



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

April 17, 2009

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: CONTROL ELEMENT ASSEMBLIES (TAC
NOS. MD9189, MD9190, AND MD9191)

Dear Mr. Edington:

The Commission has issued the enclosed Amendment No. 172 to Facility Operating License No. NPF-41, Amendment No. 172 to Facility Operating License No. NPF-51, and Amendment No. 172 to Facility Operating License No. NPF-74 for the Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated July 2, 2008.

The amendments revise TS 4.2.2, "Control Element Assemblies," to allow replacement of the full-strength control element assemblies (CEAs) with CEAs of a new design, beginning with the PVNGS, Unit 3 fourteenth refueling outage (U3R14) in the spring of 2009. Additionally, TS 4.2.2 is revised to remove the registered trademark "Inconel," while retaining the generic terminology "Alloy 625" and deleting the references to part-length CEAs.

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,

A handwritten signature in cursive script that reads "James R. Hall".

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. 172 to NPF-41
2. Amendment No. 172 to NPF-51
3. Amendment No. 172 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. 172
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 July 2, 2008, 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. 172, 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 60 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: April 17, 2009



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. 172
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 July 2, 2008, 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.

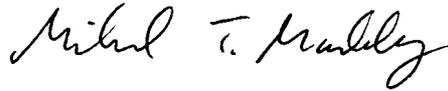
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C(2) of Facility Operating License No. NPF-51 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

- The Technical Specifications contained in Appendix A, as revised through Amendment No. 172, 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 60 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: April 17, 2009



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. 172
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 July 2, 2008, 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.

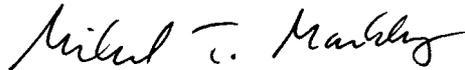
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and Paragraph 2.C(2) of Facility Operating License No. NPF-74 is hereby amended to read as follows:

- (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 172, 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 60 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: April 17, 2009

ATTACHMENT TO LICENSE AMENDMENT NOS. 172, 172, AND 172

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

4.0-1

4.0-1

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 172 , 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

*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. 172 , 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

*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 3876 megawatts thermal (100% power) through operating cycle 13, and 3990 megawatts thermal (100% power) after operating cycle 13, 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. 172 , 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

Deleted

(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.

4.0 DESIGN FEATURES

4.1 Site Location

The Palo Verde Nuclear Generating Station is located in Maricopa County, Arizona, approximately 50 miles west of the Phoenix metropolitan area. The site is comprised of approximately 4,050 acres. Site elevations range from 890 feet above mean sea level at the southern boundary to 1,030 feet above mean sea level at the northern boundary. The minimum distance from a containment building to the exclusion area boundary is 871 meters.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 241 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy or ZIRLO fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions. Other cladding material may be used with an approved exemption.

4.2.2 Control Element Assemblies

The reactor core shall contain 76 full strength and 13 part strength control element assemblies (CEAs).

The control section for the full strength CEAs shall be either boron carbide with Alloy 625 cladding, or a combination of silver-indium-cadmium and boron carbide with Alloy 625 cladding.

The control section for the part strength CEAs shall be solid Alloy 625 slugs with Alloy 625 cladding.

(continued)



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 172 TO FACILITY OPERATING LICENSE NO. NPF-41,
AMENDMENT NO. 172 TO FACILITY OPERATING LICENSE NO. NPF-51, AND
AMENDMENT NO. 172 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 July 2, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML081980032), Arizona Public Service Company (APS, the licensee) requested changes to the Technical Specifications (TSs) for Palo Verde Nuclear Generating Station (Palo Verde), Units 1, 2, and 3. The proposed changes would revise TS 4.2.2, "Control Element Assemblies," to support replacement of the full-strength control element assemblies (CEAs) with a new design for all three Palo Verde units. The U.S. Nuclear Regulatory Commission (NRC) staff issued a proposed no significant hazards consideration determination for this action, which was published in the *Federal Register* on January 27, 2009 (74 FR 4766).

Specifically, the proposed changes would revise TS 4.2.2 as follows:

1. The control section of full-strength CEAs shall be either boron carbide with Alloy 625 cladding (current design), or a combination of silver-indium-cadmium and boron carbide with Alloy 625 cladding (new design).
2. The term "Inconel" (a registered trademark) will be removed from the description of the cladding material, which will be referred to as Alloy 625, a generic term.
3. References to part-length CEAs will be deleted, as these CEAs were replaced in accordance with License Amendment 152, dated March 23, 2004 (ADAMS Accession No. ML040860573).

The purpose of the CEAs is to provide reactivity control during operation and shutdown of the reactor. Each reactor at Palo Verde contains 89 CEAs: 76 full-strength and 13 part-strength CEAs. The CEA consists of either four or twelve elements (or fingers) connected by a spider assembly which couples to the control element drive mechanism (CEDM) extension shaft. The full-strength CEA contains boron carbide (B_4C) neutron absorber pellets encased in Alloy 625

cladding. The regulating banks of full-strength CEAs consist of both 4-finger and 12-finger CEAs, while the shutdown banks consist entirely of 12-finger CEAs. The part-strength CEA is a 4-finger CEA and contains Alloy 625 neutron absorber slugs encased in Alloy 625 cladding. The part-strength CEA provides control of axial power distribution. All full-strength and part-strength CEAs span the entire height of the core when the CEAs are fully inserted. Alloy 625 is a generic name for the registered trademark Inconel.

Previously, the licensee identified cracks in the Alloy 625 cladding of several full-strength CEAs in all three Palo Verde units. Most of the cracks were found to be near the finger tips. The failure mode was determined to be irradiation assisted stress-corrosion cracking (IASCC). The failures occurred when the irradiation-induced swelling of the B₄C pellets generated sufficient strain in the cladding to initiate IASCC. In order to prevent future occurrences of IASCC in the CEA finger tips, the licensee plans to replace the full-strength CEAs with a new design. The new CEAs will be provided first to Unit 3 during the spring 2009 refueling outage.

2.0 REGULATORY EVALUATION

The regulations in 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," allow a licensee to submit an application to amend or change the existing license. An application for amendment should fully describe the changes desired, and should follow as far as applicable, the form prescribed for original license applications.

Section 50.92 of 10 CFR, "Issuance of amendment," specifies that the staff will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate in determining whether an amendment will be issued to the applicant.

Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, provides the criteria to be met in license applications. The NRC staff considers the following General Design Criteria to be applicable to the subject license amendment request:

- General Design Criterion (GDC) 10, "*Reactor design*," requires that the reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded.
- GDC 20, "*Protection system functions*," requires that the protection system shall 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 and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.
- GDC 27, "*Combined reactivity control systems capability*," requires that the reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained.

The NRC staff evaluated the licensee's amendment request to revise TS Section 4.2.2, Control Element Assemblies, against these requirements.

3.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's regulatory and technical analyses in support of its proposed license amendment which are described in Sections 3 and 4 of the licensee's July 2, 2008, submittal. The detailed evaluation below supports the staff's conclusion 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

3.1 Mechanical Design

In its July 2, 2008, submittal, APS explained that in the current design, the CEA consists of either four or twelve fingers connected by a spider assembly. The fingers of the full-strength CEA consist of an Alloy 625 tube loaded with a stack of B₄C pellets. The finger tips, where most of the cracks occurred, contain reduced diameter B₄C pellets wrapped in stainless steel compression sleeves. The compression sleeve is intended to restrict the B₄C swelling.

To eliminate the tip cracking problem, the licensee states that it will adopt a new design by Westinghouse to replace the current CEAs. According to the licensee, the new design maintains the same external dimensions as the current design, but changes the absorber material from B₄C pellets to annular silver-indium-cadmium (Ag-In-Cd) absorber slugs in the lower portion of the finger, including the tip. Thus the new design contains two types of absorber material, B₄C and Ag-In-Cd. The central void in the annular Ag-In-Cd slugs occupies an area about 10 percent of the cross section. The licensee states that the new design will alleviate the IASCC concern because the Ag-In-Cd absorber slugs have less swelling than the B₄C pellets. The Ag-In-Cd slugs are encased in the Alloy 625 tube, and will have chrome plating in the outer surface to prevent wall thinning from contact with the tube cladding. The Ag-In-Cd full-strength CEAs will have a lifetime of approximately 11 effective full power years (EFPYs), as compared to a lifetime of 8 EFPYs for the CEAs of the current design. The Ag-In-Cd absorbers have been widely used in Westinghouse control rod designs at other commercial nuclear power plants. The licensee performed the following analyses for the new Westinghouse CEA design, and applied the same NRC-approved design criteria for the current CEAs at Palo Verde, Units 1, 2 and 3.

3.1.1 Fatigue Damage

The licensee stated that the CEA will be designed such that the fatigue damage due to cyclic loads does not result in a fatigue usage factor greater than 0.8 for the lifetime of the CEA. Using the existing analysis of record for CEA design (previously approved by NRC), the licensee determined that the new tip design resulted in a usage factor of 0.0. Based on the licensee's calculation of a usage factor of 0.0 using the methodology previously approved by NRC for Palo Verde, the NRC staff concludes that the design criterion is met and that the licensee's fatigue damage analysis is acceptable for the new CEA design.

3.1.2 Pellet/Clad Interaction

The licensee stated that the CEA will be designed such that irradiation-induced swelling of the B₄C pellets does not result in excessive strain in the cladding. The excessive strain could cause the cladding to fail due to pellet-clad interaction (PCI). The licensee analyzed the irradiation behavior of the Ag-In-Cd slugs and determined that the stress resulting from thermal expansion and irradiation-induced swelling remains below the allowable stress level as compared to the current design criteria. The NRC staff reviewed the licensee's analysis and, based on the licensee's analysis using the methodology previously approved by NRC for Palo Verde, the staff concludes that irradiation-induced swelling of the Ag-In-Cd slugs will not result in excessive strain in the cladding, and thus PCI failure will not occur.

3.1.3 Clad Collapse

The licensee stated that the CEA will be designed such that cladding buckling (or collapse) does not occur with the maximum cladding ovality assumed. The clad must be designed to stand freely against the entire range of differential pressure encountered during the lifetime of the assembly. The licensee determined that the calculated collapse with a maximum ovality would only occur if the external pressure greatly exceeded the reactor coolant system pressure, which is very unlikely. The NRC staff reviewed the licensee's analysis and, based on the licensee's analysis using the methodology previously approved by NRC for Palo Verde, the staff concludes that clad collapse will not occur.

3.1.4 Conclusion

The staff reviewed the licensee's mechanical design analyses. These analyses used methodologies previously approved by NRC for Palo Verde, and demonstrated that the applicable design criteria are met. Therefore, the staff concludes that the Ag-In-Cd absorber mechanical design for the new CEAs is acceptable for Palo Verde, Units 1, 2 and 3.

3.2 Functional Requirements

The licensee evaluated the new Westinghouse CEA Ag-In-Cd absorber design to demonstrate compliance with the functional requirements for the existing full-strength CEA design. These functional requirements were established by the designer and supplier of the existing CEAs, Combustion Engineering, and were approved by NRC in previous licensing actions for Palo Verde.

3.2.1 Functional Requirement 1 – Absorber Location/Free Movement

Functional Requirement 1 states that in conjunction with the fuel assemblies and reactor internals, the CEA function is to support and locate the neutron absorbing material so that all clusters move as required for both insertion and withdrawal. The licensee determined that the envelope dimensions of the new CEA design are essentially identical to the current CEA design. Thus, the licensee asserts that the correct interfaces with the fuel assemblies and reactor internals are preserved so that all CEAs of the new design will move as required for insertion and withdrawal. Based on its review of the licensee's description of the nearly identical

envelope dimensions for the current and proposed CEA designs, the NRC staff concludes that the Ag-In-Cd absorber design meets Functional Requirement 1.

3.2.2 Functional Requirement 2 – Contain Products of Irradiation

Functional Requirement 2 states the CEA function is to contain the nuclear poison material and activation products produced by irradiation of the poison material without cladding failures. To meet this requirement, the licensee determined that the internal pressure must not exceed the reactor coolant system (RCS) pressure at end of life. The licensee determined that the new design will generate substantially less helium than the current design of B₄C pellets, and thus the internal pressure in the new design will be far less than the RCS pressure. Based on its review of the licensee's analysis demonstrating the lesser helium release of the new CEA design, the NRC staff concludes that the Ag-In-Cd absorber design meets Functional Requirement 2.

3.2.3 Functional Requirement 3 – Locate the Absorber

Functional Requirement 3 states that the CEA function is to support and locate the poison material such that its location with respect to the extension shaft is maintained. The licensee determined that the envelope dimensions of the new CEA design are essentially identical to the current CEA design, and the new design interface with the extension shaft is identical to the current CEAs in configuration and material composition. Thus, the licensee determined that the location of the poison material is maintained with respect to the CEA extension shaft. Based on its review of the licensee's description of the essentially identical envelope dimensions and interface with the extension shaft for the current and proposed CEA designs, the NRC staff concludes that the Ag-In-Cd absorber design meets Functional Requirement 3.

3.2.4 Functional Requirement 4 – Limit Stresses to Preserve Function

Functional Requirement 4 states that the magnitude and range of stress for cyclic conditions shall be limited to preserve the CEA function. The cyclic loading conditions are the same as the fatigue damage as analyzed in Section 3.1.1 of this safety evaluation. Based on the staff's conclusion in Section 3.1.1, the NRC staff concludes that the Ag-In-Cd absorber design meets Functional Requirement 4.

3.2.5 Functional Requirement 5 – Provide Sufficient Rod Worth

Functional Requirement 5 states that the CEA function is to provide sufficient negative reactivity insertion and insertion rate for adequate control and shutdown of the reactor. The licensee determined that the weight of the Ag-In-Cd absorber design has increased somewhat over the current design, which results in slightly faster insertion during a scram. The rod worth of the new design continues to meet the requirements specified in the plant physics assessment checklist. Thus, the licensee determined that the new design has sufficient negative reactivity insertion and insertion rate for adequate control and shutdown of the reactor. Based on its review of the licensee's analysis of the increased weight and adequate rod worth for the proposed CEA design, the NRC staff concludes that the Ag-In-Cd absorber design meets Functional Requirement 5.

3.2.6 Compliance with General Design Criteria

The NRC staff concludes that the new CEA design, by meeting Functional Requirements 1 through 5 above, complies with GDC 10 and GDC 20, as the reactor protection system will be designed with appropriate margin and capability to assure that specified acceptable fuel design limits are not exceeded. The staff further concludes that the new CEA design will also comply with GDC 27, as the reactivity control systems will be capable of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained.

3.3 TS Revision - Section 4.2.2, Control Element Assemblies

The licensee will revise TS 4.2.2 to reflect the addition of the new design for the full-strength CEAs, which use a combination of Ag-In-Cd and B₄C absorbers. Full-strength CEAs of the current design (using only B₄C absorbers) will continue to be acceptable for use. In addition, the licensee will delete the term "Inconel" (a registered trademark), and will only use the generic term "Alloy 625" to describe the cladding used in the CEAs. This is an editorial change that does not change the acceptable cladding material. Finally, all references to part-length CEAs will be deleted, as these types of CEAs are no longer in use, consistent with the changes approved in License Amendment 152, dated March 23, 2004. This is also an editorial change for clarity and consistency.

TS 4.2.2 will be revised to read as follows:

The reactor core shall contain 76 full strength and 13 part strength control element assemblies (CEAs).

The control section for the full strength CEAs shall be either boron carbide with Alloy 625 cladding, or a combination of silver-indium-cadmium and boron carbide with Alloy 625 cladding.

The control section for part strength CEAs shall be solid Alloy 625 slugs with Alloy 625 cladding.

Based on the staff's technical evaluation, the proposed revision to TS 4.2.2 is acceptable.

3.4 Conclusion

The staff has reviewed the licensee's proposed license amendment. Based on the staff's technical evaluation, as set forth above, the staff concludes that the proposed TS revision to allow the use of full-strength CEAs with a new design is acceptable for Palo Verde, Units 1, 2, and 3.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arizona State official was notified of the proposed issuance of the amendment. 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 January 27, 2009 (74 FR 4766). 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 Contributor: Shih-Liang Wu

Date: April 17, 2009

April 17, 2009

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: CONTROL ELEMENT ASSEMBLIES (TAC
NOS. MD9189, MD9190, AND MD9191)**

Dear Mr. Edington:

The Commission has issued the enclosed Amendment No. 172 to Facility Operating License No. NPF-41, Amendment No. 172 to Facility Operating License No. NPF-51, and Amendment No. 172 to Facility Operating License No. NPF-74 for the Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application dated July 2, 2008.

The amendments revise TS 4.2.2, "Control Element Assemblies," to allow replacement of the full-strength control element assemblies (CEAs) with CEAs of a new design, beginning with the PVNGS, Unit 3 fourteenth refueling outage (U3R14) in the spring of 2009. Additionally, TS 4.2.2 is revised to remove the registered trademark "Inconel," while retaining the generic terminology "Alloy 625" and deleting the references to part-length CEAs.

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/

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. 172 to NPF-41
2. Amendment No. 172 to NPF-51
3. Amendment No. 172 to NPF-74
4. Safety Evaluation

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(*) Concurrence via SE

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DATE	04/1/2009	3/31/2009	04/2/2009	03/ 26 /2009	04/16/2009	04/17/2009	04/17/2009

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