10 CFR 50.55a

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102-07936-MLL/MDD
June 28, 2019

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001
Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station Unit 3**
Docket No. STN 50-530
Renewed Operating License No. NPF-74
Response to Request for Additional Information - Relief Request 63 - Unit 3 Impractical Examinations for the Third 10-Year Inservice Inspection Interval

By letter number 102-07851, dated January 10, 2019, Agencywide Documents Access and Management System Accession No. ML19010A307, Arizona Public Service Company (APS) submitted relief request 63 in accordance with 10 CFR 50.55a(g)(5)(iii). Certain ultrasonic examinations of welds identified in letter 102-07851 required by Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, sub-articles IWB-2500 and IWC-2500 have been determined to be impractical for the Unit 3 third 10-Year inservice inspection interval.

The Nuclear Regulatory Commission (NRC) staff has requested additional information to complete their review with regard to ASME Code components. A clarifying phone call was held between NRC and APS on May 30, 2019, to discuss the additional information needed. The APS response to the request for additional information is provided in the enclosure to this letter.

No new commitments are being made in this submittal. If you have any questions about this request, please contact Michael D. DiLorenzo, Department Leader, Nuclear Regulatory Affairs, at (623) 393-3495.

Sincerely,

Lacal, Maria L(Z06149)
Digitally signed by Lacal, Maria L(Z06149)
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Date: 2019.06.28 15:14:33 -07'00'

MLL/MDD

Enclosure: Response to Request for Additional Information - Relief Request 63, Unit 3 Impractical Examinations for the Third 10-Year Inservice Inspection Interval

cc: S. A. Morris — NRC Region IV Regional Administrator
S. P. Lingam — NRC NRR Project Manager for PVNGS
C. A. Peabody — NRC Senior Resident Inspector for PVNGS

Enclosure

Response to Request for Additional Information

Relief Request 63

Unit 3 Impractical Examinations for the Third 10-Year Inservice Inspection Interval

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The Nuclear Regulatory Commission (NRC) staff has reviewed RR 63 and requested additional information in order to complete the review with regard to ASME Code components. A clarifying phone call was held between NRC and APS on May 30, 2019, to discuss the additional information needed. The APS response is provided after each NRC request for additional information.

NRC MVIB-RAI-1:

Table 1 states that ultrasonic testing (UT) examinations were not performed on welds 42-100 and 42-101 because the UT equipment could not be calibrated due to "weld materials and configurations." Please describe the efforts taken to calibrate the equipment. Please describe the specific aspects of the weld materials and configurations that prevented the calibration of the UT equipment.

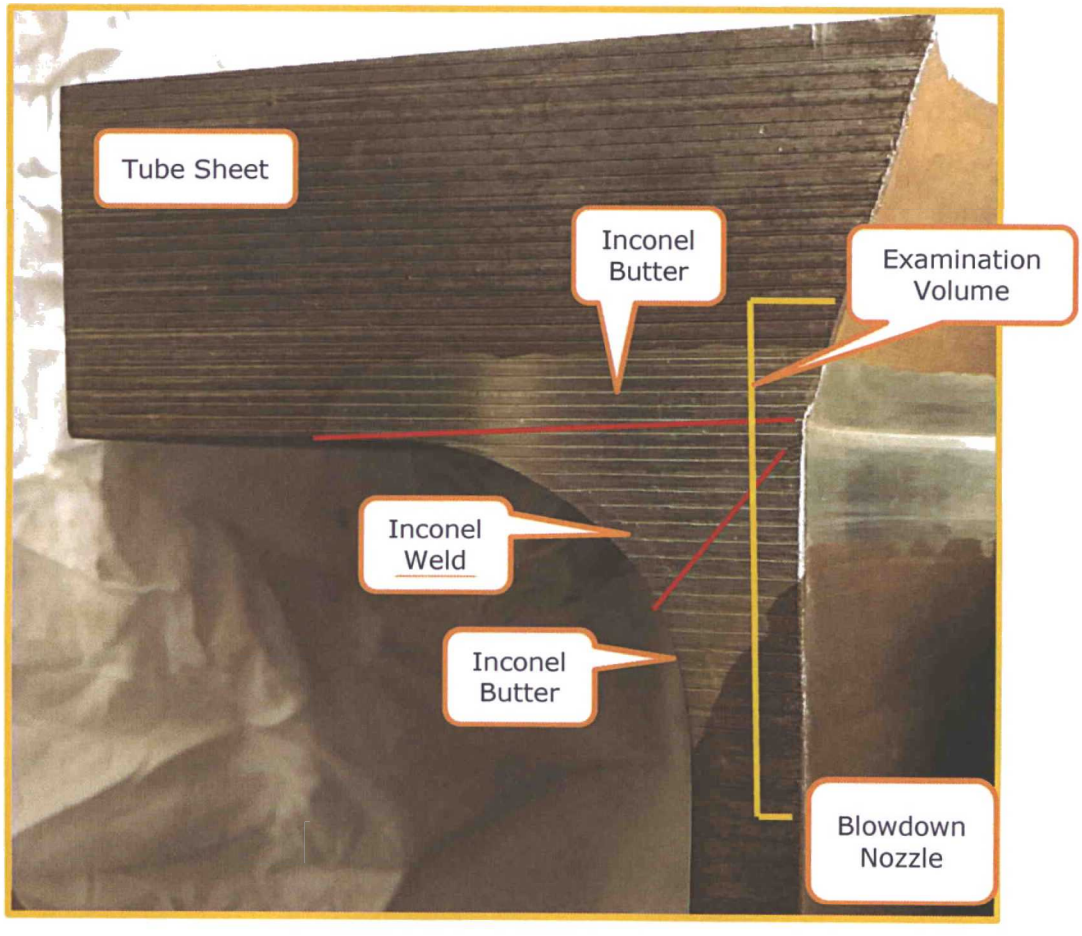
APS Response:

During the Unit 3 thirteenth refueling (3R13) outage, the steam generators were replaced. A mock-up shown in Figure 1 was fabricated by the steam generator vendor for the Unit 3 blowdown nozzle weld configuration that utilized an Inconel attachment weld configuration. Figure 2 shows a cross section of the blowdown nozzle weld, illustrating the carbon steel tube sheet, Inconel butter, Inconel attachment weld and carbon steel blowdown nozzle. For ultrasonic preservice examinations of the replacement steam generators blowdown nozzles, efforts were made to calibrate utilizing the mock-up but examinations were documented as best effort examinations.

During the third interval, multiple attempts were made to validate an ultrasonic technique utilizing the vendor provided weld mock-up. Ultrasonic examiners utilized a variety of shear wave transducers and longitude wave transducers and a proper validation was not achieved on the weld mock-up for welds 42-100 and 42-101. The nozzle mock-up was sent to the North Carolina Electric Power Research Institute Nondestructive Evaluation Facility to evaluate inspection methods including the use of state-of-the-art phased array ultrasonic techniques. Attempts at providing an ultrasonic inspection technique for the configuration were unsuccessful. The difficulty of examination on the steam generator blowdown nozzle weld configuration is a combination of geometric and material issues. Geometric issues exist due to the extended weld volume due to the Inconel butter on the tube sheet and blowdown nozzle as shown in Figure 2. Material issues present examination difficulties as the Inconel butter and Inconel weld complicate pulse echo ultrasonic exam techniques attempted due to the high attenuation and issues with beam redirect that occur in austenitic materials and dissimilar metal weld configurations.

Figure 1: Weld 42-100 and 42-101 Mock-up Block

Figure 2: Weld 42-100 and 42-101 Weld Cross Section



NRC MVIB-RAI-2:

Please describe the preservice examinations (PSE) performed on 42-100 and 42-101 and the results of these examinations. If UT examinations were performed as part of the PSE, describe the unique inservice constraints currently preventing UT from being performed.

APS Response:

The Unit 3 replacement steam generators were installed during the 3R13 outage (October 2007) and preservice examinations consisted of surface and volumetric examinations.

Preservice surface examinations detected no indications on both nozzle attachment welds and no change was recorded during the third interval examinations.

Preservice volumetric examinations included both radiographic testing (RT) and ultrasonic testing (UT) examinations. The RT for welds 42-100 and 42-101 identified porosity but the porosity is acceptable per the ASME Section III acceptance criteria.

Ultrasonic examinations were performed but examination reports specify the following with no credit for Section XI volumetric coverage:

> "Best effort examination due to weld configuration..."

No best effort ultrasonic examinations were performed during the third interval for welds 42-100 and 42-101 in Unit 3 as the weld configuration could not be validated for examination.

NRC MVIB-RAI-3:

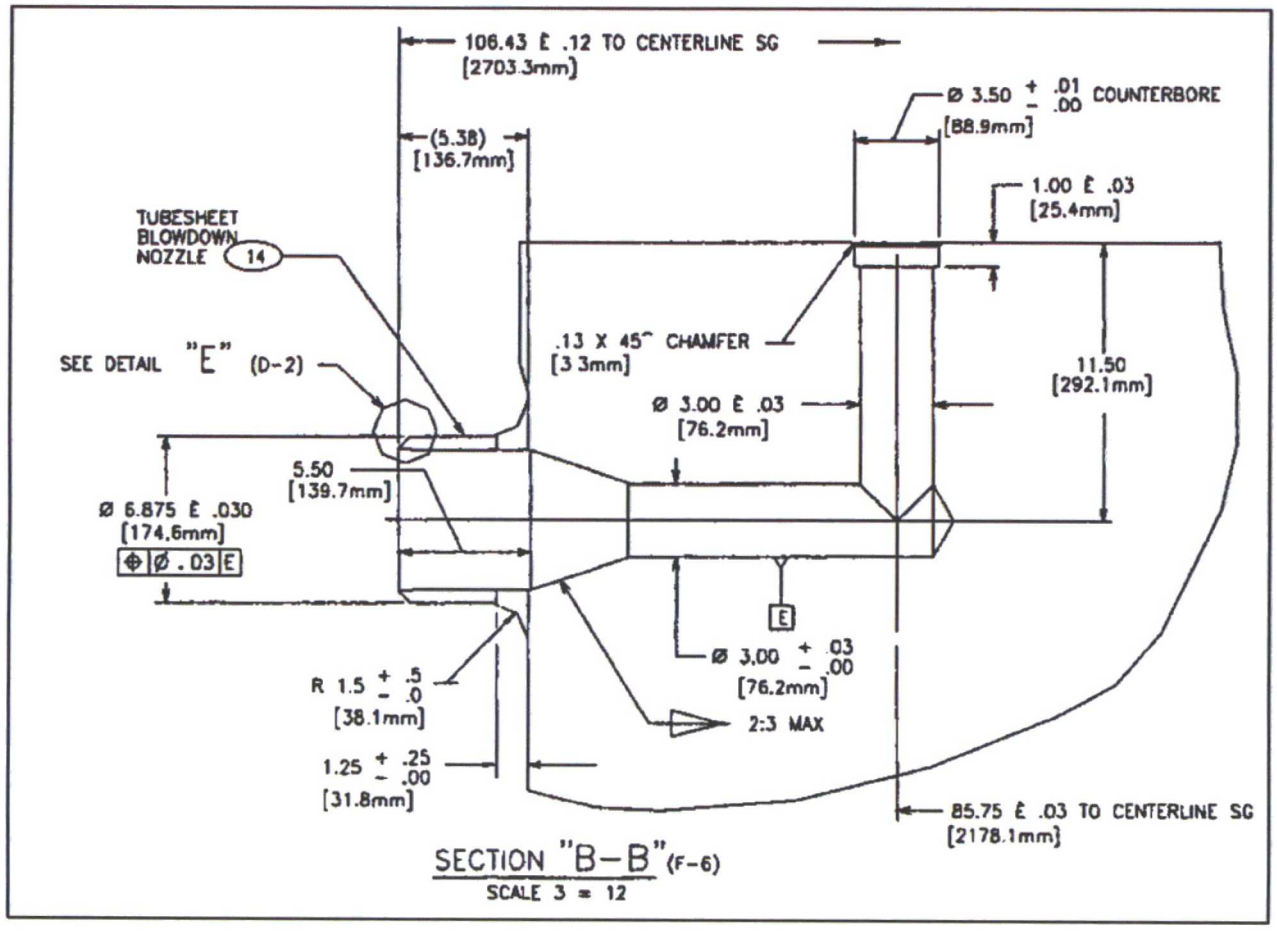
Please identify any other steam generators operated by APS with similar blowdown nozzle configurations to 42-100 and 42-101. If UT examinations have been successfully performed on locations comparable to 42-100 and 42-101, please describe the differences that permitted UT examination and examination results.

APS Response:

The Unit 1 steam generator blowdown nozzles have the same Inconel and Inconel weld butter configuration as the Unit 3 steam generator blowdown nozzles. The same ultrasonic examination issues that exist on the Unit 3 steam generator blowdown nozzles exist on the Unit 1 steam generator blowdown nozzles. The Unit 1 blowdown nozzle attachment welds will be included in the Unit 1 impractical relief request.

The Unit 2 steam generators have carbon steel blowdown nozzles and welds (Figure 3) that were successfully examined in the third ISI interval. The Unit 2 nozzle configuration provides a more accessible examination volume and favorable materials for ultrasonic examinations.

Figure 3: Unit 2 Blowdown Nozzle to Shell Weld



NRC MVIB-RAI-4:

Please provide a description, assumptions, and results of the "Structural and fatigue analysis of the steam outlet nozzle" (ANSALDO PV-RPM-13-000012, Rev.2).

APS Response:

Relief Request 63 incorrectly referenced "ANSALDO PV-RPM-13-000012, Rev. 2" for the design of the steam outlet nozzle. This document is for Unit 2 not Unit 3. The correct document for Unit 3 is "ANSALDO PX-RPM-13-DNU017, revision 0."

Description

The Units 1 and 3 steam generators steam outlet nozzles are evaluated in Report PX-RPM-13-DNU017, reference 1. This report performed a structural and fatigue analyses of the steam outlet nozzles in accordance with the ASME Code, Section III, Class 1, 1989 Edition, no addenda, reference 2. The nozzles were evaluated utilizing a 2-D axisymmetric finite element model using the ANSYS program, revision 5.4. The loads (internal pressure, temperature transients, and external piping loads) and loading combinations were derived from the certified design specification, reference 3.

Assumptions

The external thermal loads on the steam nozzles from the design specification (reference 3) are related to five operating conditions (conditions 1 thru 5) while the thermomechanical analyses have been performed for all the relevant plant transients as provided in reference 4.

The steam outlet nozzle has been analyzed for the service level A and B thermal transients as defined in reference 3.

The following transients have been considered:

1. Plant Heat-up (100°F/hr)
2. Plant Cool-down (100°F/hr)
3. Power Change up 5%/min (15% to 100% Power)
4. Power Change down 5%/min (100% to 15% Power)
5. Power Change up 5%/min (50% to 100% Power)
6. Power Change down 5%/min (100% to 50% Power)
7. 8. 10% Step Load Increase; Normal Plant variation; 10% Step Load Decrease (±10°F)
9. Reactor Trip; Loss of Reactor Coolant Flow; Loss of Load

Therefore, the following assumptions have been made in the thermal mechanical analyses to incorporate the external thermal loads when the thermal loads are not defined:

Start of heat up → condition 2

Other instants of heat up → condition 3

End of Cooldown → condition 5

Other instants of Cooldown → condition 4

Other hot loading conditions → thermal loads equal to those during normal operation

Cold loading conditions → no thermal loads

Cold loading conditions are Zero stress state and Leak Test.

Results

The analyses presented in reference 1 demonstrate that the steam outlet nozzles of the steam generators satisfy the requirements of the ASME Code Section III, Class 1, in the Design Level A/B, Level D and Test conditions for primary stresses caused by pressure and external loads and secondary stresses caused by plant thermal operating transients. In addition, the nozzles were also analyzed for the effects of fatigue damage and are determined to be acceptable.

The results are summarized in tables 1, 2 and figure 4, where the bounding ratios between calculated values and allowable limits are shown.

Table 1 – Primary Stress

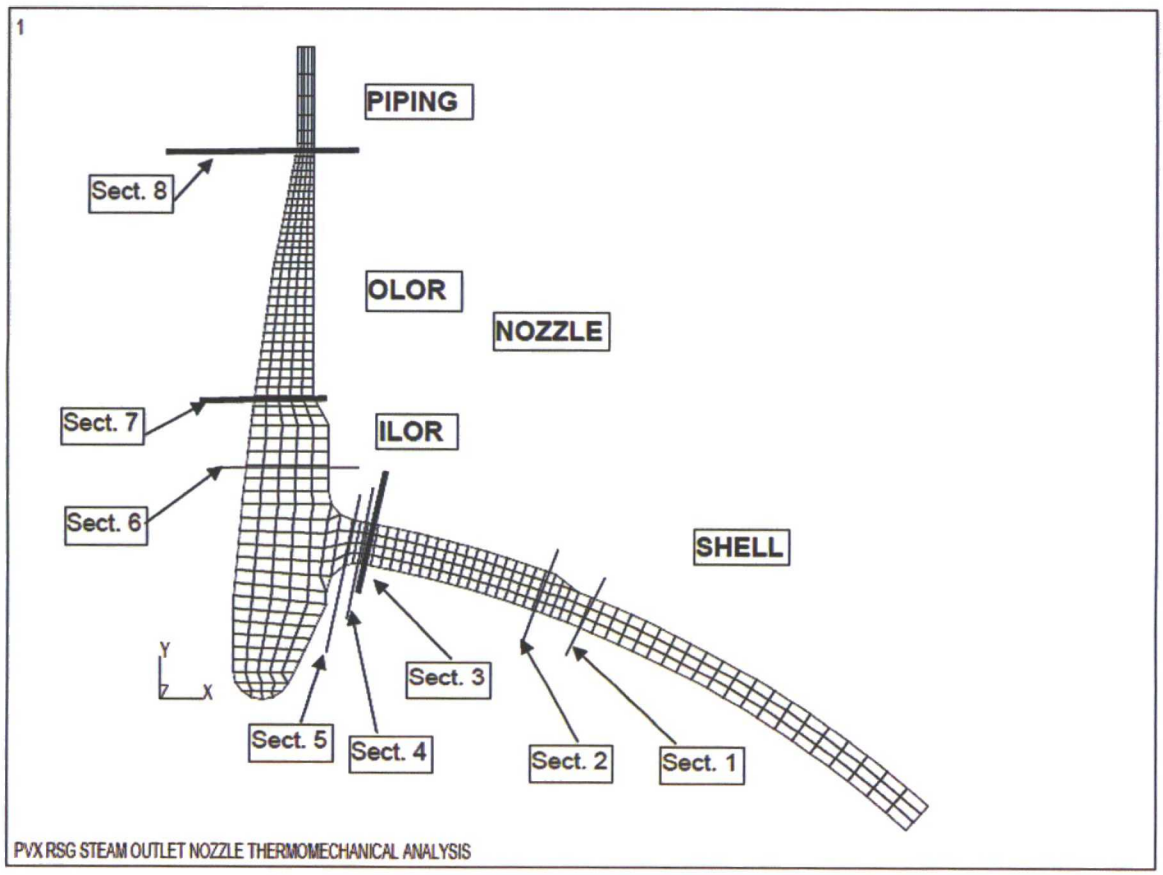
Zone	Service Level	Section # (Fig.4)	Stress Classif.	S.I. [ksi]	All. [ksi]	Ratio	Section # (Fig.4)	Stress Classif.	S.I. [ksi]	All. [ksi]	Ratio
ILOR	DESIGN	1	P_m	22.5	26.7	0.84	1	P_L+P_b	27.1	40	0.68
		3 side SA 508 Cl. 1 A	P_L	19.5	27.3	0.71					
	LEVEL D	1	P_m	32.1	56	0.57	3 side SA 508 Cl. 1 A	P_L+P_b	46.5	73.5	0.63
		3 side SA 508 Cl. 1 A	P_L	46.5	73.5	0.63					
	TEST	1	P_m	26.5	40.6	0.65	1	P_L+P_b	33.3	60.9	0.55
		3 side SA 508 Cl. 1 A	P_L	21.4	41.6	0.51					
OLOR	DESIGN	8	P_m	9.6	18.2	0.53	8	P_L+P_b	11.5	25.2	0.46
	LEVEL D	8	P_m	11.8	49	0.24	8	P_L+P_b	17.8	73.5	0.24
	TEST	8	P_m	10.9	27.7	0.39	8	P_L+P_b	12.2	41.6	0.29

ILOR – Inside Limits Of Reinforcement
OLOR - Outside Limits Of Reinforcement
P_m = general primary membrane stress intensity
P_L = local primary membrane stress intensity
P_b = primary bending stress intensity
Q = secondary stress intensity

Table 2 - Primary Plus Secondary Stress and Fatigue

Primary plus Secondary stress					Fatigue	
Section # (Fig. 4)	Stress Classification	S.I. [ksi]	Allowable [ksi]	Ratio	Section # (Fig. 4)	Usage Factor
3 side SA 508 Cl. 1 A	$P_L + P_b + Q$	35.2	54.6	0.62	3 side SA 533 Gr. B Cl. 1	0.037
3 side SA 533 Gr. B Cl. 1	$P_L + P_b + Q$	39.6	80.1	0.49	Top dome pressure test nozzle	0.137

Figure 4 – Selected Stress-Lines



References

1. Units 1 and 3 Structural and Fatigue Analysis Of Steam Outlet Nozzle Report PX-RPM-13-DNU017, revision 0, Palo Verde SDOC MN725-A01449, revision 0
2. ASME Code, Section III, Class 1, 1989 Edition, no Addenda
3. Design Specification for Replacement Steam Generators for the APS Palo Verde NGS Units 1 and 3, PX-SPD-00-AESC001, revision 8, Palo Verde SDOC MN725-A01166, revision 4
4. Units 1 and 3 Steam Outlet Nozzle-Thermal Analysis PV-RPM-13-000041, revision 0, Palo Verde SDOC MN725-A00158, revision 0