Arizona Public Service Company P.O. BOX 53999 • PHOENIX, ARIZONA 85072-3999

102-02543-WFC/TRB/GEC June 20, 1993

WILLIAM F. CONWAY EXECUTIVE VICE PRESIDENT NUCLEAR

> U. S. Nuclear Regulatory Commission ATTN: Document Control Desk Mail Station P1-37 Washington, DC 20555

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References: 1. CENPD-269-P, Revision 1-P, July 1984, "Extended Burnup Operation of Combustion Engineering PWR Fuel"

 Letter 161-04355, dated December 24, 1991, to NRC, from W. F. Conway, APS, "Palo Verde Nuclear Generating Station (PVNGS) Unit 1 Proposed Reload Technical Specification Changes Unit 1 Cycle 4"

Dear Sirs:

9310280117

PDR

Subject: Palo Verde Nuclear Generating Station (PVNGS) Unit 1 Docket No. STN 50-528 End-of-Cycle 3 (EOC-3) Fuel Clad Oxide Report and Projection for EOC-4 File: 93-056-026

PVNGS Unit 1 has an ongoing fuel performance surveillance program for the Palo Verde high temperature class of reactors. End-of-Cycle (EOC) fuel rod cladding oxide thickness measurements have been taken in PVNGS Unit 1 as part of this fuel performance surveillance program. Oxide thickness measurements are taken on selected fuel rods to provide data for monitoring Zircaloy-4 corrosion. Higher than expected levels of oxide thickness on Zircaloy-4 cladding were measured on three-cycle Batch C fuel rods and on two-cycle Batch D fuel rods during the Unit 1 EOC-3 refueling outage. Projections for Unit 1 Batch D fuel during Cycle 4, based on measurement data, indicate that oxide thicknesses will approach or exceed the analytical threshold for rapid corrosion rate acceleration. Provided for your information, as Enclosure 1, is a Proprietary ABB-Combustion Engineering (ABB-CE) Nuclear Fuel report, "An Evaluation of Oxide Thickness Measurements on Palo Verde Unit 1 Fuel Rod Cladding at EOC-3 and Projection for EOC-4."

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As stated in Enclosure 1, 52.9 gigawatt-days/metric ton of uranium (GWD/MTU) is the projected maximum EOC-4 peak rod average burnup for a 426 effective full power days (EFPD) cycle 4. This burnup is greater than the currently docketed limit of 52.0 GWD/MTU (Reference 1). Arizona Public Service Company (APS) estimates that 88 fuel rods will reach or exceed a burnup of 52.0 GWD/MTU at 426 EFPD. The power level of these high burnup pins will be very low (the maximum relative power density of any pin after it reaches 52 GWD/MTU is projected to be at least 28% below the 1-pin peak in the core), and the reactor power level will be approximately 72% due to an extended coastdown.

An evaluation pursuant to 10 CFR 50.59 (Enclosure 2), and a Proprietary evaluation by ABB-CE in support of the PVNGS 10 CFR 50.59 safety evaluation (Enclosure 3), identified no unreviewed safety issues nor the need for a change to the PVNGS Technical Specifications. Therefore, APS has determined that NRC approval is not required for operation with higher than expected fuel cladding oxide thicknesses. The higher than expected oxide thicknesses do not reduce the margin of plant safety as defined in the basis for any technical specification. The additional oxide does not require any changes in the peak linear heat rate safety limits for the reactor core, or the peak linear heat rate limiting condition for operation. ABB-CE has verified that the existing Unit 1 Cycle 4 safety analysis documented in Reference 2, applicable to 426 EFPD, remains valid. The high burnup, low power rods that have the additional oxide are not the same rods that would be limiting or subject to failure in the analysis. Direct corrosion fuel failures would occur over a sufficiently long period of time. Increased coolant activity due to fuel failures would be detected and appropriate corrective action would be taken.

APS does not expect to experience fuel cladding oxide thicknesses of this magnitude during the operation of future cycles since the projected burnup for Units 1 and 2 EOC-5, and that for Unit 3 EOC-4 fuel, will not be as high as for Unit 1 EOC-4 fuel. Additionally, subsequent cycles use a modified Zircaloy-4 cladding material with an improved resistance to corrosion. As identified in Enclosure 1, measurements taken in Unit 1 have demonstrated the superior corrosion resistance of this Zircaloy-4 cladding variant. The superior corrosion resistance of this cladding will reduce future concern with respect to the corrosion limit for Unit 3 Batch D and subsequent Palo Verde fuel batches.

It should be noted that the projection of 426 EFPD could be exceeded based on the Unit 1 capacity factor and current outage schedule. ABB-CE will be requested to perform further evaluation as part of any coastdown analysis, if required.

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Pursuant to 10 CFR 2.790(b)(1), APS herewith submits (as Enclosure 4) affidavits for consideration by the Commission in determining whether information sought to be withheld from public disclosure, included as Enclosures 1 and 3, should be withheld.

Should you have any questions, please contact Thomas R. Bradish at (602) 393-5421.

Sincerely,

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WFC/TRB/GEC/rv

Enclosures:

- 1. Oxide Thickness Measurement Report (Proprietary)
- 2. 10 CFR 50.59 Evaluation
- 3. ABB-CE Safety Evaluation (Proprietary)
- 4. Affidavits Pursuant to 10 CFR 2.790
- cc: B. H. Faulkenberry
 - J. A. Sloan

W. A. Wright

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ENCLOSURE 4

AFFIDAVITS PURSUANT TO 10 CFR 2.790

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AFFIDAVIT PURSUANT

TO 10 CFR 2.790

Combustion Engineering, Inc.) State of Connecticut) County of Hartford) SS.:

I, S. A. Toelle, depose and say that I am the Manager, Nuclear Licensing, of Combustion Engineering, Inc., duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations in conjunction with Arizona Public Service Company for withholding this information.

The information for which proprietary treatment is sought is contained in the following document:

"An Evaluation of Oxide Thickness Measurements on Palo Verde Unit 1 Fuel Rod Cladding at EOC-3 and Projection for EOC-4," November 16, 1992.

This document has been appropriately designated as proprietary.

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

Pursuant to the provisions of paragraph (b) (4) of Section 2.790

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, included in the above referenced document, should be withheld.

- The information sought to be withheld from public disclosure, which is owned and has been held in confidence by Combustion Engineering, is the detailed corrosion performance of C-E's normal-tin and low-tin content cladding.
- 2. The information consists of test data or other similar data concerning a process, method or component, the application of which results in substantial competitive advantage to Combustion Engineering.
- 3. The information is of a type customarily held in confidence by Combustion Engineering and not customarily disclosed to the public. Combustion Engineering 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 details of the aforementioned system were provided to the Nuclear Regulatory Commission via letter DP-537 from F. M. Stern to Frank Schroeder dated December 2, 1974. This system was applied in determining that the subject document herein is proprietary.
- 4. The information is being transmitted to the Commission in confidence under the provisions of 10 CFR 2.790 with the

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understanding that it is to be received in confidence by the Commission.

- 5. The information, to the best of my knowledge and belief, is not available in public sources, and any disclosure to third parties has been made pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
- 6. Public disclosure of the information is likely to cause substantial harm to the competitive position of Combustion Engineering because:
 - a. A similar product is manufactured and sold by major pressurized water reactor competitors of Combustion Engineering.
 - b. Development of this information by C-E required thousands of manhours and hundreds of thousands of dollars. To the best of my knowledge and belief, a competitor would have to undergo similar expense in generating equivalent information.
 - c. In order to acquire such information, a competitor would also require considerable time and inconvenience to ascertain detailed corrosion performance of C-E's normaltin and low-tin content cladding.
 - d. The information required significant effort and expense to obtain the licensing approvals necessary for application of the information. Avoidance of this expense would decrease a competitor's cost in applying the information and

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marketing the product to which the information is applicable.

- e. The information consists of the detailed corrosion performance of C-E's normal-tin and low-tin content cladding, the application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with Combustion Engineering, take marketing or other actions to improve their product's position or impair the position of Combustion Engineering's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.
- f. In pricing Combustion Engineering's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of Combustion Engineering's competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.
- g. Use of the information by competitors in the international marketplace would increase their ability to market nuclear steam supply systems by reducing the costs associated with their technology development. In addition, disclosure would have an adverse economic impact on Combustion Engineering's potential for obtaining or maintaining foreign licensees.

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Further the deponent sayeth not.

S.A.

S. A. Toelle Manager Nuclear Licensing

sworn to before me this <u>10th</u> day of <u>December</u>, 1992 ، ۱ مار

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Notary Public

Notary Public

My commission expires: <u>3-31-94</u>

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AFFIDAVIT PURSUANT

TO 10 CFR 2.790

Combustion Engineering, Inc.) State of Connecticut) County of Hartford) SS.:

I, S. A. Toelle, depose and say that I am the Manager, Nuclear Licensing, of Combustion Engineering, Inc., duly authorized to make this affidavit, and have reviewed or caused to have reviewed the information which is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conjunction with the application of Arizona Public Service Company in conformance with the provisions of 10 CFR 2.790 of the Commission's regulations in for withholding this information.

The information for which proprietary treatment is sought is contained in the following document:

Enclosure to V-93-107, "10CFR50.59 Evaluation Palo Verde 1 Cycle 4 Batch D Oxide Thickness," April 1993.

This document has been appropriately designated as proprietary.

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

Pursuant to the provisions of paragraph (b) (4) of Section 2.790 of the Commission's regulations, the following is furnished for

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consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

- 1. The information sought to be withheld from public disclosure, which is owned and has been held in confidence by Combustion Engineering, is the numerical values of fuel cladding oxide thickness limits and the effect on the fuel performance parameters.
- 2. The information consists of test data or other similar data concerning a process, method or component, the application of which results in substantial competitive advantage to Combustion Engineering.
- 3. The information is of a type customarily held in confidence by Combustion Engineering and not customarily disclosed to the public. Combustion Engineering 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 details of the aforementioned system were provided to the Nuclear Regulatory Commission via letter DP-537 from F. M. Stern to Frank Schroeder dated December 2, 1974. This system was applied in determining that the subject document herein is proprietary.
- 4. The information is being transmitted to the Commission in confidence under the provisions of 10 CFR 2.790 with the

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understanding that it is to be received in confidence by the Commission.

- 5. The information, to the best of my knowledge and belief, is not available in public sources, and any disclosure to third parties has been made pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
- 6. Public disclosure of the information is likely to cause substantial harm to the competitive position of Combustion Engineering because:
 - a. A similar product is manufactured and sold by major pressurized water reactor competitors of Combustion Engineering.
 - b. Development of this information by C-E required thousands of manhours and hundreds of thousands of dollars. To the best of my knowledge and belief, a competitor would have to undergo similar expense in generating equivalent information.
 - c. 'In order to acquire such information, a competitor would also require considerable time and inconvenience to determine the numerical values of fuel cladding oxide thickness limits and the effect on the fuel performance parameters.
 - d. The information required significant effort and expense to obtain the licensing approvals necessary for application of the information. Avoidance of this expense would decrease

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a competitor's cost in applying the information and marketing the product to which the information is applicable.

- The information consists of the numerical values of fuel ^e. cladding oxide thickness limits and the effect on the fuel performance parameters, the application of which provides a competitive economic advantage. The availability of such information to competitors would enable them to modify with Combustion their product to better compete Engineering, take marketing or other actions to improve their product's position or impair the position of Combustion Engineering's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.
- f. In pricing Combustion Engineering's products and services, significant research, development, engineering, analytical, manufacturing, licensing, quality assurance and other costs and expenses must be included. The ability of Combustion Engineering's competitors to utilize such information without similar expenditure of resources may enable them to sell at prices reflecting significantly lower costs.
- g. Use of the information by competitors in the international marketplace would increase their ability to market nuclear steam supply systems by reducing the costs associated with their technology development. In addition, disclosure would have an adverse economic impact on Combustion

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Engineering's potential for obtaining or maintaining foreign licensees.

Further the deponent sayeth not.

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S. A. Toelle Manager Nuclear Licensing

Sworn to before me this 2 nd day of Quin1993

Notary Public

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My commission expires: <u>3-31-94</u>

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ENCLOSURE 1

AN EVALUATION OF OXIDE THICKNESS MEASUREMENTS ON PALO VERDE UNIT 1 FUEL ROD CLADDING AT EOC-3 AND PROJECTION FOR EOC-4

A PROPRIETARY REPORT



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