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

April 8, 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, UNIT 3 – RELIEF REQUEST NO. 42 RE: 10 CFR 50.55a(g)(6)(ii)(D)(3) REQUIREMENT FOR DEMONSTRATED VOLUMETRIC LEAK PATH ASSESSMENT (TAC NO. ME0416)

Dear Mr. Edington:

By letter dated January 20, 2009, Arizona Public Service Company (APS, the licensee) submitted Relief Request No. 42 (RR-42), requesting relief from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(ii)(D)(3) for the 2009 spring refueling outage at Palo Verde Nuclear Generating Station, Unit 3 (PVNGS-3). The submittal requests relief from the requirement to perform a U.S. Nuclear Regulatory Commission (NRC)-approved demonstrated volumetric leak path assessment of each reactor pressure vessel (RPV) upper head penetration nozzle. The relief request proposes an alternative to use a previously NRC authorized volumetric leak path technique used under the requirements of the First Revised NRC Order EA-03-009, dated February 20, 2004, which was revoked by rulemaking dated September 10, 2008 (73 FR 52742).

The NRC staff has reviewed the licensee's relief request RR-42. On the basis of the information submitted, the staff concludes that the proposed alternative provides reasonable assurance of structural integrity of the RPV upper head, and that compliance with the additional requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the staff authorizes this alternative for the 2009 spring refueling outage at PVNGS-3.

All other requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

A copy of the related Safety Evaluation is enclosed. If you have any questions, please contact Randy Hall at (301) 415-4032 or via email at randy.hall@nrc.gov.

Sincerely,

Balwant K Singh for

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

Docket No. STN 50-530

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

VOLUMETRIC LEAK PATH ASSESSMENT

INSERVICE INSPECTION RELIEF REQUEST NO. 42

ARIZONA PUBLIC SERVICE COMPANY, ET AL.

PALO VERDE NUCLEAR GENERATING STATION, UNIT 3

DOCKET NO. STN 50-530

1.0 INTRODUCTION

By letter dated January 20, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090360515), Arizona Public Service Company (APS, the licensee), requested U.S. Nuclear Regulatory Commission (NRC) authorization for Relief Request No. 42 (RR-42) from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(ii)(D)(3) for the 2009 spring refueling outage at Palo Verde Nuclear Generating Station, Unit 3 (PVNGS-3). The submittal requests relief from the requirement to perform an NRC-approved demonstrated volumetric leak path assessment of each reactor pressure vessel (RPV) upper head penetration nozzle. The relief request proposes an alternative to use a previously NRC authorized volumetric leak path technique used under the requirements of the First Revised NRC Order EA-03-009, dated February 20, 2004, which was revoked by rulemaking dated September 10, 2008 (73 FR 52742).

2.0 REGULATORY EVALUATION

Paragraph 50.55a(g)(6)(ii) of 10 CFR states that the Commission may require the licensee to follow an augmented inservice inspection program for systems and components for which the Commission deems that added assurance of structural reliability is necessary. Under this section, 10 CFR 50.55a(g)(6)(ii)(D) defines the requirements for reactor vessel head inspections. Paragraph 50.55a(a)(3) of 10 CFR states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC if: (i) the proposed alternatives would provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. The licensee, in accordance with 10 CFR 50.55a(a)(3)(ii), has requested relief from the demonstrated volumetric leak path inspection requirements of 10 CFR 50.55a(g)(6)(ii)(D)(3).

3.0 TECHNICAL EVALUATION

3.1 Component for Which Relief Was Requested

American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1 vessel head penetration nozzles (97 nozzles) and associated welds identified by item number B4.20 of Code Case N-729-1, "Alternative Examination Requirements for PWR [Pressurized-Water Reactor] Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds Section XI, Division 1 Supp 4," Table 1. The current applicable ASME Code edition for PVGNS-3, for the third 10-year inservice inspection interval, is ASME Code Section XI, 2001 Edition through 2003 Addenda.

3.2 Regulatory Requirement

Paragraph 50.55a(g)(6)(ii)(D)(3) of 10 CFR requires, in part, a licensee to perform a demonstrated volumetric or surface leak path assessment through all vessel head penetration nozzle J-groove welds.

3.3 Proposed Alternative

The licensee's proposed alternative is to perform a volumetric leak path inspection using the same techniques used to satisfy the requirements of the First Revised NRC Order EA-03-009, dated February 20, 2004.

3.4 Licensee's Basis

The licensee notes that while industry has initiated efforts to accomplish a generic demonstration of the volumetric leak path assessment technique, the extent of remaining tasks will likely preclude successful completion in time to support the upcoming spring 2009 refueling outage at PVNGS-3. The licensee also states that performance of alternative surface examinations of each J-groove weld would be a significant hardship due to the personnel exposure associated with the inspections in a locked high radiation area and high contamination area without a compensating increase in the level of quality and safety. The licensee provided details on several enhancements to the volumetric leak path inspection technique which have been developed over the past 5 years, including the previously completed baseline inspection data available for assessment comparison.

3.5 Staff Evaluation

ASME Code Case N-729-1 did not include a volumetric leak path assessment as part of the long term re-inspection plans for RPV upper head penetration nozzles and their associated welds. The NRC staff believed this omission was, in part, due to the difficulty for ASME members to establish qualification requirements for this inspection technique. The NRC staff determined that surface examination of all associated penetration J-groove welds was necessary as a defense-in-depth approach to detect leakage through the J-groove weld. The NRC staff presented this position in the proposed rule to mandate upper head inspections in accordance with ASME Code Case N-729-1. During the public comment period, several stakeholders noted hardships in performing this examination, and some stakeholders requested

the option of performing a volumetric leak path assessment which would provide a similar defense-in-depth inspection to detect leakage through the J-groove weld. The staff found the stakeholder's request had merit and amended the final rule. However, due to the question regarding the effectiveness of the examination technique raised during the development of ASME Code Case N-729-1, the NRC staff included the requirement for a demonstrated volumetric leak path assessment in the final rule.

On November 24, 2008, the NRC staff held a public meeting with representatives from the Nuclear Energy Institute and industry to discuss generic activities going forward to demonstrate the volumetric leak path inspection technique. A meeting summary, dated February 24, 2009, with presentation slides is available under ADAMS Accession No. ML090560434. During the meeting, industry representatives provided a presentation on advances in the volumetric leak path assessment technique over the past 5 years. The industry described a living program being run by both major inspection vendors to ensure effective examinations were being performed. The industry representatives noted that recent concerns raised by the NRC's Office of Nuclear Regulatory Research contractors, including questions regarding the interpretation of signal data, were being incorporated into a generic standards document for use by inspectors in the field. The industry representatives explained that since baseline examinations have been performed on all RPV upper head penetration nozzles throughout the U.S. PWR fleet, there would be significant enhancements in analyzing future inspection results. The industry representatives also stated their intention to provide details of each of these enhancements to the NRC in a guideline in the spring of 2009, but that this information was already being put into use by vendors in the field. Further, industry representatives discussed activities to complete an industry generic demonstration of the volumetric leak path technique, but they did not expect to complete the project in time to support the spring 2009 outage at PVNGS-3.

Surface examination of the entire wetted surface of each J-groove weld is an option for the licensee under the requirements of 10 CFR 50.55a(g)(6)(ii)(D)(3), however, the licensee stated that such examination would pose a hardship, due to the greatly increased personnel radiation exposure and the additional risk of heat stress to inspection personnel. The licensee provided further justification as follows:

> "The supplementary scans and additional robotic tool reconfigurations required to accomplish surface examinations result in a significant extension to the examination duration and the accompanying increase in the total dose received. More importantly, the complicated geometry of the J-groove weld surface, particularly on penetrations other than those very close to the reactor head center, poses an extremely difficult challenge for remote inspection. Furthermore, the guide funnels attached to the outside diameter (OD) of the nozzles obstruct access to the J-groove weld surface. It is known that the requisite surface examination coverage for all Palo Verde Unit 3 J-groove welds cannot be obtained using current robotic inspection technology.
>
> Dose rates under the head near the J-groove weld areas are expected to be in the 1.5 to 3 Rem/hour range based on previous survey data. In addition, the area under the head will be posted as a Locked High Radiation Area, a Hot Particle Contamination Area, and a High Contamination Area which may require

personnel to wear additional layers of protective clothing increasing the body heat burden.

The performance of additional manual surface exams under these hazardous radiological conditions, coupled with potential exposure of inspection personnel to heat stress during the examination performance, creates a hardship without a compensating increase in the level of quality and safety."

The NRC staff finds that the licensee has provided sufficient plant-specific information regarding weld surface condition and personnel radiological dose exposure such that the staff concludes that compliance with these provisions constitutes a hardship upon the licensee. Given the delay in implementation of a generic demonstration of the volumetric leak path technique, the staff finds that the volumetric leak path assessment technique as described in the licensee's proposed alternative provides a best effort defense-in-depth inspection beyond the required bare metal visual inspection to identify leakage through each J-groove weld. Further, the NRC staff concludes that the licensee's proposed alternative provides reasonable assurance of structural integrity of the RPV upper head, and that compliance with the additional requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

The NRC staff has reviewed the licensee's basis and concludes that the licensee's proposed alternative provides reasonable assurance of structural integrity of the RPV upper head, and that compliance with the additional requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, in accordance with 10 CFR 50.55a(a)(3)(ii), the NRC authorizes RR-42 for the spring 2009 refueling outage at PVNGS-3.
All other requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Jay Collins

Date: April 8, 2009

A copy of the related Safety Evaluation is enclosed. If you have any questions, please contact Randy Hall at (301) 415-4032 or via email at randy.hall@nrc.gov.

Sincerely,

/RA by Balwant K. Singal for/

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

Docket No. STN 50-530

Enclosure:
Safety Evaluation

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ADAMS Accession No.: ML090770066 (*) Concurrence via SE (**) See previous concurrence

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DATE	3/23/09	3/19/09	3/16/09	3/31/09	4/08/09	4/08/09

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