirculation Actuation Signal Refueling Water Storage Tank Level-Low" Allowable Value and Note

The proposed change to TS Table 3.3.5-1 will raise the required RWT low level allowable value range for an RAS from "≥ 6.9 and ≤ 7.9%" to "≥ 9.15 and ≤ 9.65%." The licensee calculated the RAS allowable values and RWT minimum volume using PVNGS Calculation 13-JC-CH-0209, Revision 9, "Refueling Water Tank Level Measurement," dated October 14, 2009, which is a methodology that is consistent with NRC Regulatory Guide 1.105. The calculation uses the square-root-sum-of-the-squares method and includes bias uncertainties, bistable uncertainties, indicator uncertainties, temperature variations, and drift.

The proposed change would also apply the existing Note d to TS 3.3.5, Table 3.3.5-1, Function 5.a, to provide guidance on evaluating the existing as-found conditions and ensuring that setpoints are reset within allowed tolerances for continued operation. TS Table 3.3.5-1 Note d is separated into two parts. Part 1 requires that if the as-found value is conservative with respect to the allowable value but outside its predetermined as-found acceptance criteria band, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. Part 1 also requires that if the as-found value is not conservative with respect to the allowable value, the channel shall be declared inoperable. Part 2 requires that the setpoint shall be reset to a value that is within the as-left tolerance band. Otherwise, the channel shall be declared inoperable. Part 2 also requires that the setpoint and the methodology used to determine the setpoint, the predetermined as-found tolerance band, and the as-left tolerance band are specified in the Updated Final Safety Analysis Report.

The existing Note d provides requirements on evaluating as-found conditions and ensuring that setpoints are reset properly within allowed tolerances for continued functionality. Note d was developed and added to TS Table 3.3.5-1 while the industry and the NRC were working on the details of TSTF-493, "Clarify Application of Setpoint Methodology for LSSS Functions." Although Note d does not use the exact wording that is contained in the TSTF-493, Revision 4, Option A, recommended note, Note d contains requirements for:

1. Evaluation to verify channel functionality if the as-found channel setpoint is outside the predefined as-found tolerance band.
2. Declaring the channel inoperable if the channel setpoint is not conservative with respect to the allowable value.
3. Resetting the channel setpoint within the as-left tolerance band.
4. Describing where the setpoint, the methodology used to determine the setpoint, the as-found band, and the as-left band are specified.

Therefore, the NRC staff concludes that Note d is equivalent to the recommended note in TSTF-493, Revision 4, Option A.

The NRC staff has reviewed the proposed TS changes to increase the RWT low level allowable values for the RAS in Table 3.3.5-1, and to make Note d applicable to Function 5.a of Table 3.3.5-1 in order to ensure operability of the RAS RWT level-low function for PVNGS Units 1, 2,

and 3. On the basis of the above information, the staff concludes that the licensee's calculation of the revised RAS allowable values and RWT minimum volume meets the guidance of RG 1.105. The application of Note d to Function 5.a of TS 3.3.5, Table 3.3.5-1, ensures operability of the RAS RWT level-low function. The licensee's procedures will maintain the RWT minimum volume allowable values within the established tolerances to ensure that the instruments will be capable of performing their specified safety function. Thus, the changes are consistent with GDC 13 and GDC 20. Based on its review of the licensee's submittals, the staff finds the proposed TS changes acceptable.

### 3.2 TS 3.5.5, Figure 3.5.5-1, Minimum Required RWT Volume

In order to ensure that there will be adequate borated water volume available for the design functions of the RWT, the proposed changes will raise the associated minimum required RWT volumes in TS Figure 3.5.5-1 used to determine operability of the RWT for the range of temperatures from 210 degrees Fahrenheit (°F) through 600 °F. The minimum required volume at 210 °F will change from 601,000 gallons/79.9 percent to 611,000 gallons/81.2 percent; the minimum required volume at 565 °F (through 600 °F) will change from 624,000 gallons/83 percent to 634,000 gallons/84.3 percent; and the corresponding minimum required volumes for temperatures between 210 °F and 565 °F will be raised proportionally. The proposed TS changes will ensure that the RWT water volume is maintained above the vortex breaker during the initial phase of an accident, prior to isolation of the RWT. This is intended to prevent air ingestion in ESF pump suction piping from an emptying RWT. It will also ensure that there is adequate water volume available in the containment to meet functional requirements of the ESF pumps and the containment sump strainers for applicable design-basis accidents and break scenarios. In addition, the licensee evaluated the impact of this proposed TS change on post-LOCA sump pH and found that the current calculated maximum post-LOCA sump pH remains bounding for the proposed increase in the TS minimum RWT water level.

The NRC staff has reviewed the proposed TS changes to increase the minimum required RWT borated water volumes in TS Figure 3.5.5-1. These proposed TS changes are intended to prevent air ingestion from the RWT to ESF pump suction following an RAS and will assure that there is adequate water volume available in the containment to meet functional requirements of the ESF pumps and the containment sump strainers for applicable design-basis accidents and break scenarios. The licensee's evaluation demonstrates compliance with the regulatory requirements of 10 CFR 50.36(c)(3), 10 CFR 50.46(b)(5), and GDCs 35 and 38, and is consistent with the guidance in NRC Generic Letter 2008-01. Therefore, the NRC staff concludes that the proposed TS changes are acceptable.

### 3.3 Crediting Time-Critical Manual Closure of the RWT Isolation Valves

#### 3.3.1 Description of Operator Action(s) and Assessed Safety Significance

The required operator action is to initiate closure of the RWT discharge valves after an RAS. This operator action is not new. However, the proposed change will now require timely closure of the valves (i.e., the action will become time-critical). The purpose of this time-critical action is to preclude the potential for air entrainment during RWT drain down following an RAS. Discharge valves CH-530 and CH-531 will now be required to be closed to isolate the RWT within 8 minutes after an RAS. This will ensure, for any LOCA break size, that the RWT is

isolated before its water level reaches the point where air could be entrained and operation of the ESF pumps could be compromised. This is a simple sequence of tasks that requires verifying the containment sump isolation valves are open and then operating hand-switches to close each RWT discharge valve at the main control board.

### 3.3.2 Operating Experience Review

NRC Information Notice 97-78 alerted addressees to instances where licensees implemented changes to their facilities or operations that inappropriately credited operator actions in place of automated system actuations without confirming that the actions could be performed reliably within the time constraints of relevant scenarios. One of the cited examples was Salem Nuclear Generating Station, Unit 2, where the NRC identified that the EOPs were revised to implement an essentially new switchover design. The change resulted in shorter required response times for operators. This was a de facto change to the licensing basis previously approved by the NRC and was determined by the NRC to constitute an Unreviewed Safety Question. Salem's simulator was not capable of modeling relevant failures, and Salem failed to consider credible operator errors of omission or commission that could affect the overall response time in carrying out the switchover evolution. The licensee addressed the Salem shortcomings in its engineering evaluation, taking advantage of the Salem experience as well as its own operating experience in past training sessions on the PVNGS simulator. The NRC staff concludes the licensee's application of operating experience is acceptable.

### 3.3.3 Functional Requirements Analysis and Function Allocation

Because this operator action is not a new action, a functional requirements analysis and function allocation were not necessary. If the licensee's engineering analysis had shown that the required tasks could not be done within the time constraints established, the NRC staff would have expected a reallocation of this function from the operator to an automatic system. However, this was not the case, and there was no need for either a new functional requirements analysis or a reallocation of function. The staff concludes the licensee's approach is acceptable based on the licensee's engineering evaluation of adequate margin to proposed time constraints.

### 3.3.4 Task Analysis

Because this operator action is not a new action, the only aspect requiring reanalysis was the establishment of time constraints for the action sequence. The licensee established the design values for the time to initiate closure of the RWT outlet valves after an RAS in accordance with ANSI/ANS-58.8-1984, "Time Response Design Criteria for Safety-Related Operator Actions." Prior to applying the ANSI/ANS-58.8-1984 guidance, the licensee verified the basis and assumptions of ANSI/ANS-58.8-1984 to ensure its applicability to this action sequence. This, in effect, confirmed the original task analysis and its output for the existing action sequence. The design values for the timing of the action sequence were established and later validated (see below). The design value for operator action to initiate closure of the first RWT outlet motor-operated valve is 6 minutes after an RAS and the design value for initiating closure of the second RWT outlet motor-operated valve is 7 minutes after an RAS. These are the values to be used for operator action time in the design basis analysis for RWT transfer volume. The simulator testing demonstrated substantial margin to these design times. Specifically, the

testing determined that the values that could be reasonably established as the maximum time after an RAS to initiate closure of the first and second RWT isolation valves with 95 percent confidence are 3.33 minutes and 4.3 minutes, respectively. The NRC staff concludes that the licensee's update to the task analysis is acceptable based on its engineering evaluation of adequate margin to proposed time constraints.

### 3.3.5 Human-System Interface Design

Human-System Interface (HSI) design, including the design of the Safety Parameter Display System, will not be affected by the proposed license amendment request. The same controls, displays, and alarms that have been successfully used in the past will continue to be used under the proposed license amendment request. Because no changes are needed to the HSI design, the NRC staff concludes the licensee's approach is acceptable.

### 3.3.6 Procedure Design

The only changes to the procedures are those being made to the PVNGS EOPs: a) the proposed Note that states that the action to close valves CH-530 and CH-531 after an RAS is a time-critical step; and (b) re-sequencing the actions after an RAS to isolate the RWT sooner. The NRC staff concludes these changes are acceptable based on successful operating experience during training with the existing EOPs, and on the time-testing that was done in the PVNGS simulator using the revised procedures and a random sample of operators.

### 3.3.7 Training Program Design

Because the EOPs are an integral part of the licensed operator qualification and requalification training programs, training on the proposed action sequence will be included in both initial and continuing operator training. The licensee determined that the simulator is capable of modeling the task sequence and may, therefore, be used in training. Training on the time-critical aspect of the task sequence will be completed prior to amending the TSs. Based on the facts that the revised action sequence will be included in the training program and that the training changes will be implemented prior to amending the TSs, the NRC staff concludes that the training to be provided is acceptable.

### 3.3.8 Human Factors Verification and Validation

Time testing at the PVNGS simulator was performed to demonstrate sufficient margin to the licensee-established design values. Data was collected from six different licensed operating crews selected at random (a sample size of approximately 30 percent). The simulator testing demonstrated that a value of 3.33 minutes could be reasonably established as the maximum time after an RAS to initiate closure of the first RWT isolation valve with 95 percent confidence. This provides significant margin to the design value of 6 minutes for this task. Likewise, the second valve was closed with significant margin to the design value (4.3 minutes actual versus 7 minutes design).

### 3.3.9 Human Performance Monitoring Strategy

The actions proposed by this license amendment request will be included in the licensee's procedure 40DP-9ZZ04, "Time Critical Action (TCA) Program," which, according to the licensee's letter dated November 30, 2009, "provides a means to: a) ensure that the time-critical actions within the scope of the procedure can be accomplished by plant personnel, b) document periodic validation of credited action times, and c) ensure that subsequent changes to the plant, procedures, or programs will not invalidate the credited action times." Based on the administrative protection against inadvertent change and the periodic re-validation provided by the licensee, the NRC staff concludes that the licensee's long-term monitoring strategy is acceptable.

### 3.3.10 Staff Conclusion on Time-Critical Operator Actions

The NRC staff has reviewed the proposed changes to the PVNGS licensing basis to credit operator manual action to close the RWT discharge valves within 8 minutes of a recirculation actuation signal. Based on the information provided by the licensee (i.e., that pilot-testing in the simulator demonstrated significant margin to design, as well as the appropriate administrative controls being applied to procedures, training, and HSI design, and the application of industry and in-house operating experience), the NRC staff concludes that the proposed license amendment request is acceptable with respect to these time-critical operator actions.

## 3.4 Implementation Schedule

The licensee has proposed to implement the subject TS changes in two stages, because PVNGS is a three-unit facility with common technical specifications and the modifications associated with these changes will be completed at different times, i.e., during refueling outages for each unit. The associated modifications include installation of new control board meters, a simulator model change, revisions to the EOPs, and related procedure changes. The existing affected TS pages will be retained and annotated with the statement "Pre-RWT TS Setpoint Change," and the revised pages will be added immediately after those pages and marked with the statement "After RWT TS Setpoint Change." As clarified in the licensee's letter dated July 22, 2010, the associated RWT modifications have been completed for Unit 1, and will be completed for Unit 3 during the fall 2010 refueling outage and for Unit 2 during the spring 2011 refueling outage. Therefore, the "After RWT TS Setpoint Change" pages will apply to Units 1 and 3 upon implementation of these license amendments (within 90 days of issuance). The current TS pages, to be designated as "Pre-RWT TS Setpoint Change," will continue to apply to Unit 2 until the associated RWT modifications are completed in the spring of 2011. Training and procedure changes in support of related changes in operation and maintenance will be completed prior to the application of the TS changes. The staff concludes that the licensee's method for implementing these changes in two stages is acceptable.

## 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arizona State official was notified of the proposed issuance of the amendments. The State official had no comments.

## 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on April 20, 2010 (75 FR 20629). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

## 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (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.

Principal Contributors: Kulin D. Desai  
Jennifer M. Gall  
George W. Lapinsky  
Barry Marcus

Date: November 24, 2010

R. Edington

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A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA by N. Kalyanam for/

James R. Hall, 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

Enclosures:

1. Amendment No. 182 to NPF-41
2. Amendment No. 182 to NPF-51
3. Amendment No. 182 to NPF-74
4. Safety Evaluation

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DATE	10/18/2010		10/15/10	11/23/10	7/21/10
OFFICE	DIRS/IHPB/BC	DSS/SRXB/BC	OGC	NRR/LPL4/BC	NRR/LPL4/PM
NAME	UShoop*	AUIses*	BMizuno	MMarkley	JRHall (NKalyanam for)
DATE	8/26/10	8/19/10	11/19/10	11/24/10	11/24/10

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