



102-07275-MLL/TNW
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- References:
1. Arizona Public Service Company (APS) letter number 102-07149, *License Amendment Request to Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis*, dated November 25, 2015, [Agencywide Documents Access and Management System (ADAMS) Accession Number ML15336A251]
 2. APS letter number 102-07181, *Supplemental Information Regarding License Amendment Request to Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis*, dated January 29, 2016 (ADAMS Accession Number ML16043A361)
 3. NRC document *Palo Verde 1, 2, and 3 – APHB and ESGB RAIs for Spent Fuel Pool Criticality Safety Analysis LAR*, dated June 2, 2016 (ADAMS Accession Number ML16155A075)

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528, 50-529, and 50-530
Response to Request for Additional Information Regarding License
Amendment Request to Revise Technical Specifications to
Incorporate Updated Criticality Safety Analysis**

In Reference 1, Arizona Public Service Company (APS) submitted a license amendment request (LAR) to revise the PVNGS Technical Specifications (TS) for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3. The proposed amendment would modify TS requirements to incorporate the results of an updated criticality safety analysis for both new and spent fuel storage. In Reference 2, APS provided supplementary information requested by the Nuclear Regulatory Commission (NRC) staff to support the acceptance review of the LAR. In Reference 3, the NRC staff requested additional information to support the review of the LAR.

The enclosure to this letter provides the APS response to the NRC staff request for additional information. The APS responses do not affect the conclusion of the no significant hazards consideration determination [10 CFR 50.91(a)] provided in the original LAR.

This submittal does not contain any new regulatory commitments as defined by NEI 99-04, *Guidelines for Managing NRC Commitment Changes*, Revision 0.

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Response to Request for Additional Information Regarding License Amendment Request to
Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis

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By copy of this letter, this response is being forwarded to the Arizona Radiation Regulatory Agency in accordance with 10 CFR 50.91(b)(1).

Should you have any questions concerning the content of this letter, please contact Michael D. Dilorenzo, Licensing Section Leader, at (623) 393-3495.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on: June 30, 2016
(Date)

Sincerely,

MLL/TNW/CJS/af

Enclosure: Response to Request for Additional Information Regarding License
Amendment Request to Revise Technical Specifications to Incorporate
Updated Criticality Safety Analysis

cc:	K. M. Kennedy	NRC Region IV Regional Administrator
	S. P. Lingam	NRC NRR Project Manager for PVNGS
	M. M. Watford	NRC NRR Project Manager
	C. A. Peabody	NRC Senior Resident Inspector for PVNGS
	A. V. Godwin	Arizona Radiation Regulatory Agency (ARRA)
	T. Morales	Arizona Radiation Regulatory Agency (ARRA)

Enclosure

**Response to Request for Additional Information Regarding License
Amendment Request to Revise Technical Specifications to
Incorporate Updated Criticality Safety Analysis**

Supplemental Information Regarding License Amendment Request to Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis

Introduction

By letter dated November 25, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15336A251)(Reference 1), Arizona Public Service Company (APS) submitted a license amendment request (LAR) for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3. The proposed amendment would modify technical specification (TS) requirements to incorporate the results of an updated criticality safety analysis for both new and spent fuel storage. In Reference 2, APS provided supplementary information requested by the Nuclear Regulatory Commission (NRC) staff to support the acceptance review of the LAR.

The NRC *Probabilistic Risk Assessment Operations and Human Factors Branch* (APHB) and *Steam Generator Tube Integrity and Chemical Engineering Branch* (ESGB) have identified requests for additional information (RAIs) (Reference 3). Each of the NRC staff information requests is provided first, followed by the APS response to each request.

As described in the NRC document that provided the RAIs, a telephone call was held on April 13, 2016, regarding proprietary information to be withheld regarding Westinghouse report WCAP-18030-P/NP, *Criticality Safety Analysis for Palo Verde Nuclear Generating Station Units 1, 2, and 3*. As the APS response to these RAIs do not impact the Westinghouse report, the proprietary issues regarding the report will be addressed as part of the responses to the RAIs from the other NRC staff branches.

APHB-RAI-1

Clarification is needed for items on Tables 2, 3, and 5. These tables present specific acceptance/rejection criteria for various tests. Most of the items listed on these tables are clear and specific making it easy and unambiguous for inspectors to determine if a component has passed or failed the inspection. However, each of these tables has an item that is less clear: "Evidence of visual indications of performance inhibitors." Please clarify what specific properties an inspector would look for to indicate that performance is inhibited. If the requested information is specified in other documents, such as an inspection procedure, you may include a reference to that document as well as a brief description of the acceptance criteria and/or an excerpt from the document.

APS Response:

For the visual inspections listed in Tables 2, 3, and 5, the phrase "evidence of visual indications of performance inhibitors" is used to ensure that the inspector notes anything not captured in the other listed criteria. This may include pitting, corrosion films, blisters, discoloration, etc. This also includes any surface anomalies that are not expected or anticipated.

It is difficult to provide specific criteria for unexpected performance issues that may occur. For this reason "evidence of visual indications of performance inhibitors" was used to capture a broad range of performance inhibitors that may be found during the visual inspection of the coupon or insert. APS selected this approach after review of other licensee programs that have been approved and implemented. The visual inspection is intended to capture unexpected anomalies. Providing specific acceptance criteria would be inconsistent with the objective of the inspection.

Supplemental Information Regarding License Amendment Request to Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis

APHB-RAI-2

Has the operating experience review [OER] mentioned in Sections 3.1.4 and 3.1.5 of the November 25, 2015, submittal been conducted? If so what were the results? If not, when will it be conducted and how will the results be used to modify this process?

APS Response:

Yes, relevant industry operating experience (OE) has been reviewed and the results included within the content of the license amendment request (Reference 1) and the supplemental information request response (Reference 2). The APS goal in the development of the license amendment request was to create a high quality criticality analysis. As part of achieving this goal, relevant industry operating experience has been included from the inception of the project. For example, acceptable methodologies, code use, and selection of inputs for the criticality safety analyses were determined following the review of operating experience of Prairie Island, Turkey Point, and Comanche Peak nuclear stations. Lessons learned from these licensee submittals have been incorporated into PVNGS topical report and insert designs, including the proposed insert monitoring program.

One of the important decisions of the project was the selection of the neutron absorbing material for the spent fuel pool inserts. To make this decision and ensure an appropriate surveillance program was developed, APS identified lessons learned from Zion, Arkansas Nuclear One, LaSalle, Peach Bottom, Quad Cities, and other licensees. Additionally, information was gathered from industry organizations such as the NEI 12-16 Task Force, the Neutron Absorber Users Group and industry peers such as Westinghouse, Curtiss-Wright, and other industry consultants.

To ensure that proper administrative controls are in place to prevent mishandling of fuel assemblies, APS reviewed, and has described in section 3.1.5 of the license amendment request (Reference 1) and items 1a and 1b of the supplemental information request response (Reference 2), plans to implement lessons learned from operating experience at the Indian Point nuclear station.

Since 2012, two separate special nuclear material (SNM) self-assessments have been conducted at PVNGS which included industry operating experience reviews. One of the SNM self-assessments included an industry peer from Calvert Cliffs. APS continues to monitor relevant industry OE to ensure that appropriate administrative controls remain in place and the insert monitoring program will be effective.

ESGB-RAI-1

The proposed amendment refers to a "related spent fuel pool (SFP)" when describing the coupon tree surveillance assembly. Please confirm that each unit's SFP will have its own coupon tree. If each unit has an independent coupon tree, will the frequency of coupon removal described in Table 1 apply to each unit's coupons? If there is not a coupon tree in each SFP, please describe how the monitoring program ensures that tested coupons are representative of the installed inserts in each unit's SFP.

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APS Response:

Each PVNGS operating unit spent fuel pool will have its own coupon tree. APS does, however, intend to use a performance based surveillance monitoring program as described in section 3.1.4 of Reference 1. Assuming successful and similar test results from an initial set of coupons taken from each pool, APS intends to evaluate pool and insert conditions to justify that the units are sufficiently similar, such that future testing can be performed on coupons from one unit at a time and be representative of all three spent fuel pools. This approach will allow the station to extend the surveillance program to support plant life through potential license extensions and possibly plant decommissioning.

Should surveillance testing be implemented using coupons of one unit to represent the three spent fuel pools, APS will establish a program that ensures that each testing cycle uses samples from a different pool to ensure that results are being seen from each unit on an established periodic basis.

ESGB-RAI-2

Table 2 of the LAR dated November 25, 2015, provides a minimum areal density criterion of 0.0156 g/cm² [gram/centimeter²] Boron-10 for the coupons. What is the nominal areal density of the installed panels and surveillance coupons? If the as-built Maxus production material used for a given coupon has an areal density that is significantly greater than the minimum value described in the acceptance criteria for the coupon program, then that coupon could decrease significantly in areal density from its pre-characterization value and still pass the acceptance criteria. Since there is no acceptance criteria for change in areal density (i.e. 5% reduction), how would such a reduction be addressed by the neutron absorber monitoring program?

APS Response:

If a coupon is found to have a degrading trend in measured areal density value, APS will enter the information into the corrective action program to track this trend and take appropriate action to ensure that no inserts drop below the minimum certified value. See response to ESGB-RAI-3 for information regarding the relationship between the nominal areal density and minimum areal density.

ESGB-RAI-3

What is the tolerable variation in areal density within a pool's production material for the inserts and coupons? If an insert were manufactured close to the minimum acceptable areal density, and a coupon for the same pool were manufactured at the upper bound of the acceptable areal density for that batch, it is possible that degradation (reduction in areal density) in the coupon would meet the acceptance criteria for the surveillance program but, that same reduction would place the panel below the minimum areal density. Please discuss the acceptable variation of areal density within each pool in the context of its potential impact of the surveillance program.

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APS Response:

To ensure that there is sufficient margin between the measured areal density values of the inserts and the minimum certified areal density value stated in the criticality safety analysis, the insert material will be manufactured with a B₄C loading that ensures that the average of the as-measured areal density values for the entire batch of inserts will be at least six sigma (six standard deviations) greater than the minimum certified areal density value of 0.0156 g/cm² Boron-10. (The “as-measured” value is defined as the areal density value measured for each insert minus the associated uncertainty value for that individual measurement.)

In addition, during the insert fabrication process, a material coupon will be extracted from the same material sheet used to extract each insert with the sole purpose of measuring the areal density value of that sheet/insert; therefore, the areal density value of each insert will be known. Also, each surveillance coupon will be measured for its areal density value when characterized prior to being placed in the fuel pools. APS can assess the variation of areal density between surveillance coupons and inserts to determine if a large areal density reduction in a surveillance coupon suggests that an insert would not meet the minimum certified value if the same reduction were to apply.

ESGB-RAI-4

For the full length inserts that will be removed for periodic inspection as described in Table 4 of the LAR dated November 25, 2015, please confirm that the inserts will be placed back in their original storage location following inspection.

APS Response:

When a full length insert is removed for inspection it will not be returned to the spent fuel pool. The impacted fuel storage locations will be controlled to ensure spent fuel is always stored in compliance with one of the arrays in the proposed Technical Specification 3.7.17. Potential actions include replacing the insert that was removed for inspection with a new insert or changing the array designation of the impacted fuel storage locations.

- References:**
1. APS letter number 102-07149, *License Amendment Request to Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis*, dated November 25, 2015, (ADAMS Accession Number ML15336A251)
 2. APS letter number 102-07181, *Supplemental Information Regarding License Amendment Request to Revise Technical Specifications to Incorporate Updated Criticality Safety Analysis*, dated January 29, 2016 (ADAMS Accession Number ML16043A361)
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