PROPRIETARY
Enclosure 2B to this letter contains proprietary information and should be withheld from public disclosure under 10 CFR 2.390

Palo Verde Nuclear Generating Station

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102-05518-CDM/TNW/GAM
June 20, 2006

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

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 NRC Request for Additional Information Regarding Proposed Technical Specification (TS) Changes Related to Steam Generator (SG) tube inspection; Withdrawal of Proposed Alloy 600 SG Inspection Criteria TS Change; and Supplement to Response to GL 2004-01

By letter no. 102-05276, dated May 26, 2005, Arizona Public Service Company (APS) submitted an application to change PVNGS technical specifications related to steam generator (SG) tube inspection. The changes would (1) establish consistency with Revision 4 to the Standard Technical Specification Change Traveler TSTF-449, "Steam Generator Tube Integrity," and (2) define the depth (C* or C-star) of the required tube inspections and plugging criteria within the tubesheet of Alloy 600 SG tubes based on Westinghouse topical report WCAP-16208-P, Revision 1, to address the NRC position identified in GL 2004-01, "Requirements for Steam Generator Tube Inspections."

NRC Request for Additional Information

In an e-mail from Mel Fields, NRC, to Tom Weber, APS, dated October 31, 2005, the NRC provided a request for additional information (RAI) regarding the proposed TS changes for the C* inspection depth. Several of the NRC's RAI questions were related to Westinghouse topical report WCAP-16208-P.

A001

Provided in Enclosure 1 is APS' notarized affidavit required by 10 CFR 50.30(b). Provided in Enclosure 2A are APS' responses to the NRC RAI. Provided in Enclosure 2B are Westinghouse's responses to the WCAP-16208-P RAI questions. Westinghouse considers information in Enclosure 2B to be proprietary and requests that it be withheld from public disclosure pursuant to 10 CFR 2.390(a)(4). Enclosure 2C contains an affidavit from Westinghouse that sets forth the basis on which the information may be withheld from public disclosure pursuant to 10 CFR 2.390. A redacted, non-proprietary version of Westinghouse's RAI responses is provided in enclosure 2D.

Withdrawal of Proposed Alloy 600 SG C* Inspection Criteria TS Change

The PVNGS SGs containing Alloy 600 tubes ("Alloy 600 SGs") were replaced with Alloy 690-tube SGs ("Alloy 690 SGs") in Units 1 and 2 in fall 2005 and fall 2003, respectively. The Alloy 600 SGs in Unit 3 will be replaced with Alloy 690 SGs in the next Unit 3 refueling outage in fall 2007. The final periodic Alloy 600 SG tube inspection was completed during the spring 2006 refueling outage. In a conference call with the NRC staff on March 29, 2006, prior to beginning the Unit 3 refueling outage and final Alloy 600 SG inspection, APS discussed the preliminary responses to the Alloy 600 C* inspection criteria RAI and the planned Unit 3 SG inspection. The NRC staff identified no concerns with the preliminary RAI responses and planned inspection. In addition, on April 21, 2006, following completion of the Unit 3 SG inspection but prior to startup, APS discussed the results of the SG inspection with the NRC staff. There were no concerns identified by the NRC staff.

Since the final periodic Alloy 600 SG inspection at PVNGS has been completed (the last Alloy 600 SGs will be replaced with Alloy 690 SGs in the next Unit 3 refueling outage in fall 2007), there is no longer a need to specify periodic Alloy 600 SG C* inspection criteria in the TSs. Therefore, APS is requesting to withdraw the proposed periodic Alloy 600 C* inspection criteria from the TS amendment request submitted in letter no. 102-05276, dated May 26, 2005. Provided in Enclosure 3A are revised markups of proposed TS pages reflecting the withdrawal of the Alloy 600 C* inspection criteria, and Enclosure 3B contains revised retyped TS pages. Enclosure 3C contains revised TS Bases pages reflecting the withdrawal of the Alloy 600 C* inspection criteria. This change does not affect the No Significant Hazards Consideration provided in the May 26, 2005 amendment request.

Supplement to GL 2004-01 Response: Safety Assessment of Unit 3 SGs

By letter 102-05171, dated October 28, 2004, APS submitted a response to GL 2004-01, "Requirements for Steam Generator Tube Inspections." In the GL 2004-01 response, APS committed to submit a TS amendment request consistent with the

recommendation in GL 2004-01 to limit the extent of the inspection in the tubesheet region where the tubes are expanded for the full depth of the tubesheet. This commitment was met by the proposed TS change in APS letter no. 102-05276, dated May 26, 2005, described above, to define the C* depth of the required tube inspections and plugging criteria within the tubesheet of Alloy 600 SG tubes based on Westinghouse topical report WCAP-16208-P, Revision 1. The spring 2006 Unit 3 refueling 12 (U3R12) periodic Alloy 600 SG tube inspection included inspections in accordance with the proposed TS Alloy 600 C* SG tube inspection criteria as modified by the additional C* length described in the RAI response in Enclosure 2A to this letter. As discussed above, no further periodic Alloy 600 SG inspections will be performed prior to the Alloy 600 SG replacement in Fall 2007 and therefore APS is requesting to withdraw the proposed periodic Alloy 600 SG tube C* inspection criteria.

APS' October 28, 2004, response to GL 2004-01 also provided a safety assessment of the Alloy 600 SGs as requested by GL 2004-01. A safety assessment of the U3R12 SG tubesheet inspection results is provided in Enclosure 4.

No commitments are being made to the NRC by this letter. If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

David Mauldin

CDM/TNW/GAM

Enclosures:

1. Notarized Affidavit
2. RAI Responses
   - 2A. APS Response
   - 2B. Westinghouse Response (Proprietary)
   - 2C. Westinghouse Affidavit
   - 2D. Westinghouse Response (Redacted, Non-Proprietary)
3. Revised Proposed TS Pages
   - 3A. Revised TS Markup Pages
   - 3B. Revised Retyped TS Pages
   - 3C. Revised TS Bases Markup Pages
4. Safety Assessment of the U3R12 SG Tubesheet Inspection Results

cc: (Cover letter with enclosures 1 & 2A only)

B. S. Mallett	NRC Region IV Regional Administrator
M. B. Fields	NRC NRR Project Manager
G. G. Warnick	NRC Senior Resident Inspector for PVNGS
A. V. Godwin	Arizona Radiation Regulatory Agency (ARRA)
T. Morales	Arizona Radiation Regulatory Agency (ARRA)

ENCLOSURE 1

AFFIDAVIT

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, David Mauldin, represent that I am Vice President, Nuclear Engineering, Arizona Public Service Company (APS), that the foregoing document has been signed by me on behalf of APS with full authority to do so, and that to the best of my knowledge and belief, the statements made therein are true and correct.

David Mauldin

Sworn To Before Me This 20th Day Of June, 2006.

Susie Lynn Ergish
Notary Public

SUSIE LYNN ERGISH
Notary Public - Arizona
Maricopa County
My Comm. Expires Jul 14, 2007

Notary Commission Stamp

ENCLOSURE 2A

ARIZONA PUBLIC SERVICE COMPANY
RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING TECHNICAL SPECIFICATION IMPROVEMENT AND TUBESHEET INSPECTION DEPTH FOR STEAM GENERATOR TUBES

NRC Background

By letter dated May 26, 2005 (ML051520413), Arizona Public Service Company submitted an application to change technical specifications related to steam generator tube inspection. The changes would (1) establish consistency with Revision 4 to the Technical Specification Task Force (TSFT) Standard Technical Specification Change Traveler, TSTF-449, "Steam Generator Tube Integrity," and (2), define the depth (C* or C-star) of the required tube inspections and plugging criteria within the tubesheet.

The technical basis for implementing a C* inspection and plugging distance was initially documented in Westinghouse topical report WCAP-16208-P, Revision 0, "NDE Inspection Length for CE Steam Generator Tubesheet Region Explosive Expansions," dated October 2004. In a letter dated December 16, 2004 (ML043510406), the Nuclear Regulatory Commission (NRC) staff requested additional information from Florida Power and Light (FPL) about their C* amendment application for St. Lucie Unit 2. FPL's response to this request was issued March 31, 2005 (ML050960517), and Revision 1 of WCAP-16208-P was subsequently issued in May 2005 (ML051520420).

APS General Responses:

1. The Palo Verde Nuclear Generating Station (PVNGS) Unit 1 steam generators (SGs) were replaced in fall 2005 with SGs containing Alloy 690 Thermally Treated tubing. The Unit 1 SG design is consistent with the information provided in APS response to Generic Letter 2004-01 for the Unit 2 Alloy 690 SGs (APS Letter 102-05171 dated October 28, 2004). Therefore, the responses provided in this submittal apply to the Unit 3 Alloy 600 SGs only.

2. The Unit 3 Alloy 600 SGs will be replaced with Alloy 690 SGs in fall 2007. The final PVNGS periodic Alloy 600 SG tube inspection was completed in Unit 3 in spring 2006 (U3R12), and APS is requesting to withdraw the proposed periodic Alloy 600 C* inspection criteria from the May 26, 2005 TS amendment request. A supplement to the Generic Letter 2004-01 safety assessment provided in APS letter no. 102-05171, dated October 28, 2004, is being provided for Unit 3 Cycle 13 in Enclosure 4. As such, the RAI responses below contain summary information from the U3R12 inspection and an integrity assessment for Unit 3 Cycle 13. Additionally, responses are provided for the NRC RAIs that explicitly address wording contained in the May 26, 2005, TS amendment request but are no longer applicable to the TS amendment request due to the withdrawal of the proposed C* inspection criteria.

3. Responses to RAIs 4, 5, 7, and 8 were provided by Westinghouse and are included in Enclosure 2B (proprietary) and 2D (redacted). Based on those responses, the minimum inspection depth for the Unit 3 Alloy 600 SGs was revised from 11.6 inches below the Bottom of the Expansion Transition (BET) specified in WCAP-16208-P, Revision 1, to 12.6 inches. This minimum inspection depth accounts for NDE uncertainty. Therefore, an inspection criteria of 13 inches below the BET was

specified for the spring 2006 U3R12 Alloy 600 SG tube inspection, instead of 12 inches as proposed in the May 26, 2005, TS amendment request.

The revised inspection criterion (13 inches versus the previous 12 inches) will be the C* inspection length referred to in response to all RAI Questions.

4. APS has been conducting Alloy 600 SG Plus Point cold leg sample inspections of the tubesheet transition region and into the tubesheet since 1996. To date, no stress corrosion cracking (SCC) flaws have been identified in any of the PVNGS Alloy 600 SGs. The basis for the inspection program was the reported findings of SCC at other Combustion Engineering (CE) designed Alloy 600 steam generators. Based on the PVNGS specific findings, APS has not identified a condition adverse to quality within the Alloy 600 SG cold leg tubesheet region that requires the cold leg region to be programmatically included as part of the C* inspections. Therefore, the Alloy 600 SG C* criteria will not be applied to the cold-leg tubesheets.

   As such, the APS responses to the RAIs will address the Alloy 600 SG hot leg inspection program/basis only.

NRC Request 1

Technical Specification 5.5.9 references the excluded portion of the tube (the C* distance) from the bottom of the expansion transition (BET). This is also noted in the new Basis B 3.4.18. If the BET is located above the top of the tubesheet, less than 12 inches of expanded tube within the tubesheet (engaged tubing) could be inspected. Has the BET for each tube been located and confirmed to be below the top of the tubesheet? Similarly, if less than 12" of any tube is expanded into the tubesheet, the proposed specifications as written may exclude part of the tube needing to be inspected. If there are tubes with the BET above the TTS or less than 12" expanded into the tubesheet, discuss the requirements that will be in place to ensure these tubes are properly inspected.

APS Response 1

The hot leg Bottom of Expansion Transition (BET) location in every active tube in the Unit 3 Alloy 600 SGs has been determined and is recorded in the Unit 3 Eddy Current Data Management records. Of the 20,638 tubes that remain in service, only one tube has a BET that is above the top of tubesheet. The BET for this tube, (R149C116 in SG 32) is 0.23 inches above the secondary tubesheet face. The Westinghouse responses to RAI Questions in Enclosure 2B indicate that the minimum required inspection length for the hot leg is 12.6 inches. This length includes an allowance for NDE uncertainty. As such, the revised minimum inspection depth of 13 inches from the BET, as discussed in General Response 3 above, is sufficient to account for tube R149C116 and ensures that all hot leg tubes are properly inspected. For tubes with BET's above the tubesheet, further programmatic defense-in-depth is provided with

acquisition instructions to obtain required inspection length data from the top-of-tubesheet landmark. Additionally, for added conservatism and program implementation, APS employed an inspection requirement in U3R12 of 14 inches below the top of the tubesheet landmark. The average acquired inspection was 15.31 inches for SG 31 and 15.41 inches for SG 32. The minimum requirement of 13 inches below the BET was verified for every inspected tube. It should also be noted that the minimum 14 inch inspection is 2.5 inches below the centerline of the tubesheet.

With respect to ensuring at least 13 inches of expanded tubing exists, APS reviewed the design and data management records. The CE System 80 tubesheets are 23.5 inches in thickness. The lowest BET recorded for the Unit 3 SGs is in tube R115C74 in SG 31. The recorded BET is 2.27 inches below the secondary face of the tubesheet. As such, there is greater than 20 inches of expanded tubing. Furthermore, all inspection records are reviewed to ensure that the required data below the BET is acquired in order to verify the minimum length of expanded tube.

The APS SG inspection program also requires that any tubes without tubesheet expansion (NTE) are to be inspected with Plus Point for the entire tubesheet thickness. For Unit 3, there are no hot leg tubes that fall into this category. A total of five cold leg tubes (one in SG 31 and four in SG 32) contain NTE calls. As indicated, these tubes were inspected with the Plus Point probe for the full tubesheet thickness.

NRC Request 2

Please confirm that your operating parameters will always be conservatively bounded by the conditions for which the C* distance was determined in WCAP-16208-P, Rev. 1 (e.g. temperature, pressure, etc.). If conditions are not always bounded, what controls are in place to ensure an adequate depth of inspection in the tubesheet?

APS Response 2

WCAP 16208-P, Revision 1, assumed the following values in determining structural and accident leakage integrity

- For structural integrity (pull-out), WCAP 16208-P, as supplemented by the Westinghouse RAI responses in Enclosure 2B, assumed a normal operating differential pressure (NODP) of 1286 psid for PVNGS. Bounding conservatisms are contained in both the WCAP and the Enclosure 2B responses. For example, in establishing the minimum pullout length for Unit 3, the specified value of 4.75 inches (see Enclosure 2B, revised Table 6-7 accounting for "first slip") corresponds to a differential pressure of 1450 psid which significantly bounds the current Unit 3 Cycle 13 NODP value of 1285 psid. As previously noted, Unit 3 Cycle 13 is the last operating cycle for the original Alloy 600 steam generators and, as such, there are no concerns that the operating conditions will not remain bounded.

Additionally, with respect to pullout, the minimum inspection length of 13 inches conservatively bounds the required pullout length (4.75 inches) for significant additional margin. As indicated in Enclosure 2B, the C* inspection pullout length bounds the most limiting test specimen even when its evaluated using load at first slip. The 13 inch inspection length also considerably bounds the conservative extreme case of no residual load (6.8 inches).

- The contact loads calculated in WCAP-16208-P, Rev. 1 for tubesheet dilation effects for the hot leg were based on a temperature of 600°F. The lower bound current operating Thot for Unit 3 is 611°F. There are no plans to further reduce Thot for Cycle 13 in Unit 3.

- For accident leakage, WCAP 16208-P uses a limiting accident condition of 2560 psid and 600° F. The basis for the limiting condition is provided in Section 4.3 of the WCAP. This accident pressure is bounding for PVNGS and exceeds the value assumed for condition monitoring and operational assessment for the accident induced leakage performance criteria. A change to this condition would require a change to the PVNGS licensing basis and would require NRC approval. As also indicated previously, the current and expected Cycle 13 Thot well exceeds the 600°F analysis value.

- Enclosure 2B provides the Westinghouse response to RAI 4 with respect to the cold leg. The evaluation provides analysis as to the impact of further reduced temperature. As indicated in APS General Response 4 above, APS does not intend to apply C* to the cold leg at this time.

NRC Request 3

Please discuss the expected condition of the tube-to-tubesheet joint. For example, discuss the amount of corrosion expected at the top of the tubesheet (similar to what may have been present in some of the test specimens) and whether there is sludge buildup at the top of the tubesheet.

APS Response 3

It is APS' position that the original Combustion Engineering Owners Group (CEOG) Task 1154 program, combined with the testing and analysis performed in support of C*, provided a sufficiently broad cross section of tubesheet holes, joint fabrication and tubing materials to account for variances in the Unit 3 as-built condition. The basis for this position is as follows.

The Task 1154 program utilized a combination of actual fabricated SG (Boston Edison) samples, program specific rough and smooth bore tubesheet samples, and a Ringhals Tubesheet Mock-up. The Boston Edison (Pilgrim) SG was fabricated for the Boston Edison NSSS contract that was subsequently canceled. The SG is of System 80 design. The tube material is typical of production material installed in the PVNGS

steam generators. The Boston Edison tubing is 0.042 inch average wall thickness and should have the normal variations in tube wall thickness and yield strengths that would be expected at PVNGS. A review conducted by APS of PVNGS certified material test reports (CMTRs) indicates that some tubing manufactured for the Boston Edison contract was, in fact, installed at PVNGS.

The explosive expansion process for the Boston Edison SG was performed using the same procedures and control processes used at PVNGS. The CE fabrication procedures provide detailed instructions for procurement of the charge components (polyethylene sheath and detonating fuse); assembly; installation in tubesheet holes including specific reference to number of tubes per shot by row number; cleanliness requirements; pre and post explansion inspection requirements with sign-off responsibilities; identification and flagging of unexplanded tubes, all indicating a thorough and controlled process.

The data from the Boston Edison test bed is also considered to be representative of the spread of hole roughness data expected to be present in the PVNGS Unit 1 steam generators based on a review of the tubesheet drilling process. As indicated in previous correspondence (Reference 2) the Unit 1 SGs were classified as "rough bore" versus the Unit 3 SGs which have been classified as "smooth bore" expansions. However, since correlations between rough bore and smooth bore have been utilized by Westinghouse, additional discussions regarding hole variability are considered useful. By procedure, the CE System 80 tubesheets were drilled by row, and the drill bits in the production process were changed at least every 25 holes. Although the Boston Edison test bed is in one general location, the data was taken in different rows, each of which included more than 25 holes (~ 60 per row), thereby incorporating the process variability in hole surface finish for a typical vintage steam generator. Therefore, APS considers the adjacent rows and columns of the Boston Edison test bed to represent a collective fabrication of hundreds of tubes (~900) and by consequence represents a significant range of process variability for the drilling process and resulting bore surface finish.

Additionally, it should be noted that, as also reported in Section 3.2.1 of WCAP 16208-P, APS was able to detect differences between "rough" and "smooth" bore using bobbin coil techniques. Although the inspection sample reported in the WCAP clearly indicated a difference between Units 1 and 3, there was sufficient overlap to credit some of the Boston Edison data as directly applicable to Unit 3.

As indicated in Reference 2, Combustion Engineering changed their drilling process during fabrication of the PVNGS Unit 2 Alloy 600 SGs. The new process referred to as a Bore Trepanning Process (BTA) was adopted to increase productivity. The process had a consequential effect of producing smoother bore surfaces. For this reason, SGs were either classified as rough bore or smooth bore in the CEOG study. Although CE was knowledgeable regarding the time frame the switch was made to BTA, fabrication records did not explicitly call out whether the tubesheet holes were gun drilled or drilled using BTA. As reported in WCAP 16208-P, all evidence indicates a smooth bore finish in Unit 3. As also reported in the WCAP, in the mid-1980s, a tube-to-tubesheet joint

mockup was fabricated as a demonstration for a potential RSG project for the Ringhals plant in Sweden. The tubesheet was bored on a lathe which is considered to be a representative simulation of the BTA process. The tubesheet was the standard Class 508 carbon steel material but was only eight inches thick. Alloy 690 tubing with a 0.75" OD and a 43 mil wall thickness was explanded into the tubesheet by the standard CE process including the positioning roll and seal weld. Pullout testing of Alloy 690 compares favorably to Alloy 600 because the material property specifications are the same. The Ringhals Mock-up is regarded by APS to have provided consistent pull-out data representative of the Unit 3 smooth bore condition.

Finally, the make-up, production and control of the task-specific tubesheet mock-ups used in CEOG Task 1154 is provided in Section 3.2.1 of WCAP 16208-P. The smooth bore samples are generally regarded to be consistent with Unit 3 tubing.

As indicated previously, the collective use of these samples provides variability and prevents test and analysis bias. The condition of the Unit 3 tubesheets has been reviewed and confirmed to be "smooth bore" by eddy current sampling. With regard to sludge and top-of-tubesheet condition, the Unit 3 SGs have been chemically cleaned twice (1994 and 2003). Visual examination after chemical cleaning indicates a top-of-tubesheet condition that is similar to the specimens used to support WCAP-16208-P. Due to SG replacement plans, sludge lancing was not performed in U3R11 or U3R12. However, the design of the CE System 80 SGs (e.g., High-rate Blowdown and downcomer sweeping) minimizes sludge pile accumulation. The effectiveness of these design features to minimize sludge has been validated by ECT, visual inspection and low sludge removal totals.

Based on this information, APS concludes that the expected conditions of the Unit 3 inservice tubesheet joints are sufficiently consistent with the WCAP program samples.

NRC Request 4

Technical Specification 5.5.9.d and Basis B 3.4.18 propose applying the C* criteria to both the hot-leg and cold-leg tubesheets. The contact loads calculated in WCAP-16208-P, Rev. 1 for tubesheet dilation effects were based on a temperature of 600°F. Since leakage estimates assume only the hot leg is affected, and the cold leg temperature is lower than 600° F, the model does not appear to account for conditions on the cold-leg. In addition, the 0.1 gpm referenced in WCAP-16208-Rev. 1 is based only on leakage from the hot leg. If both ends of the tube are to have a length of tubing excluded from inspection, as they are in proposed Technical Specification 5.5.9.d, both ends must be addressed by the leakage assessment. Alternatively, the proposed technical specifications and bases could be revised to require inspection on the cold leg (i.e., C* would not be applied on the cold leg.)

APS Response 4

See APS General Response 4 above and Westinghouse response to RAI 4 in Enclosure 2B.

NRC Request 5

Please clarify whether the load at first slip was reported and plotted in Figures 5-1 through 5-3 of WCAP-16208-P, Revision 1 or whether the maximum load was plotted. If the load at first slip was not used in all cases, please discuss the effect on the required inspection distance if the load at first slip was used. In addition, if the load at first slip was not used in Table 6-8 of WCAP-16208-P, Rev. 1 ("Burst Based Inspection Length"), please provide Table 6-8 values to confirm that the 12 inch proposed inspection distance is still bounded when the most limiting specimen is evaluated using load at first slip.

APS Response 5

See Westinghouse response to RAI 5 in Enclosure 2B.

NRC Request 6

Given the inherent assumption that neither structurally significant nor leakage significant flaws will develop within the C* distance, and assumptions on degradation below the C* distance, please discuss your plans to provide the information listed below following each inspection. Similarly, please discuss your plans to modify the technical specifications to include reporting this information.

(a) Number of total indications, location of each indication, orientation of each indication, size of each indication, and whether the indications initiated from the inside or outside surface.

(b) The cumulative number of indications detected in the tubesheet region as a function of elevation within the tubesheet.

(c) Projected end-of-cycle accident-induced leakage from tubesheet indications.
This leakage shall be combined with the postulated end-of-cycle accident-induced leakage from all other sources.

APS Response 6

It is APS' position that the requested information is not required to be added to the PVNGS TSs based on the differences in application of the C* approach and other

related tubesheet Alternate Repair Criteria (ARC). This position is based on the following:

- All detected degradation within the C* distance is removed from service upon detection
- Any detected degradation found beyond the C* distance is also removed from service regardless of NDE technique. No ARC criterion is applied.
- The C* approach assumes a 360°, 100% through-wall circumferential cut exists in 100% of the active tubes in each steam generator. All C* flaws are also assumed to be located at the bottom of the C* inspection distance. As such, no credit is taken or needed for the reasonably expected actual flaw sizes and flaw elevation distributions.
- The C* approach as applied at PVNGS takes no credit for the tubesheet within the C* distance with respect to structural and leakage integrity.

Per General Response 2 above, the question is no longer applicable based on APS' request to withdraw C* inspection criteria from the TS amendment request. However, in order to provide the basis for the Unit 3 Cycle 13 safety assessment, and based on discussions with the NRC Staff during a March 29, 2006 phone call, the requested information for the tubesheet inspections has been provided in Enclosure 4.

NRC Request 7

In WCAP-16208-P, Revision 1, it is not clear whether all of the available data were used to support the analytical adjustment to account for the axial load resistance provided by internal pressure. For example, specimens 8 and 12 from the Task 1154 program were run at room temperature with internal pressure; however, an analysis of this data (similar to what was done for the elevated temperature data point) was not provided. Please evaluate all data in which internal pressure (above ambient pressure) was applied to support the basis for the analytical adjustments to account for the internal pressure. With respect to the analysis of the pressure effects, please provide additional details on how the axial force resistance due to the internal pressure of 1435 psi was calculated and discuss how the effect of the residual contact pressure was taken into account in your analysis (The actual pullout force was nearly the same as the pullout resistance expected analytically from the internal pressure effects. As a result, if the residual contact pressure was not included in this assessment, it would appear that the analytical adjustments for internal pressure are too high.)

APS Response 7

See Westinghouse response to RAI 7 in Enclosure 2B.

NRC Request 8

It is the NRC Staff's understanding that not all data was included in Appendix B of WCAP-16208-P, Rev. 1 (i.e., some data was not included since it was well outside the targeted temperatures and pressures.) It is also the staff's understanding that some data in Appendix B were not included in Table 4-1 of WCAP-16208-P, Rev. 1 (which was used in determining the leak rate as a function of joint length). Please confirm the staff's understanding and discuss the basis for not including all of the Appendix B data in Table 4-1. For example, was data from Appendix B not included in Table 4-1 when steady state was never reached although the temperatures and pressures were within the desired range?

APS Response 8

See Westinghouse response to RAI 8 in Enclosure 2B.

NRC Request 9

Section 5.2 (pages 6-7) of Enclosure [2] to the amendment application states in two places that leakage below the inspection length in the tubesheet can be neglected. Please confirm that your assessments of tube integrity (condition monitoring and operational assessment) will include 0.1 gpm leakage from indications in the hot leg below the C* distance, consistent with WCAP-16208-P, Rev. 1.

APS Response 9

The information provided in Section 5.2 of Enclosure 2 to the amendment application was an overgeneralization of the impact of the contribution of C* related accident leakage. The approach to condition monitoring and operational assessment is clearly stated in APS' response to Generic Letter 2004-01 (Reference 3). In the response APS states that:

> *"All operational assessments for Units 1 and 3 assume a cumulative projected leakage contribution of 0.1 gpm for undetected flaws within the tubesheet region. This is based on a conservative assumption that every tube is flawed. The WCAP-16208 analysis indicates that the contribution of a 100% through-wall, 360° circumferential flaw is 1.0E-5 gpm. Accident leakage for the rest of the SG damage mechanisms are shown to be less then 0.4 gpm, based on the performance criteria limit of 0.5 gpm, in the operational assessment. For both the current Unit 1 Cycle 12 and Unit 3 Cycle 11 operational assessments, the projected 95/50 leakage at main steam line break conditions for all other mechanisms in the SG was zero gpm."*

Note: The projected 95/95 leakage for MSLB for all other mechanisms for Unit 3 Cycle 12 was calculated to be 0.11 gpm. No flaws found in U3R12 were of sufficient size to produce leakage at MSLB conditions.

Per General Response 2 above, the question is no longer applicable based on APS's request to withdraw C* from the TS amendment request.

NRC Request 10

> **The second paragraph of Section 5.2 (page 6) of Enclosure [2] to the amendment application contains the following statement: "The proposed inspection length requirement 'from the tube-to-tubesheet weld to 12 inches below the bottom of the expansion transition' bounds the WCAP-16208-P recommended inspection lengths for both Unit 1 and Unit 3." Please confirm that you intended to say the proposal to not inspect "from the tube-to-tubesheet weld to 12 inches below the bottom of the expansion transition" is consistent with the inspection lengths in WCAP-16208-P, Rev. 1 for both Unit 1 and Unit 3.**

APS Response 10

APS concurs that the wording in Enclosure 1 to the amendment application incorrectly characterized the wording in Section 5.5.9.d of the proposed Technical Specification. However, per General Response 2 above, the question is no longer applicable based on APS' request to withdraw C* from the TS amendment request.

References

1. Westinghouse Report WCAP 16208-P Revision 1, *NDE Inspection Length for CE Steam Generator Tubesheet Region Explosive Expansions*, dated May 2005

2. APS Letter 102-04856, dated October 23, 2002, from C.D. Mauldin, APS, to NRC, *Response to Request for Additional Information to Proposed Exigent Amendment to Technical Specification 5.5.9, Steam Generator (SG)Tube Surveillance Program*

3. APS Letter 102-05171 dated October 28, 2004 from C.D. Mauldin, APS, to NRC, *60-day Response to NRC Generic Letter 2004-01, "Requirements for Steam Generator Tube Inspections"*

4. APS Letter 102-05359 dated October 18, 2005 from C. Eubanks, APS, to NRC, *Special Report 3-SR-2004-002-01*

5. Westinghouse Document LTR-CDME-06-13-P, Revision 0, *Responses to NRC Requests for Additional Information on WCAP-16208-P, Rev. 1, "NDE Inspection Length for CE Steam Generator Tubesheet Region Explosive Expansions"* dated April 2006.

ENCLOSURE 2C

WESTINGHOUSE AFFIDAVIT

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Our ref: CAW-06-2137

May 2, 2006

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: LTR-CDME-06-13-P, Rev. 0, "Responses to NRC Requests for Additional Information on WCAP-16208-P, Rev. 1, 'NDE Inspection Length for CE Steam Generator Tubesheet Region Explosive Expansions,'" (Proprietary)

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-06-2137 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The affidavit, which accompanies this letter, sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes use of the accompanying affidavit by Arizona Public Service.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-06-2137, and should be addressed to B. F. Maurer, Acting Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,

for B. F. Maurer, Acting Manager
Regulatory Compliance and Plant Licensing

Enclosures

cc: G. Shukla

CAW-06-2137

AFFIDAVIT

STATE OF CONNECTICUT:

ss Windsor

COUNTY OF HARTFORD:

Before me, the undersigned authority, personally appeared I. C. Rickard, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

I. C. Rickard, Licensing Project Manager
Systems and Safety Analysis, Nuclear Services
Westinghouse Electric Company, LLC

Sworn to and subscribed
before me this 2nd day
of May, 2006

Laurie J. White
Notary Public

My Commission Expires: 8/31/09

(1) I am Licensing Project Manager, Systems and Safety Analysis, in Nuclear Services, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitute Westinghouse policy and provide the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information that is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of other countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.390, it is to be received in confidence by the Commission.

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in LTR-CDME-06-13-P, Rev. 0, "Responses to NRC Requests for Additional Information on WCAP-16208-P, Rev. 1, 'NDE Inspection Length for CE Steam Generator Tubesheet Region Explosive Expansions,'" being transmitted by Arizona Public Service letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse for use by Palo Verde Unit 3 enables Westinghouse to support utilities in identifying and applying a steam generator tubesheet inspection model and, in particular, to determine the tubesheet inspection length appropriate for the

Palo Verde Unit 3 steam generators, including:

(a) The identification of important factors relevant to determining the recommended steam generator tubesheet inspection length, and

(b) Development of a generic methodology for applying the inspection length model to utilities with NSSS plants.

Further, this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for licensing documentation.

(b) Westinghouse can sell support and defense of the inspection model.

(c) The information requested to be withheld reveals the distinguishing aspects of a methodology which was developed by Westinghouse.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar inspection models and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended.

Further the deponent sayeth not.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.390 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.390(b)(1).

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