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

December 4, 2019

Mr. Robert S. Bement
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 63 FOR IMPRACTICAL EXAMINATIONS FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2019-LLR-0002)

Dear Mr. Bement:

By letter dated January 10, 2019, as supplemented by letters dated June 14 and June 28, 2019, Arizona Public Service Company (the licensee) requested the U.S. Nuclear Regulatory Commission's (NRC's) approval of Relief Request 63 for the third 10-year inservice inspection (ISI) program interval at Palo Verde Nuclear Generating Station (Palo Verde), Unit 3. Relief Request 63 pertains to impracticality determination of volumetric examination of some specific American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Class 1 Category B-D pressurizer welds; Class 2 Category C-B steam generator blowdown welds, and nozzle inside radius sections; and Class 2 Category C-F-1 piping welds obtained during the third ISI interval at Palo Verde, Unit 3.

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(g)(5)(iii), the licensee has determined that conformance with a Code requirement is impractical. As a result, the licensee requested alternate ultrasonic examinations of certain welds required by Section XI of the ASME Code.

The NRC staff has reviewed the licensee's submittal and concludes, as set forth in the enclosed safety evaluation, that the proposed alternative in Relief Request 63 has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Accordingly, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC grants the use of proposed alternative for the examination of welds listed in Relief Request 63 at Palo Verde, Unit 3 for the third 10-year ISI interval, which commenced on January 11, 2008, and ended on May 31, 2018.

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

If you have any questions, please contact the Project Manager, Siva P. Lingam, at 301-415-1564 or by e-mail to Siva.Lingam@nrc.gov.

Sincerely,

/RA/

Jennifer L. Dixon-Herrity, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. STN 50-530

Enclosure:
Safety Evaluation

cc: Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST 63

IMPRACTICAL EXAMINATIONS FOR THE

THIRD 10-YEAR INSERVICE INSPECTION INTERVAL

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION, UNIT 3

DOCKET NO. 50-530

1.0 INTRODUCTION

By letter dated January 10, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19010A307), as supplemented by letters dated June 14 and June 28, 2019 (ADAMS Accession Nos. ML19165A140, and ML19179A331, respectively), Arizona Public Service Company (APS, the licensee) requested relief from certain requirements of Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Subarticles IWB-2500 and IWC-2500 for the third 10-year inservice inspection (ISI) interval at Palo Verde Nuclear Generating Station (Palo Verde), Unit 3. Relief Request 63 pertains to impracticality determination of volumetric examination using ultrasonic testing (UT) for some specific ASME Code Class 1 Category B-D pressurizer welds; Class 2 Category C-B steam generator (SG) blowdown welds, and nozzle inside radius sections; and Class 2 Category C-F-1 piping welds obtained during the third ISI interval at Palo Verde, Unit 3.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(g)(5)(iii), "ISI program update: Notification of impractical ISI Code requirements," the licensee requested relief from the required 100 percent weld examination coverage of the above welds and to use alternative requirements, if necessary, for the inspection on the basis that the ASME Code requirement is impractical.

2.0 REGULATORY EVALUATION

Adherence to Section XI of the ASME Code is mandated by 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," which states, in part, that,

> Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the [ASME Code]… that become effective

> subsequent to editions specified in paragraphs (g)(2) and (3) of [10 CFR 50.55a] and that are incorporated by reference in paragraph (a)(1)(ii)… of [10 CFR 50.55a], to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Paragraph 50.55a(g)(5)(iii) of 10 CFR states,

> If the licensee has determined that conformance with a Code requirement is impractical for its facility the licensee must notify the NRC [U.S. Nuclear Regulatory Commission] and submit, as specified in § 50.4, information to support the determinations. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the inservice inspection interval for which the request is being submitted. Requests for relief made in accordance with this section must be submitted to the NRC no later than 12 months after the expiration of the initial or subsequent 120-month inspection interval for which relief is sought.

Paragraph 50.55a(g)(5)(iv) of 10 CFR, "ISI program update: Schedule for completing impracticality determinations," requires that where an examination requirement by the Code edition or addenda is determined to be impractical by a licensee, the basis for this determination must be demonstrated to the satisfaction of the Commission not later than 12 months after the expiration of the initial 120-month period of operation from the start of facility commercial operation and each subsequent 120-month period of operation during which the examination is determined to be impractical.

Paragraph 50.55a(g)(6)(i) of 10 CFR, "Impractical ISI requirements: Granting of relief," states that,

> The Commission will evaluate determinations under paragraph (g)(5) of [10 CFR 50.55a] that code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, and will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to grant relief and the use of the proposed alternative.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Relief Request

3.1.1 ASME Code Components Affected

The affected components are ASME Class 1 and 2 welds and nozzle inside radius sections. The Examination Categories are Class 1 B-D, "Full Penetration Welded Nozzles in Vessels," Class 2 C-B, "Pressure Retaining Nozzle Welds in Vessels," and Class 2 C-F-1, "Pressure Retaining Welds in Austenitic Stainless Steel or High Alloy Piping." The Item Numbers are

B3.110 (Pressurizer Nozzle-to-Vessel Welds), C2.21 (Nozzle-to-Shell (Nozzle to Head or Nozzle to Nozzle) Weld), C2.22 (Nozzle Inside Radius Section), C5.11 (Circumferential Weld), and C5.21 (Circumferential Weld) as shown in Tables IWB-2500-1 and IWC-2500-1 of the ASME Code, Section XI. The affected welds are listed in Attachment 1, Tables 1, 2 and 3 of the relief request.

3.1.2 Applicable Code Edition and Addenda

The Code of Record for the third 10-year ISI interval is the 2001 Edition through the 2003 Addenda of the ASME Code, Section XI. The applicable edition of the ASME Code, Section XI, Appendix VIII program for the ultrasonic examination is the 2001 edition.

3.1.3 Applicable Code Requirements

The applicable code requirements are based on ASME Code, Section XI, Table IWB-2500-1, Class 1, Examination Category B-D, Item No. B3.110, which requires a 100 percent volumetric examination of the nozzle-to-vessel welds for all pressurizer nozzles. Table IWC-2500-1, Class 2, Examination Category C-B, Item Nos. C.2.21 and C2.22 require a 100 percent volumetric examination of the nozzle-to-shell welds, and nozzle inside radius sections for all SG nozzles. Table IWC-2500-1, Class 2, Examination Category C-F-1, Item Nos. C.5.11 and C5.21 require a 100 percent volumetric examination of the pressure retaining welds in austenitic stainless steel or high alloy piping.

The applicable code classes, item, and examination categories, as noted above, are included in Attachment 1 of the relief request for each of the welds and the limited examination coverage achieved. Table 1 of the relief request assigned a sequence number that refers directly back to the specifics for each of the examination limitations for which relief is being sought.

3.1.4 Impracticality of Compliance

The licensee has determined that compliance with the ASME Code requirements of achieving essentially 100 percent coverage of the subject welds is impractical. In accordance with 10 CFR 50.55a(g)(5)(iii), this relief request is based on actual demonstrated examination coverage limitations when attempting to comply with the Code requirements in the performance of the examinations listed in Attachment 1, Tables 1, 2 and 3 of the relief request. As described briefly in the licensee's submittal, the coverage of the surge nozzle-to-vessel weld (Sequence No. 1.1), the spray nozzle-to-vessel weld (Sequence No. 1.2), and the safety nozzle-to-vessel welds (Sequence No. 1.3) for four safety nozzles of the pressurizer are limited to 65.2, 80.8 and 74.7 percent due to the "geometric nozzle design configuration," preventing a complete UT scan.

The licensee stated that the ISI program for the third 10-year ISI interval uses ASME Code Case N-460, "Alternative Examination Coverage for Class 1 and Class 2 Welds, Section XI, Division 1." Use of this code case allows the acceptance of examinations that obtained greater than 90 percent coverage (but less than 100 percent due to interference by another component or part geometry). The relief request is for those welds that achieved less than 90 percent examination coverage.

The licensee further stated that component design configurations with conditions resulting in examination limitations, such as geometric configurations of components or their welds, do not

allow full required examination volume and/or coverage, thus the relief request addresses those conditions.

3.1.5 Burden Caused by Compliance

The licensee stated, in part, in its letter dated January 10, 2019, that,

> Components and welds associated with the items listed in this relief request are constructed of standard design items meeting typical national standards that specify required configurations and dimensions including Class 1 Category B-D, Class 2 Category C-B, and Class 2 Category C-F-1.
>
> For the Class 1 Category B-D Nozzle-to-Vessel Welds of the Pressurizer, the design configurations of these welds and obstructions do not allow for the required examination coverage.
>
> For the Class 2 Category C-B Nozzle-to-Shell Welds at the steam generator blowdown line, the weld configuration and materials do not allow for the required examination coverage. Available ultrasonic testing (UT) equipment could not be successfully calibrated for the configuration and materials at these nozzle locations.
>
> For the Class 2 Category C-B Nozzle Inside Radius (IR) Sections, the design configuration of these nozzles does not allow for UT of the IR sections of these nozzles from the outside surface of the steam generator (SG) nozzles. The only way these limitations could be improved would be to modify the nozzle design.
>
> The Class 2 Category C-F-1 Piping Welds are Pipe-to-Valve, Pipe-to-Tee, and Pipe-to-Flange welds (including similar configurations at orifices and penetrations). Examinations are limited as the UT examination coverage is only accessible from the pipe side of the weld.

The licensee stated that it has performed examinations and/or attempted to the maximum extent possible. Therefore, the licensee determined that obtaining essentially 100 percent coverage for the subject weld is not feasible and is impractical without adding undue burden, increased radiation exposure, and/or potential damage to the plant or the component itself without an increase in safety of the plant. The licensee further stated that making the subject welds accessible for inspection from both sides would require replacement or significant modification of the weld and associated components.

3.1.6 Licensee's Proposed Alternative

In lieu of achieving essentially 100 percent of examination coverage, the licensee proposed alternate examination coverage for the subject welds as identified in Attachment 1, Tables 1, 2, and 3 of the relief request.

As part of the proposed alternative, the licensee identified the following compensatory measures for not achieving essentially 100 percent of examination coverage of the subject welds:

1) Periodic system pressure tests and visual examinations are performed in accordance with ASME Section XI, Examination Category B-P, for

Class 1 pressure retaining welds and items each refueling outage and Examination Category C-H for Class 2 pressure retaining welds and items each inspection period in accordance with Table IWB-2500-1 and Table IWC-2500-1, respectively.

2) Conduct UT examinations to the maximum extent possible and when required by ASME Section XI, perform a 100 percent surface examination as noted in Attachment 1 of this [relief request].

3.1.7 Basis for Use

The licensee stated, in part, in its letter dated January 10, 2019, that,

> 10 CFR 50.55a(g)(4) recognizes that throughout the service life of a nuclear power facility, components which are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements set forth in the ASME Code to the extent practical within the limitations of design, geometry, and materials of construction of the welds and items as described in Attachment 1 of this [relief request].
>
> There is no plant-specific or industry operating experience regarding potential degradation specific to the subject welds in this relief request.

The licensee further stated that,

> For the Class 1 and 2 welds located inside the containment of Unit 3, with limited examinations listed in Attachment 1 of this [relief request], operational leakage is monitored in accordance with the Technical Specification requirements. In addition, during outages, engineers perform walk-downs of systems inside the containment. This walk-down is performed to look for evidence of leakage accumulation and boric acid as well as system abnormalities that could affect plant performance. Also, system pressure tests are performed as required by the ASME Code, Section XI.
>
> For the ASME Class 2 welds examined in accordance with Appendix VIII, Supplement 2, "Qualification Requirements for Wrought Austenitic Piping Welds," ASME Section XI required examination coverage is limited when the weld can only be scanned from one side. … It should be noted that UT was performed through the weld to obtain the maximum possible Code required volume and… the theoretical beam path extends into the far side of the weld for the UT examinations performed. Therefore, the UT examinations conducted using the [ASME Code, Section XI,] Appendix VIII, Supplement 2, qualified procedures, provide reasonable assurance for the detection of flaws on the far side of welds where the ultrasonic beam has been transmitted even though not presently qualified.
>
> No reasonable action can be taken by APS at this time to improve these examinations without applying impractical options. Based on the limited UT examinations achieved, surface examinations (where applicable), any applicable leakage monitoring, and required system pressure tests with VT-2 visual examinations, the proposed alternative in this relief request will provide

assurance of an acceptable level of quality and safety by providing reasonable assurance of structural integrity.

3.1.8 Duration of Alternative

The licensee stated that the relief request is applicable to the original Palo Verde, Unit 3 third 10-year ISI Interval "which began on January 11, 2008, and ended on May 31, 2018, and covers all the limited examinations that have been identified for the entire interval in Unit 3."

3.2 NRC Staff Evaluation

The NRC staff evaluated Relief Request 63 pursuant to 10 CFR 50.55a(g)(6)(i). The NRC staff's evaluation focused on: (1) whether a technical justification exists to support the determination that the ASME Code requirement is impractical; (2) that imposition of the ASME Code required inspections would result in a burden to the licensee without a commensurate increase in safety; and (3) that the licensee's proposed alternative provides reasonable assurance of structural integrity and leak tightness of the subject welds. The NRC staff concludes that if these three criteria are met, the requirements of 10 CFR 50.55a(g)(6)(i) will be met; thereby, granting the requested relief will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

Impracticality of Compliance

The NRC staff examined the sketches in Figures 1-1-1, 1-1-2, 1-2-1, and 1-3-1 for these welds and confirmed that the UT scans were limited due to design configuration of the nozzles and the pressurizer top and bottom heads. The UT scan of the surge nozzle-to-vessel weld is further obstructed by the existence of multiple pads welded to the pressurizer close to the surge nozzle. This explains why its coverage is the worst among the three types of nozzles mentioned above. For the SG No. 2 blowdown nozzle at tube sheet (Sequence No. 1.4), the licensee could not obtain repeatable results during examination calibration. Examination was repeated by outside vendors and industry groups without success. Additional information was provided in the licensee's supplemental letter dated June 28, 2019, which attributes geometric and material issues for a dissimilar weld to its failure to achieve proper validation on the weld mock-up. All these arguments support impracticality in obtaining UT results for this weld. For the SG No. 1 head-to-nozzle inside radius section (Sequence No. 1.5), the licensee could not perform UT from SG outside because the nozzles protrude into the vessel by approximately 13 inches and access to the nozzle inspection area from inside the SG is impractical. The NRC staff noted that the predominant limitations that prevented the licensee's UT to achieve essentially 100 percent coverage of the required volume was design and configuration of the welds and associated components (i.e., pipe-to-valve or elbow-to-valve) that restricted the UT to a single-sided scanning only. The NRC staff concludes that scanning from both sides of the welds, as is required to achieve the required coverage, is impractical because of the configuration of the welds.

Based on the above evaluation, the NRC staff finds that a technical justification exists to support the determination that achieving essentially 100 percent coverage is impractical.

Burden of Compliance

For the three types of pressurizer nozzle-to-vessel welds, the NRC staff verified that the UT scan is limited by the design configuration of the nozzles and the pressurizer top and bottom heads. Therefore, it is not possible to increase ASME Code coverage without significant work (e.g., redesign the pressurizer top head, bottom head, and nozzle configurations) and/or damage to the plant. For the SG No. 2 blowdown nozzle at tube sheet, the NRC staff found that the UT scan is limited by the material and the geometry of the Inconel buttering, the Inconel weld, and the carbon steel nozzle. Therefore, it is not likely to obtain required ASME Code UT data without rewelding the joint with another material and with modified weld configuration. For the SG No. 1 head-to-nozzle inside radius section, protrusion of the nozzle into the inside of SG obstruct the UT examination of the subject welds. Hence, required ASME Code UT data for the nozzle inside radius section could not be obtained without major nozzle modification.

Based on the above information, the NRC staff determined that replacing or reconfiguring the components is the only reasonable means to achieve full coverage of these welds and that replacement or reconfiguration of the welds and components constitutes a burden on the licensee without a commensurate increase in safety.

Structural Integrity and Leak Tightness

In evaluating the licensee's examination coverage achieved, the NRC staff assessed whether the licensee obtained as much coverage as reasonably possible and the manner in which the licensee reported the coverage achieved.

The NRC staff considered whether the licensee's proposed alternative provided reasonable assurance of structural integrity and leak tightness of the subject welds based on: (1) the examination coverage achieved, (2) safety significance of unexamined volumes - unachievable coverage (e.g., any stress or the material condition of the welds, indicating that the uncovered areas are more susceptible to cracking or degradation), (3) the presence or absence of known active degradation mechanisms, (4) the significance of a leak and/or structural failure of the subject welds, (5) operating experience supporting structural integrity and leak tightness, and (6) essentially 100 percent coverage achieved for similar welds in similar environments subject to similar degradation mechanisms.

Welds in Examination Categories B-D and C-B

For the safety significance of the unexamined volumes of welds, the NRC staff noted that the surge nozzle-to-vessel weld (65.2 percent) and the spray nozzle-to-vessel weld (80.8 percent) are axisymmetric to the pressurizer and have reasonable distance from major discontinuities such as other nozzles. As a result, there are only small variations of applied stresses and material resistance along the circumference, making the examination results of 65.2 percent of one weld and 80.8 percent of another representative of each respective weld. The safety nozzle-to-vessel welds (74.7 percent) for the four safety nozzles of the pressurizer are not axisymmetric to themselves. However, Figure 1-3-1 indicated that a significant portion of the high stress area was covered by the UT scan. Therefore, the NRC staff finds the UT information, from 74.7 percent of coverage, representative of the entire weld.

Consequently, it is reasonable to conclude that the safety significance of the unexamined volumes of all subject welds is minimum and, if significant service induced degradation had

occurred, evidence of it would have been detected by the examinations that the licensee already performed for the subject components.

For the SG No. 2 blowdown nozzle at tube sheet, the NRC staff noted that UT was not performed due to impracticality of compliance as discussed before. Instead, surface examinations were performed. The licensee's supplement dated June 28, 2019, indicated that Unit 3 SGs were replaced in October 2007, and preservice surface examinations detected no indications and no change was recorded during the third interval examinations. Further, preservice radiographic testing and the best effort UT examination results met the ASME Code criteria. The NRC staff finds that the above supplemented information provides reasonable assurance of structural integrity and leak tightness for the SG No. 2 blowdown nozzle at tube sheet.

For the SG No. 1 head-to-nozzle inside radius section, the NRC staff noted that UT was not performed due to impracticality of compliance. However, the licensee's supplement dated June 28, 2019, reported structural and fatigue analysis results for the nozzle, showing very low fatigue usage factors and margins between calculated stress values and allowable limits at locations much more critical than the inside radius sections of the nozzle. These indicate that crack initiation is unlikely to occur in the nozzle inside radius section, and even if it occurred, the subsequent crack growth would be limited. The NRC staff finds that the above supplemented information provides reasonable assurance of structural integrity and leak tightness for the SG No. 1 head-to-nozzle inside radius sections.

Regarding operating experience, the licensee stated that there is no plant-specific or industry operating experience regarding potential degradation specific to the subject welds in this relief request. Hence, the NRC staff finds that the operating experience supports structural integrity and leak tightness of the subject components.

In addition, pressure tests performed by the licensee in accordance with the ASME Code, Section XI, will provide additional assurance that any through-wall cracking, if it occurred, would be detected and the licensee will take appropriate corrective actions.

In summary, the NRC staff finds that the UT examinations performed for three types of the welds and the supplemental information for the remaining two provide reasonable assurance of structural integrity and leak tightness of the subject welds.

Welds in Examination Category C-F-1

The ASME Code, Section XI, Table IWC-2500-1, Examination Category C-F-1, contains Item Nos. C5.11 and 5.21 that are relevant to this relief request.

Table 2 of the relief request lists affected welds inspected under Item No. C5.11, which are circumferential welds in piping that has a nominal wall thickness greater than 3/8 inches and pipe size greater than a nominal pipe size (NPS) of 4 inches. Table 3 of the relief request lists affected welds inspected under Item No. C5.21, which are circumferential welds for piping that has a nominal wall thickness greater than 1/5 inches and pipe size between an NPS of 2 inches and NPS of 4 inches. The required inspection for these affected welds is a surface and volumetric examination every ISI interval. The licensee performed the required surface examinations of all the affected welds without deviation from the ASME Code. With respect to the requirements for volumetric examination coverage, the licensee deviated from the required essentially 100 percent coverage.

In its review of the licensee's relief request, the NRC staff determined that it needed additional information. In request for additional information (RAI), MPHB-RAI-1, the NRC staff asked the licensee whether (i.e., as a substitute), examinations were performed on similar welds in the same piping systems such that essentially 100 percent coverage was achieved. In its response to MPHB-RAI-1, by supplemental letter dated June 14, 2019, the licensee stated that there are no examinations that can formally be credited in place of the limited examination coverage as identified in Tables 2 and 3 of the relief request. The licensee stated that it completed other UT examinations on similar welds of the same piping systems, often on the same lines that have achieved essentially 100 percent coverage without detecting rejectable indications. Those completed UT examinations, which correspond to the limited examinations within the same piping systems, are shown in Tables 2A and 3A of the licensee's supplemental letter dated June 14, 2019. The NRC staff determined that those welds in which the licensee had examined in the same piping systems and achieved essentially 100 percent coverage without detecting rejectable indications provide reasonable assurance that the welds covered in this relief request would not likely be significantly degraded. Therefore, the NRC staff finds that the licensee's response is acceptable.

The NRC staff issued MPHB-RAI-2 to request clarification on the exact weld metal (material specification) used in the welds as shown. The licensee provided material specifications as shown in Tables 2B and 3B of its supplemental letter dated June 14, 2019. Tables 2B and 3B provide two weld material specifications for each weld. The licensee stated that Specification "SFA-5.9/ER316/F6/GTAW [Gas Tungsten Arc Welding]" was used for the initial passes (root) of each weld. The balance of each weld was completed using either Specification SFA-5.9/ER316/F6/GTAW or SFA-5.4/ER316/F5/SMAW [Shielded Metal Arc Welding]. The NRC staff verified that all the welds in Tables 2 and 3 of the relief request contain stainless steel filler metal, not nickel-based Alloy 82/182 filler metal. The stainless steel weld filler metal is less susceptible to stress corrosion cracking than the Alloy 82/182 filler metal and, therefore, has relatively favorable operating experience.

The NRC staff issued MPHB-RAI-3 to request that the licensee clarify the zones that were specified in Tables 2 and 3 of the relief request. In the licensee's supplemental letter dated June 14, 2019, the licensee responded that the ISI program is subdivided into zones for convenience of program management. The licensee stated that each zone may represent a room within the plant or a portion of a system separated by building penetrations, code classification boundaries, or otherwise. The Unit 3 ISI program currently defines Zones 1 through 6, and Zones 16 through 129. The physical locations of each weld are provided in Tables 2B and 3B of the licensee's supplemental letter dated June 14, 2019. Tables 2B and 3B show leak detection/monitoring for the areas and/or rooms and include control room indication. Tables 2B and 3B also provide radiation dose rates for each room as averages during the previous 5 years. In addition, the licensee provided the design and operating conditions (e.g., temperature and pressure) of the welds in Tables 2B and 3B. The NRC staff finds that the licensee's zoning plan is an acceptable tool to effectively and efficiently manage the examination of the welds because each zone has leak detection capability to identify potential leakage from a degraded weld.

Based on the information submitted by the licensee, the NRC staff determined that:

- The licensee examined the subject welds using the appropriate equipment, ultrasonic modes of propagation, probe angles, frequencies, and scanning directions to obtain

maximum coverage. The licensee examined the subject welds using 45, 60 and/or 70 degree ultrasonic beam.

- The licensee used applicable refracted longitudinal or 2.25 mega-hertz 70-degree sheer wave scans to examine the far side of the weld examination volumes that are limited by component geometry.

- The licensee determined the required examination volumes for these welds per Figure IWC-2500-7(a) of the ASME Code, Section XI.

- Figures 2a and 2b in this relief request illustrate the typical ASME Code required volumes scanned from a single side using the corresponding ultrasonic beam angles listed in Tables 2 and 3 of this relief request for each weld.

- The licensee used Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) procedures and techniques for the C-F-1 volumetric examinations.

- The licensee calculated the examination coverage in a reasonable manner.

- The licensee used UT procedures that were qualified as required by the regulation in 10 CFR 50.55a.

- The examination coverage was limited by physical access (i.e., the configuration of one side of the weld did not permit access for scanning).

- No unacceptable indications were identified.

In addition to the examination coverage described above, the NRC staff evaluated the safety significance of the unexamined volumes of weld. Based on information submitted by the licensee, the NRC staff determined that:

- The licensee has examined 50 percent of required volume for welds in Examination Category C-F-1 by UT as shown in Table 2 of the relief request.

- The ultrasonic scans have covered the weld root and the heat affected zone (HAZ) of the base material near the inside diameter surface of the joint that are typically susceptible to higher stresses and, therefore, potential degradation.

- The licensee has inspected the far-side volume of the subject welds by the “Best Effort” examination. For the stainless steel weld, the coverage obtained for axial scans was limited to the volume up to the weld centerline (near-side) because claiming coverage for the volume on the opposite side of the weld centerline (far-side) requires meeting the 10 CFR 50.55a(b)(2)(xv)(A)(2) far-side UT qualifications, which has not been demonstrated in any qualification attempts to date. Thus, the licensee did not take any credit for the far-side coverage achieved from the “Best Effort” examination.

- The results of the UT showed no unacceptable indications in any of the subject welds.

- During refueling outages, the licensee performs walkdowns of piping systems inside the containment to look for evidence of leakage accumulation, boric acid residues and system abnormalities that would indicate piping degradation.

Based on the coverage achieved by the qualified UT, the examination of the weld root and its HAZ to the extent possible, and there have been no unacceptable indications in any of the examined welds, the NRC staff concludes that if significant service-induced degradation had occurred, evidence of it would have been detected by the examinations that the licensee performed.

The NRC staff also noted that, in addition to the required volumetric examinations, these welds have received the required surface examinations and system leakage test according to the ASME Code, Section XI, Table IWC-2500-1, Examination Category C-F-1. Additionally, these welds are located either in the auxiliary building or containment and are subject to leakage monitoring.

In summary, the NRC staff concludes that the volumetric examinations performed to the extent possible provide reasonable assurance of structural integrity and leak tightness of the subject welds. The NRC staff further concludes that compliance with the ASME Code examination requirements for the subject welds is impractical and would be a burden on the licensee to replace or reconfigure the welds and attached components without a commensurate increase in safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that it is impractical for the licensee to comply with the examination requirements of the ASME Code, Section XI. The NRC staff finds that requiring the licensee to perform volumetric examinations in accordance with ASME Code, Section XI, is impractical due to the original construction design of Palo Verde, Unit 3. The NRC staff concludes that the licensee has adequately addressed all the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Accordingly, the NRC staff determines that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC grants the use of proposed alternative for the examination of welds listed in Relief Request 63 at Palo Verde, Unit 3 for the third 10-year ISI interval, which commenced on January 11, 2008, and ended on May 31, 2018.

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

Principal Contributors: J. Tsao
S. Sheng

Date: December 4, 2019

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNIT 3 – RELIEF REQUEST 63 FOR IMPRACTICAL EXAMINATIONS FOR THE THIRD 10-YEAR INSERVICE INSPECTION INTERVAL (EPID L-2019-LLR-0002) DATED DECEMBER 4, 2019

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