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

February 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 – EXEMPTION FROM THE REQUIREMENTS OF APPENDIX G TO 10 CFR PART 50 (TAC NOS. ME0703, ME0704, AND ME0705)

Dear Mr. Edington:

Pursuant to Title 10 of the *Code of Federal Regulations*, Part 50 (10 CFR Part 50), Section 50.12, the Nuclear Regulatory Commission (NRC) has granted the enclosed exemption from specific requirements of 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements," for the Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3. This action is in response to your letter dated February 19, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090641014), as supplemented by letter dated December 22, 2009 (ADAMS Accession No. ML100040069), which, in part, requested to amend your facility operating licenses to use the methodology in Combustion Engineering Topical Report NPSD-683-A, Revision 6, "Development of a RCS [Reactor Coolant System] Pressure and Temperature Limits Report (PTLR) for the Removal of P-T [Pressure Temperature] Limits and LTOP [Low-Temperature Overpressure Protection] Requirements from the Technical Specifications" (ADAMS Accession No. ML011350387), for the calculation of stress intensity factors due to internal pressure loadings (K_{IM}).

A copy of the exemption has been forwarded to the Office of the Federal Register for publication.

Your related license amendment requests for PVNGS, Units 1, 2, and 3, which propose to relocate specific reactor coolant system pressure-temperature curves and limits from the Technical Specifications to a licensee-controlled document identified as the Pressure and Temperature Limits Report, is under review by the NRC staff. We will inform you of the results of that review in separate correspondence.

If you have any questions, please contact me at (301) 415-4032 or via e-mail at randy.hall@nrc.gov.

Sincerely,

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

Enclosure:
Exemption

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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

EXEMPTION

1.0 BACKGROUND

The Arizona Public Service Company (APS, the facility licensee) is the holder of Facility Operating License Nos. NPF-41, NPF-51, and NPF-74, which authorize operation of the Palo Verde Nuclear Generating Station (PVNGS, the facility), Units 1, 2, and 3, respectively. The licenses provide, among other things, that the facility is subject to all rules, regulations, and orders of the Nuclear Regulatory Commission (NRC, or the Commission) now or hereafter in effect.

The facility consists of three pressurized-water reactors located in Maricopa County, Arizona.

2.0 REQUEST/ACTION

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix G, "Fracture Toughness Requirements," which is invoked by 10 CFR 50.60, requires that pressure-temperature (P-T) limits be established for the reactor coolant pressure boundary during normal operating and hydrostatic or leak rate testing conditions. Specifically, 10 CFR Part 50, Appendix G states that "[t]he appropriate requirements on both the pressure-temperature limits and the minimum permissible temperature must be met for all conditions," and "[t]he pressure-temperature limits identified as 'ASME [American Society for Mechanical Engineers] Appendix

G limits' in Table 3 require that the limits must be at least as conservative as limits obtained by following the methods of analysis and the margins of safety of Appendix G of Section XI of the ASME Code [Boiler and Pressure Vessel Code]." The regulations in 10 CFR Part 50, Appendix G, also specify the applicable editions and addenda of the ASME Code, Section XI, which are incorporated by reference in 10 CFR 50.55a. In the most recent version of 10 CFR (2009 Edition), the 1977 Edition through the 2004 Edition of the ASME Code, Section XI are incorporated by reference in 10 CFR 50.55a. Finally, 10 CFR 50.60(b) states that, "[p]roposed alternatives to the described requirements in Append[ix] G ... of this part or portions thereof may be used when an exemption is granted by the Commission under [10 CFR] 50.12."

By letter dated February 19, 2009, as supplemented by letter dated December 22, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML090641014 and ML100040069, respectively), the licensee submitted a request for exemption from 10 CFR Part 50, Appendix G regarding the pressure-temperature (P-T) limits calculation, and a license amendment request to revise Technical Specification (TS) 3.4, "Reactor Coolant System (RCS)," to relocate the P-T limits and the low temperature overpressure protection (LTOP) system enable temperatures from the TS to a licensee-controlled document; the Pressure and Temperature Limits Report (PTLR). In the license amendment request, the licensee identified Combustion Engineering (CE) Owners Group Topical Report CE NPSD-683-A, Revision 6, "Development of a RCS Pressure and Temperature Limits Report (PTLR) for the Removal of P-T Limits and LTOP Requirements from the Technical Specifications" (ADAMS Accession No. ML011350387), as the PTLR methodology that would be cited in the administrative controls section of the PVNGS, Units 1, 2, and 3 Technical Specifications governing PTLR content. The NRC staff evaluated the specific PTLR methodology in CE NPSD-683, Revision 6. This evaluation was documented in the NRC safety evaluation (SE) of

March 16, 2001 (ADAMS Accession No. ML010780017), which specified additional licensee actions that are necessary to support a licensee's adoption of CE NPSD-683, Revision 6. The final approved version of this report was reissued as CE NPSD-683-A, Revision 6, which included the NRC SE and the required additional action items as an attachment to the report. One of the additional specified actions stated that if a licensee proposed to use the methodology in CE NPSD-683-A, Revision 6, for the calculation of flaw stress intensity factors due to membrane stress from pressure loading (K_{IM}), an exemption was required, since the methodology for the calculation of K_{IM} values in CE NPSD-683-A, Revision 6, could not be shown to be conservative with respect to the methodology for the determination of K_{IM} provided in editions and addenda of the ASME Code, Section XI, Appendix G through the 2004 Edition. Therefore, in addition to the license amendment request, the licensee's February 19, 2009, submittal also contains an exemption request, consistent with the requirements of 10 CFR 50.12 and 50.60, to apply the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6, as part of the PVNGS, Units 1, 2, and 3 PTLR methodology.

During the NRC staff's review of CE NPSD-683, Revision 6, the NRC staff evaluated the K_{IM} calculational methodology of that report versus the methodologies for the calculation of K_{IM} given in the ASME Code, Section XI, Appendix G. In the NRC's March 16, 2001, SE, the staff noted, "[t]he CE NSSS [nuclear steam supply system] methodology does not invoke the methods in the 1995 edition of Appendix G to the Code for calculating K_{IM} factors, and instead applies FEM [finite element modeling] methods for estimating the K_{IM} factors for the RPV [reactor pressure vessel] shell ... the staff has determined that the K_{IM} calculation methods apply FEM modeling that is similar to that used for the determination of the K_{IT} factors [as codified in the ASME Code, Section XI, Appendix G]. The staff has also determined that there is only a slight non-conservative difference between the P-T limits generated from the 1989 edition of

Appendix G to the Code and those generated from CE NSSS methodology as documented in CE/ABB Evaluation 063-PENG-ER-096, Revision 00, "Technical Methodology Paper Comparing ABB/CE PT Curve to ASME Section III, Appendix G," dated January 22, 1998 (ADAMS Accession No. ML100500514, non-proprietary version). The staff considers that this difference is reasonable and that it will be consistent with the expected improvements in P-T generation methods that have been incorporated into the 1995 edition of Appendix G to the Code." This conclusion regarding the comparison between the CE NSSS methodology and the 1995 Edition of the ASME Code, Section XI, Appendix G methodology also applies to the 2004 Edition of the ASME Code, Section XI, Appendix G methodology because the evolution of the ASME Code Section XI, Appendix G methodology does not affect the K_{IM} calculation significantly.

In summary, the staff concluded in its March 16, 2001, SE that the calculation of K_{IM} using the CE NPSD-683, Revision 6 methodology would lead to the development of P-T limit curves which may be slightly non-conservative with respect to those which would be calculated using the ASME Code, Section XI, Appendix G methods, and that such a difference was to be expected with the development of more refined calculational techniques. Furthermore, the staff concluded in its March 16, 2001, SE that P-T limit curves that would be developed using the methodology of CE NPSD-683, Revision 6 would be adequate for protecting the RPV from brittle fracture under all normal operating and hydrostatic/leak test conditions.

3.0 DISCUSSION

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50 when (1) the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security; and (2) when special circumstances are present.

This exemption results in changes to the plant by allowing the use of an alternative methodology for calculating flaw stress intensity factors in the RPV due to membrane stress from pressure loadings in lieu of meeting the requirements in 10 CFR 50.60 and 10 CFR Part 50, Appendix G. As stated above, 10 CFR 50.12 allows NRC to grant exemptions from the requirements of 10 CFR Part 50. In addition, the granting of the exemption will not result in violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, the exemption is authorized by law.

The underlying purpose of 10 CFR 50.60 and 10 CFR Part 50, Appendix G is to ensure that appropriate P-T limits and the minimum permissible temperature are established for the RPV under normal operating and hydrostatic or leak rate test conditions. The licensee's alternative methodology for establishing the P-T limits and the LTOP setpoints is described in CE NPSD-683-A, Revision 6, which has been approved by the NRC staff. Based on the above, no new accident precursors are created by using the alternative methodology. Thus, the probability of postulated accidents is not increased. Also, based on the above, the consequences of postulated accidents are not increased. In addition, the licensee used an NRC-approved methodology for establishing P-T limits and minimum permissible temperatures for the reactor vessel. Therefore, there is no undue risk to the public health and safety.

The exemption results in changes to the plant by allowing an alternative methodology for calculating flaw stress intensity factors in the reactor vessel. This change to the calculation of stress intensity factors in the reactor vessel material has no negative implications for security issues. Therefore, the common defense and security is not impacted by this exemption.

Special circumstances, pursuant to 10 CFR 50.12(a)(2)(ii), are present in that continued operation of PVNGS, Units 1, 2, and 3 with P-T limit curves developed in accordance with the ASME Code, Section XI, Appendix G is not necessary to achieve the underlying purpose of 10

CFR Part 50, Appendix G. Application of the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6 in lieu of the calculational methodology specified in the ASME Code, Section XI, Appendix G provides an acceptable alternative evaluation procedure, which will continue to meet the underlying purpose of 10 CFR Part 50, Appendix G. The underlying purpose of the regulations in 10 CFR Part 50, Appendix G is to provide an acceptable margin of safety against brittle failure of the reactor coolant system during any condition of normal operation to which the pressure boundary may be subjected over its service lifetime.

Based on the staff's March 16, 2001, SE regarding CE NPSD-683, Revision 6 and the licensee's rationale to support the exemption request, the staff agrees with the licensee's determination that an exemption is required to approve the use of the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6. The staff concludes that the application of the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6, for PVNGS, Units 1, 2, and 3 provides sufficient margin in the development of RPV P-T limit curves such that the underlying purpose of the regulations (10 CFR Part 50, Appendix G) continues to be met. Therefore, the NRC staff concludes that the exemption requested by the licensee is justified based on the special circumstances of 10 CFR 50.12(a)(2)(ii), "[a]pplication of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

Based upon a consideration of the conservatism that is incorporated into the methodologies of 10 CFR Part 50, Appendix G and ASME Code, Section XI, Appendix G, the staff concludes that application of the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6, as described, would provide an adequate margin of safety against brittle failure of the RPV. Therefore, the staff concludes that the exemption is appropriate under the special circumstances of 10 CFR 50.12(a)(2)(ii), and that the application of the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6, is acceptable for use in the PVNGS, Units 1, 2, and 3 PTLR methodology.

4.0 CONCLUSION

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants APS an exemption from the requirements of 10 CFR Part 50, Appendix G to allow application of the K_{IM} calculational methodology of CE NPSD-683-A, Revision 6 in establishing the PTLR methodology for PVNGS, Units 1, 2, and 3.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not have a significant effect on the quality of the human environment (75 FR 8149; dated February 23, 2010).

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 24th day of February 2010.

FOR THE NUCLEAR REGULATORY COMMISSION

Allen G. Howe

Allen G. Howe, Acting Director
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

If you have any questions, please contact me at (301) 415-4032 or via e-mail at randy.hall@nrc.gov.

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

Enclosure:
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