10 CFR 50 55a

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U S Nuclear Regulatory Commission
Washington, DC 20555-0001

Reference APS letter number 102-07037, Palo *Verde Nuclear Generating Station Unit 3, Docket No STN 50-530, Transmittal of Proprietary Documents for Relief Request 53,* dated April 17, 2015

Dear Sirs

Subject **Palo Verde Nuclear Generating Station (PVNGS)**
Unit 3
Docket No 50-530
American Society of Mechanical Engineers (ASME) Code, Section XI, Request for Approval of an Alternative to Flaw Removal - Relief Request 53

Pursuant to 10 CFR 50 55a(z)(1), Arizona Public Service Company (APS) requests NRC approval of Relief Request 53, which proposes an alternative to the ASME Code requirements of Section XI related to flaw indications identified in a Unit 3 reactor coolant pump 2A suction pressure instrument nozzle Specifically, APS is proposing a half-nozzle repair and flaw evaluation which provides an acceptable level of quality and safety as an alternative to the IWA-4421 requirements for flaw removal The duration of this relief request is for one operating fuel cycle

The referenced letter provides proprietary documents that were submitted to the NRC in support of this relief request

No commitments are being made to the NRC by this letter

APS requests approval of this relief request prior to startup from the Unit 3 eighteenth refueling outage currently scheduled for April 30, 2015

Should you need further information regarding this relief request, please contact Thomas Weber, Regulatory Affairs Department Leader at (623) 393-5764

A047
NRR

Sincerely,

JJC//DCE/hsc

Enclosure Relief Request 53 Proposed Alternative in Accordance with 10 CFR 50 55a(z)(1)

cc M L Dapas NRC Region IV Regional Administrator
M M Watford NRC NRR Project Manager for PVNGS
C A Peabody NRC Senior Resident Inspector for PVNGS

Enclosure

Relief Request 53 Proposed Alternative in Accordance with 10 CFR 50 55a(z)(1)

ATTACHMENTS

Attachment 1 - RCP Instrumentation Nozzle Repair Schematic

Attachment 2 - Flaw Fracture Mechanics, Corrosion, and Loose Parts Evaluations for One Cycle Relief (DAR-MRCDA-15-6-NP)

Attachment 3 – APS Response to NRC Request for Additional Information (RAI), dated April 14, 2015

Background Information

On April 7, 2015, evidence of leakage was found during post-shutdown boric acid walkdowns at the Palo Verde Nuclear Generating Station (PVNGS) Unit 3 reactor coolant pump (RCP) 2A suction pressure instrument nozzle In response, on April 8, 2015, a visual examination of the nozzle was conducted in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Case N-722-1, *Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials, Section XI, Division 1* APS determined the indication to be reactor coolant system (RCS) pressure boundary leakage based on the results

The RCP 2A suction instrument nozzle was an Alloy 600, 1-inch nominal pipe size, that contained an internal orifice designed to limit RCS leakage to within the capacity of the charging system in the event of a connected instrument line break The nozzle extends through the approximate 3-inch RCP suction safe end pipe wall to connect to its associated instrument piping A J-groove weld that connects the suction instrument nozzle to the safe end pipe wall inner surface provided the original RCS pressure boundary The ASME Code Section III Class 1 boundary was originally located at the internal orifice within the suction instrument nozzle

The RCP 2A suction instrument nozzle is one of twenty Unit 3 RCS cold leg instrument nozzles inspected in accordance with Table 1, Item BP-15 205, of ASME Code Case N-722-1 Subsequent to the visual examination performed on April 8, 2015, the scope was expanded to visually examine the remaining 19 RCS cold leg instrument nozzles in accordance with Note 7 of Code Case N-722-1, Table 1 The results were found to be acceptable

During the repair of the nozzle, Arizona Public Service Company (APS) performed supplemental inspections in an attempt to obtain information regarding the as-found condition of the suction pressure instrument nozzle These supplemental inspections included

- A dam was installed to allow introduction of liquid penetrant into the annulus of the cut nozzle The penetrant was allowed to soak for approximately 3 hours and the internal nozzle bore and the inside face of the J-groove weld were then examined visually with a borescope for any evidence of penetrant migration
- A straight beam ultrasonic test (UT) through the nozzle wall from the cut end was performed to detect circumferential flaws in the nozzle wall A mockup of the nozzle was used to calibrate the UT process prior to the examination
- After boring out a portion of the nozzle for the repair, additional internal visual examinations were performed using a borescope

The visual and dye penetrant inspections did not identify signs of degradation or the source of the leak The straight beam UT did not identify evidence of circumferential flaws at any depth in the nozzle The results were not unexpected given the likelihood of axially oriented SCC

An ASME Code compliant half-nozzle repair was implemented to replace the original function of the J-groove weld on the interior of the safe end wall The replacement half-nozzle consists of a forged, primary water stress corrosion cracking (PWSCC) resistant Alloy 690 drilled round bar stock attached by an external J-groove weld with a fillet weld cap The half-nozzle repair effectively transfers the Class 1 reactor coolant pressure boundary weld from the original internal J-groove weld in the RCP carbon steel safe end to a new external J-groove weld The replacement half-nozzle contains an internal orifice and integral 90 degree elbow that functionally replaces the original restriction orifice The inner portion of the original RCP 2A suction instrument nozzle and the J-groove weld (remnant nozzle and remnant weld) will remain in place In summary, the repair relocated the RCS pressure boundary from the RCP 2A suction instrument nozzle remnant J-groove weld to a new exterior J-groove weld Additionally, the ASME Code Class 1 boundary was relocated from the remnant nozzle internal orifice to the replacement nozzle orifice

The Enclosure includes the following attachments

- Attachment 1- *RCP Instrumentation Nozzle Repair Schematic*
- Attachment 2 - *Flaw Fracture Mechanics, Corrosion, and Loose Parts Evaluations for One Cycle Relief (DAR-MRCDA-15-6-NP)*
- Attachment 3 - *APS Response to NRC Request for Additional Information (RAI), dated April 14, 2015*

1 ASME Code Components Affected

Components	RCP 2A Suction Pressure Instrument Nozzle
Code Class	Class 1
Examination Category	B-P (Class 1 PWR Components Containing Alloy 600/82/182)
Code Item Number	B15 205
Description	Reactor Coolant System Cold Leg Instrument
Size	1 inch Nominal Pipe Size at the RCP 2A Suction Pressure Instrument Nozzle J-groove Weld
Material	SB-166 Alloy 600 Nozzle and ERNiCr-3/ENiCrFe-3 Alloy 82/182 Butter and Weld

2 Applicable Code Edition and Addenda

PVNGS, Unit No 3, Inservice Inspection Program (ISI) – Third Interval, ending January 11, 2018 ASME B&PV, Section XI, 2001 Edition including Addenda through 2003 (Reference 1) as supplemented by 10 CFR 50 55a(g)(6)(ii)(E), *Reactor Coolant Pressure Boundary Visual Inspections*

3 Applicable Code Requirements

Section XI, Article IWA-4000 provides requirements for repair/replacement activities

IWA-4421 states, in part

> Defects shall be removed or mitigated in accordance with the following requirements

The following Section XI articles are not applicable because they are exempted by Article IWB-1220(b)(1), as addressed by 10 CFR 50 55a(g)(6)(ii)(E)(2) and Code Case N-722-1 since the nominal pipe size of the nozzle is one inch or less

Section XI, Article IWA-3000 provides standards for examination evaluation

IWA-3100(a) states, in part

> Evaluation shall be made of flaws detected during an Inservice examination as required by IWB-3000 for Class 1 pressure retaining components

IWA-3300(b) states, in part

> Flaws shall be characterized in accordance with IWA-3310 through IWA-3390, as applicable

Section XI, Article IWB-3000 provides acceptance standards for Class 1 components

IWB-3420 states

> Each detected flaw or group of flaws shall be characterized by the rules of IWA-3300 to establish the dimensions of the flaws These dimensions shall be used in conjunction with the acceptance standards of IWB-3500

4 Reason for Request

APS conducted boric acid walkdowns inside the containment building at the beginning of the PVNGS Unit 3 18th Refueling Outage (3R18) These walkdowns revealed evidence of leakage in the annulus at the RCP 2A suction safe end pressure instrument nozzle (suction instrument nozzle) Subsequent visual examination confirmed reactor coolant as the source

Visual examinations of the remaining Unit 3 RCS cold leg instrument nozzles were performed as required by Code Case N-722-1 with no evidence of RCS pressure boundary leakage identified

Repair of the original RCP 2A instrument nozzle and J-groove weld would require removal of the RCP internals to access the internal surface of the reactor coolant piping in order to grind out the attachment weld and repair or replace the remaining nozzle Such an activity would result in high radiation exposure to the personnel involved and present the additional risk of introducing foreign material into the RCS and reactor core Additionally, volumetric UT examination of the remnant J-groove weld was not feasible because of its configuration and the restrictive access associated with the small bore of the instrument nozzle internal orifice

A half-nozzle design repair was implemented such that the original RCP 2A instrument nozzle and J-groove weld no longer perform a pressure boundary function APS is proposing a half-nozzle repair and a flaw evaluation as an alternative to the IWA-4421 requirements for flaw removal

5 Proposed Alternative and Basis for Use

APS is proposing an alternative in accordance with 10 CFR 50 55a(z)(1) The alternative consists of two main elements

a ASME Code Compliant Half-Nozzle Repair

The half-nozzle repair is an industry standard, ASME Code compliant repair method that attaches a new PWSCC resistant Alloy 690 half-nozzle using an external Alloy 52M partial penetration J-groove weld The repair relocated the pressure boundary weld from the instrument nozzle J-groove weld on the interior wall of the RCP suction nozzle safe end to the new exterior J-groove weld on the exterior wall The half-nozzle repair of the RCP 2A suction nozzle penetration will not remove the flaws in the remnant J-groove weld or remnant Alloy 600 nozzle material near this weld The half-nozzle repair is shown in Attachment 1 to this Enclosure

b Flaw Evaluation

The flaw evaluation postulated a maximum bounding flaw that propagates axially and circumferentially through the J-groove weld and butter into the carbon steel base material to a depth conservative with respect to one operating fuel cycle

The results of the evaluation were found to be acceptable and are summarized in Attachment 2, *Flaw Fracture Mechanics, Corrosion, and Loose Parts Evaluations for One Cycle Relief,* to this Enclosure

The above two elements provide an acceptable level of quality and safety in accordance with 10 CFR 50 55a(z)(1)

6 Duration of Proposed Alternative

The duration of the request is for the 19th Unit 3 operating fuel cycle ending in the refueling outage U3R19 The U3R19 refueling outage is currently scheduled for fall 2016

7 Precedents

Palo Verde Nuclear Generating Station, Units 1, 2, and 3 - 10 CFR 50 55a(a)(3)(i) Alternative Repair Request for Reactor Coolant System Hot Leg Alloy 600 Small-Bore Nozzles (Relief Request 31, Revision 1), August 16, 2005, ADAMS Accession Number ML 052550368

8 References

Section XI, *Rules for Inservice Inspection of Nuclear Power Plant Components, 2001 Edition, including Addenda through 2003*

9 Attachments

Attachment 1 - *RCP Instrumentation Nozzle Repair Schematic*

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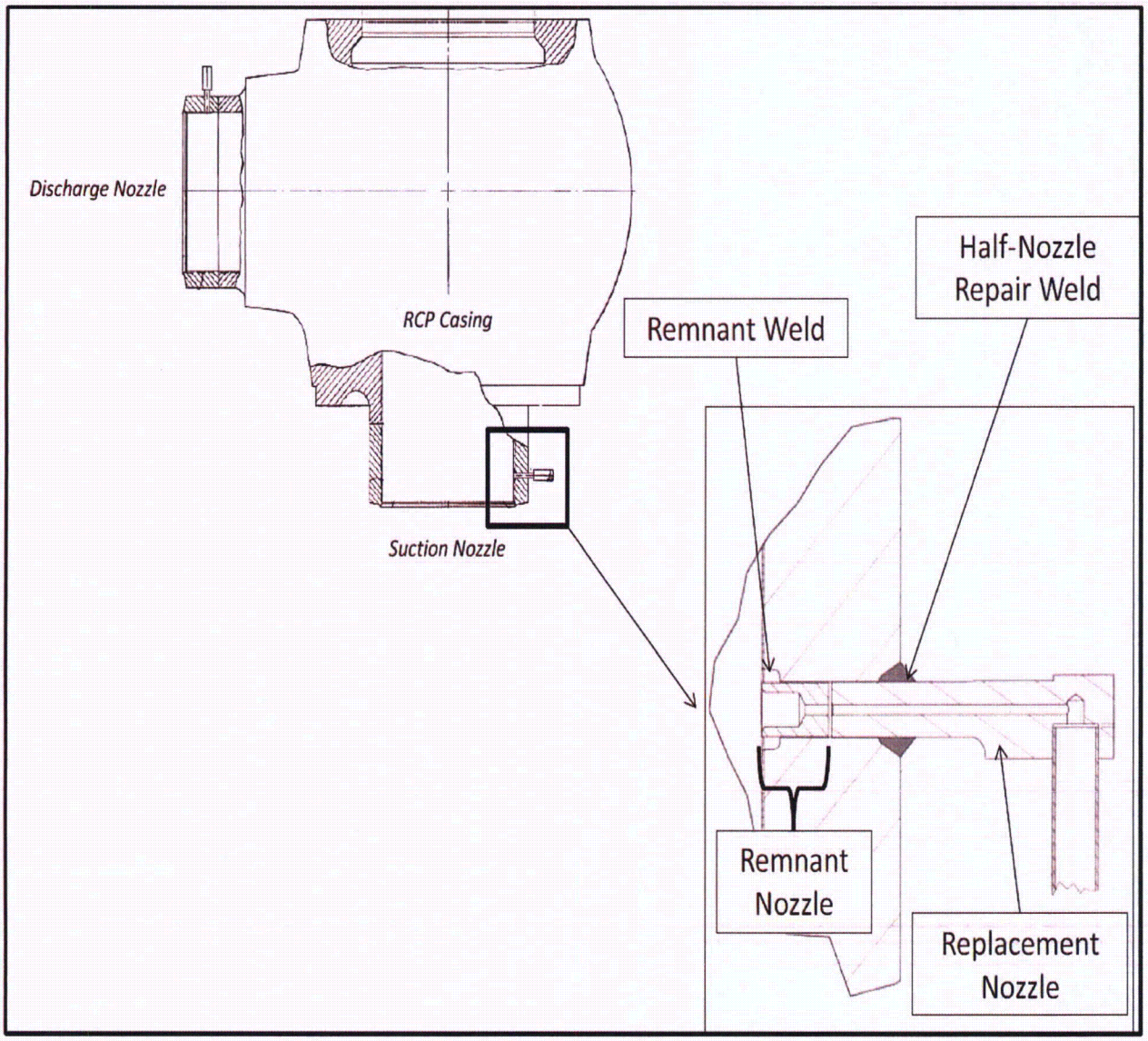
ATTACHMENT 1

RCP Instrumentation Nozzle Repair Schematic



RCP 2A RCP Instrumentation Nozzle Repair Schematic