



102-07029-TNW/MDD/CJS  
April 1, 2015

**Palo Verde  
Nuclear Generating Station**  
5801 S. Wintersburg Road  
Tonopah, AZ 85354

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

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS) Unit 2  
Docket No. STN 50-529  
License No. NPF-51  
Response to NRC Request for Additional Information Regarding 2014  
Steam Generator Tube Inspections**

Attached please find Arizona Public Service Company's (APS) response to the March 10, 2015, Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI).

By letter dated October 10, 2014 (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML14288A371), APS submitted information summarizing the results of the 2014 steam generator tube inspections at Palo Verde Nuclear Generating Plant (PVNGS) Unit 2.

The NRC staff reviewed the information provided by APS and determined that additional information was needed to complete its review of the steam generator tube inspections. On March 10, 2015, the NRC staff provided an RAI to APS, which requested that a response be submitted within 30 days. The APS response to the RAI is provided in the Enclosure to this letter.

No commitments are being made to the NRC by this letter. Should you need further information regarding this response, please contact Michael D. Dilorenzo, Licensing Section Leader, at (623) 393-3495.

Sincerely,

A handwritten signature in black ink that reads "Thomas N. Weber".

Thomas N. Weber  
Nuclear Regulatory Affairs Department Leader  
TNW/MDD/CJS/hsc

A001  
MRR

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U.S. Nuclear Regulatory Commission

Response to NRC Request for Additional Information Regarding 2014 Steam Generator Tube Inspections

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Enclosure:      Response to Request for Additional Information for Steam Generator Tube Inspections in Unit 2

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**

**Response to Request for Additional Information for Steam  
Generator Tube Inspections in Unit 2**

**Enclosure**  
**Response to Request for Additional Information**  
**for Steam Generator Tube Inspections in Unit 2**

**Introduction**

By letter dated October 10, 2014 (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML14288A371), Arizona Public Service Company (APS) submitted information summarizing the results of the 2014 steam generator tube inspections at Palo Verde Nuclear Generating Plant (PVNGS) Unit 2.

The NRC staff reviewed the information provided by APS and determined that additional information was needed to complete its review of the steam generator tube inspections. On March 10, 2015, the NRC staff provided a Request for Additional Information (RAI) to APS, which requested that a response be submitted within 30 days. The APS response to the RAI is provided as follows.

**NRC Request 1**

*For each operating cycle since steam generator replacement in 2003, please provide the effective full power months (EFPM) accrued, and the cumulative EFPM as of RFO18.*

**APS Response**

The EFPM and cumulative EFPM accrued for each operating cycle since steam generator replacement in 2003 is provided in the following table.

| <b>PVNGS Unit 2 Operating Cycles Since 2003</b> |             |                        |
|---|-------------|------------------------|
| <b>Operating Cycles</b>                         | <b>EFPM</b> | <b>Cumulative EFPM</b> |
| Cycle 12 (Ended Spring 2005)                    | 14.72       | 14.72                  |
| Cycle 13 (Ended Fall 2006)                      | 15.73       | 30.45                  |
| Cycle 14 (Ended Spring 2008)                    | 15.97       | 46.42                  |
| Cycle 15 (Ended Fall 2009)                      | 15.27       | 61.69                  |
| Cycle 16 (Ended Spring 2011)                    | 15.96       | 77.65                  |
| Cycle 17 (Ended Fall 2012)                      | 17.12       | 94.77                  |
| Cycle 18 (Ended Spring 2014)                    | 16.51       | 111.28                 |

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**NRC Request 2**

*In the section labeled "Upper Internals Inspection Summary" on pages 7 and 8, the phrases "no anomalies were noted" and "no anomalous conditions were noted" are used when discussing various sections of the upper internals. Please discuss whether any degradation was noted during these inspections. Similarly, please clarify whether any degradation was observed during the channel head and plug inspections.*

**APS Response**

As stated on page 7 of the *Unit 2 - 18<sup>th</sup> Refueling Outage Steam Generator Tube Inspection Report*, the majority of the upper internals inspection for steam generator SG 21 was not performed during the outage.

A visual inspection was performed on the upper internals of steam generator SG 22. The visual examinations documented the overall condition of the components in the accessible areas above the primary separator deck and below the primary separator deck (inside the shroud). The upper hand hole was opened and a camera was inserted into the no-tube lane to inspect the top of the 7<sup>th</sup> eggcrate tube support, the bottom of the 8<sup>th</sup> eggcrate tube support and the center stay opening.

Specific areas visually examined during the inspection above the primary separator deck included 194 steam separators, drain lines, bottom of the dryer deck, bottom of the dryers and accessible nozzles.

Specific areas visually examined below the primary separator deck included I-Beam attachments, recirculation piping and nozzles, recirculation pipe stanchions, U-bolt attachments and vanes underneath the primary separators. The square bend region was visually inspected including the tube bundle in this area, diagonal supports and vertical supports. The square bend region showed evidence of scale deposits.

No degradation was documented on any of the components that were visually inspected.

The downcomer feed ring was not inspected. The PVNGS replacement steam generators downcomer feedwater rings are constructed of chrome-moly carbon steels and erosion/corrosion is not considered relevant for the PVNGS replacement steam generators at the current accumulated EFPM.

Procedure 81DP-9RC01, *PVNGS Steam Generator Management Program*, requires that a visual inspection of the steam generator plugs be performed to assess plug integrity, consistent with the EPRI *PWR Steam Generator Examination Guidelines*. A visual examination was conducted in both SG 21 and SG 22. No evidence of plug leakage was identified. The results are documented on plug examination sheets

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that have been signed and attached to the procedure in the eddy current testing work orders.

A channel head inspection was also performed in response to industry operating experience. No degradation was identified during the channel head inspections.

**NRC Request 3**

*Table 2 provides the number of tubes and number of indications detected. Please clarify the number of tubes and the number of indications (regardless of depth) with wear in the U-bend region (batwings and vertical straps) and at the horizontal (straight span) tube supports.*

**APS Response**

The following figure (Revised Table 2 of the *Unit 2 - 18<sup>th</sup> Refueling Outage Steam Generator Tube Inspection Report*) documents the specific inspection results for the U-bend region (batwings and vertical straps) and at the horizontal (straight span – “eggcrate”) tube supports.

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**Figure**

| <b>TABLE 2 Revised 3-17-15</b>              |                           |             |                       |     |    |                           |             |     |                       |    |
|---|---------------------------|-------------|-----------------------|-----|----|---------------------------|-------------|-----|-----------------------|----|
| <b>INDICATION SUMMARY</b>                   |                           |             |                       |     |    |                           |             |     |                       |    |
| <b>DAMAGE MECHANISM</b>                     | <b>STEAM GENERATOR 21</b> |             |                       |     |    | <b>STEAM GENERATOR 22</b> |             |     |                       |    |
|   | Tubes                     | Indications | BW                    | VS  | EC | Tubes                     | Indications | BW  | VS                    | EC |
| <b>WEAR</b>                                 |                           |             |                       |     |    |                           |             |     |                       |    |
| 1% - 19%                                    | 447                       | 503         | 275                   | 201 | 27 | 763                       | 881         | 410 | 418                   | 53 |
| 20% - 29%                                   | 25                        | 25          | 14                    | 11  | 0  | 78                        | 86          | 49  | 36                    | 1  |
| 30% - 39%                                   | 4                         | 4           | 3                     | 1   | 0  | 9                         | 9           | 7   | 2                     | 0  |
| ≥ 40%                                       | 0                         | 0           | 0                     | 0   | 0  | 2                         | 2           | 2   | 0                     | 0  |
| <b>PLUGGED</b>                              | (10)                      |             |                       |     |    | (26)                      |             |     |                       |    |
| <b>Possible Loose Parts (Rotating Coil)</b> |                           |             |                       |     |    |                           |             |     |                       |    |
| PLI   | 0                         |             |                       |     |    | 3 (note 4)                |             |     |                       |    |
| PLP   | 18                        |             |                       |     |    | 22                        |             |     |                       |    |
| <b>PLUGGED</b>                              | (0)                       |             |                       |     |    | (3)                       |             |     |                       |    |
| <b>PREVENTATIVE</b>                         | (0)                       |             |                       |     |    | (0)                       |             |     |                       |    |
|   |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             |                       |     |    |                           |             |     |                       |    |
| <b>PLUGGED</b>                              |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             | <b>( 10 )</b>         |     |    |                           |             |     | <b>( 29 )</b>         |    |
| <b>TOTAL PLUGGED / %</b>                    |                           |             |                       |     |    |                           |             |     |                       |    |
|   |                           |             | <b>( 177 / 1.4% )</b> |     |    |                           |             |     | <b>( 206 / 1.6% )</b> |    |

**NOTES:**

1. Numbers in (X) are tubes numbers plugged in each category
2. The "Tube" column above represents Bobbin Coil results for the number of tubes; using the largest wear indication
3. The "Indications" column above represents Bobbin Coil results for the number of wear indications
4. The three PLI (wear caused by a loose part) represent the tubes discussed in the SG22 Foreign Object Summary paragraphs in Section 8.

**LEGEND:**

BW – batwing  
 VS – vertical strap  
 EC – eggcrate