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Project No.: 700
Our ref: LTR-NRC-03-70
December 5, 2003

Subject: Response to Round #3 Request for Additional Information Regarding WCAP-16072-P & -NP, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs " (Proprietary / Non-proprietary)

References: 1. E-Mail form B. Benney (NRC) to R. Sisk (Westinghouse), Round 3 RAIs on ZrB₂ Implementation Topical Report, 11/18/2003.
2. WCAP-16072-P & -NP, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs", April 2003
3. Letter, H. A. Sepp (W) to USNRC Document Control Desk, "Submittal of WCAP-1602-P, Revision 0, Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs, (Proprietary/Non-proprietary)", LTR-NRC-03-14, April 25, 2003

Enclosed are copies of Westinghouse Electric Company LLC (Westinghouse) responses to the Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI), Reference 1, regarding WCAP-16072-P & -NP, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs", Reference 2. This topical report was submitted for NRC review and approval on April 25, 2003, Reference 3.

Also enclosed are:

1. One (1) copy of the Application for Withholding, AW-03-1745 with Proprietary Information Notice and Copyright Notice.
2. One (1) copy of Affidavit, AW-03-1745.

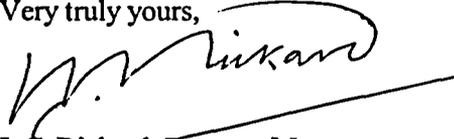
This submittal contains Westinghouse proprietary information of trade secrets, commercial or financial information which we consider privileged or confidential pursuant to 10 CFR 9.17(a)(4). Therefore, it is requested that the Westinghouse proprietary information attached hereto be handled on a confidential basis and be withheld from public disclosure.

This material is for your internal use only and may be used solely for the purpose for which it is submitted. It should not be otherwise used, disclosed, duplicated, or disseminated, in whole or in part, to any other person or organization outside the Office of Nuclear Reactor Regulation without the expressed prior written approval of Westinghouse.

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Correspondence with respect to any Application for Withholding should reference AW-03-1745 and should be addressed to Ian C. Rickard, Program Manager of Regulatory Compliance and Plant Licensing, Westinghouse Electric Company.

Very truly yours,

A handwritten signature in black ink, appearing to read "I. C. Rickard", written over a horizontal line.

I. C. Rickard, Program Manager
Regulatory Compliance and Plant Licensing

Copy to: F. M. Akstulewicz, NRC (w/o enclosures)
B. J. Benney, NRC (w/ 3 proprietary & 1 non-proprietary copies)
P. Clifford, NRC (w/o enclosures)

Enclosure

Non-Proprietary Response to NRC Round #3 Request for Additional Information

WCAP-16072-P & -NP

**“Implementation of Zirconium Diboride Burnable Absorber Coatings in
CE Nuclear Power Fuel Assembly Designs”**

Round #3 RAI #1:

In Section 2.3.1, the topical report states, “The surface roughness of the ZrB₂ IFBA coated fuel pellet surface would be expected to be less than the original uncoated UO₂ fuel pellet surface. However, it is assumed to be the same as UO₂. The coated surface is observed by Westinghouse to be no rougher and no more rigid than that of UO₂”. Please demonstrate that the ZrB₂ IFBA coated fuel pellet surface roughness is and will remain less than the uncoated UO₂ pellet.

Response:

Surface roughness measurements of the uncoated, standard UO₂ pellets and the coated UO₂ pellets for fuel pellets fabricated at about the same time, recently as well as several years ago, were reviewed. [

] ^{a,c} The observation that the coated surface is no rougher than the uncoated UO₂ surface is correct. Furthermore, the stated assumption that the coated pellet surface roughness is the same as the uncoated pellets is an appropriate assumption.

Westinghouse currently applies a surface roughness specification for the fabrication of standard UO₂ pellets that is identical to the specification for ZrB₂ coated pellets. Fabrication process control procedures are in place to ensure the specifications are met. [

] ^{a,c} Westinghouse will continue to impose a fabrication surface roughness specification for ZrB₂ pellets that will be assured through appropriate fabrication quality assurance procedures and appropriately accounted for in the design and safety analyses

Round #3 RAI #2:

In Section 4.2.3, Large Break Loss-of-Coolant (LBLOCA) and Small Break Loss-of-Coolant (SBLOCA) demonstration analyses reveal that aspects of ZrB₂ IFBA fuel designs, especially impacts of rod internal pressure, have the potential to produce significant changes in the calculated results. The topical states, Alimplementation analyses are performed to determine the plant-specific impact of the ZrB₂ IFBA fuel. Cycle-specific evaluations may also be required to ensure that cycle-specific IFBA fuel designs do not invalidate bounding ECCS Performance Analyses. Please describe how licensees implementing this topical report will demonstrate compliance to the acceptance criteria in 10 CFR 50.46 (b) and to the reporting criteria in 10 CFR 50.46 (a)(3)(i) and (ii).

Response:

The quoted statement, which appears in the topical report in both the LBLOCA (Section 4.2.3.1) and SBLOCA (Section 4.2.3.2) discussions is, in a sense, redundant, being simply a statement of normal process. The statement is not setting a new process in place, rather, it is merely a reflection of how the normal reload analysis proceeds, regardless of the presence of new fuel features or methodology changes.

Specifically, the first step in the reload analysis process is to determine the need for the performance of full scope analyses (in this case LOCAs). This determination is accomplished by reviewing key parameter checklists for LOCA analyses to determine if anything associated with the upcoming reload cycle exceeds (in a non-conservative direction) specific parameter values associated with the bounding analysis results for the existing Analysis of Record (AOR). If no key parameter values are exceeded, a new analysis to replace the existing AOR is not required and the reload can be processed via 10 CFR 50.59. However, where a key parameter value would result in the AOR no longer remaining bounding, full scope LOCA analyses are performed to assure that all 10 CFR 50.46(b) acceptance criteria are satisfied.

When new fuel design feature(s) or analysis methods are implemented, a similar process is followed. That is, new analyses are performed to assess the impact of new fuel design feature(s) and/or methods relative to the existing bounding AOR results to assure that all 10 CFR 50.46(b) acceptance criteria are satisfied. If the results of these analyses are more limiting than the existing bounding AOR results but do not require any changes to regulatory limits (e.g., Technical Specification Limiting Conditions of Operation), the utility updates the applicable UFSAR sections pursuant to 10 CFR 50.71 and 10 CFR 50.59. If the new results require changes to Technical Specification Limiting Conditions of Operation, the utility submits the appropriate license amendment pursuant to 10 CFR 50.90.

With respect to the reporting requirements of 10 CFR 50.46(a)(3)(i) and (ii), the effect of changes is tracked on a utility specific basis. When changes do not exceed the regulatory significance threshold of 50°F, the effect of change(s) is submitted to the NRC by the licensee in an annual 10 CFR 50.46 report. If changes exceed the regulatory significance threshold of 50°F, the effect of change(s) is submitted to the NRC by the licensee within the 30-day time period specified in the regulation. In general, such a report would document the effect and that it resulted from the implementation of some new fuel design feature or methodology change which had already been reviewed and approved by the NRC, as for example in this case the implementation of ZrB₂. This is exactly the process that was followed when the Westinghouse-developed ZIRLO™ cladding material was implemented for CE fuel designs. A topical report

(CENPD-404-P-A, Rev. 1) was submitted, reviewed and approved. Utilities updated their COLR references, as necessary, and the reload analysis described above was employed on the first introduction of a batch of ZIRLO™ clad fuel. Because methodology changes other than those strictly associated with implementation of ZIRLO™ were performed, it was determined that the change in Peak Clad Temperature (PCT) exceeded the regulatory significance threshold of 50°F. Consequently, licensees submitted a 30-day letter acknowledging the significance of the change and that it was due to the implementation of a previously NRC approved fuel design change and previously approved methodology change. No further action was required.

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Round #3 RAI #3:

In RAI #11, the staff had concerns that current plant operations (staff training and operating procedures) as well as the MTC surveillance test may be inadequate for an increasing trend in critical soluble boron concentration (and MTC). In response, Westinghouse stated that this "is a plant specific implementation issue". Further, Westinghouse stated it will recommend that procedures be implemented to confirm that the MTC is within its limits at the highest RCS boron concentration expected during the cycle. Please describe the recommended actions licensees must complete prior to implementing this topical report.

Response #3:

For some plants containing ZrB₂ IFBA, the most positive MTC may occur not at beginning of cycle (BOC) but at some later time within the first third of the cycle where the critical boron concentration (CBC) is at its greatest value. For CE plants using ZrB₂ IFBA, the difference between the most positive MTC and the BOC value is expected to be small (<1 pcm/°F). This difference is well within the MTC uncertainty allowance used in the core design and safety analysis processes. Current Westinghouse core design procedures already require that the maximum value of the predicted MTC be confirmed to be within its limit at all burnups during the cycle. In addition to this existing requirement, Westinghouse will recommend that the MTC surveillance requirement be modified to indicate that if the cycle maximum HFP CBC is more than 100 ppm greater than the BOC HFP value and if the results of the BOC MTC tests indicate a difference between prediction and measurement that is larger than the design tolerance (1.6 pcm/°F) then an additional MTC surveillance should be performed at HFP within 7 EFPD of the core burnup corresponding to the cycle maximum predicted HFP CBC. Note that this approach is consistent with the method approved by the NRC in CE-NPSD-911 to eliminate the End-of-Cycle MTC surveillance requirement.

Round #3 RAI #4:

In response to RAI #8, Westinghouse stated that their evaluation of cladding collapse in the plenum region of the rods demonstrated that cladding collapse would not occur if the radial support offered to the cladding by the plenum spring was factored into the calculation. The staff does not approve of this deviation from established methodology. Please provide analyses demonstrating fuel rod failure will not occur due to clad flattening (collapse). No credit may be taken for any radial support provided by the plenum spring.

Response #4:

The cladding creep behavior during creep ovalization in the plenum region is the same as creep ovalization in the fuel region. Support from the plenum spring coil is similar to support from the fuel pellets for the case of finite axial pellet-to-pellet gaps. Support from the fuel pellet is a well established and accepted methodology. Thus, Westinghouse concludes that radial support from the plenum spring coils is not a significant deviation from established methodology.

The plenum spring material is stainless steel. Creep of the stainless steel in the plenum region is insignificant. Lateral load carrying capability for the typical plenum spring captured within the cladding tube is significant. [

] ^{a,b,c} Thus, the data demonstrate that collapse in the plenum region cannot occur if a standard plenum spring is present.

Section 4.2.2.4 of WCAP-16072-P states that evaluations of cladding collapse in the plenum region would not occur if the radial support of the plenum spring is taken into account. NRC RAI Round 1 Response #8 states that credit for the radial support from the plenum spring was necessary because of the addition of lower initial gas pressure combined with conservative values for other input parameters in the cladding collapse analysis. Response #8 states that future cladding collapse analyses may or may not utilize this credit. Plenum collapse evaluations are expected to be performed using the previously approved CEPANFL for Westinghouse CE plants. However, performing less conservative plenum collapse analyses is not justified in view of the insignificant probability that plenum collapse can occur. Westinghouse concludes that credit for plenum spring support, which has been [] ^b, and which is quite similar to established methodology for pellet support, is appropriate.



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Project No.: 700
Our ref: AW-03-1745
December 5, 2003

**APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE**

Subject: Response to Round #3 Request for Additional Information Regarding WCAP-16072-P & -NP, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs " (Proprietary / Non-proprietary)

Reference: Letter from I. C. Rickard (W) to USNRC Document Control Desk, "Response to Round #3 Request for Additional Information Regarding WCAP-16072-P & -NP, "Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs " (Proprietary / Non-proprietary)," LTR-NRC-03-70, dated December 5, 2003

This Application for Withholding is submitted by Westinghouse Electric Company LLC (Westinghouse) pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse that is customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the Enclosure to the Reference letter. In conformance with 10 CFR Section 2.790, Affidavit AW-03-1745 accompanies this Application for Withholding, setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-03-1745 and should be addressed to the undersigned.

Very truly yours,

A handwritten signature in black ink, appearing to read 'I. C. Rickard', written over a horizontal line.

I. C. Rickard, Program Manager
Regulatory Compliance and Plant Licensing

AFFIDAVIT

STATE OF CONNECTICUT:

ss

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:



A handwritten signature in black ink, which appears to read "I. C. Rickard", is written over a horizontal line.

I. C. Rickard, Program Manager
Regulatory Compliance and Plant Licensing

Sworn to and subscribed before me
this 4th day of December, 2003

A handwritten signature in black ink, which appears to read "Linda A. Scott", is written over a horizontal line.
Notary Public

My Commission expires: May 31, 2003

- (1) I am Program Manager, Regulatory Compliance and Plant Licensing, in Nuclear Services, Westinghouse Electric Company LLC ("Westinghouse"), and 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 rulemaking 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 2.790 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 the 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 2.790 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 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 constitutes Westinghouse policy and provides 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 which 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 those 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 2.790, 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 the Enclosure for "Response to Round #3 NRC Request for Additional Information, WCAP-16072-P & -NP, Implementation of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs" (Proprietary / Non-proprietary)" (Proprietary)," December 5, 2003, for submittal to the Commission, being transmitted by Westinghouse letter (LTR-NRC-03-70) and Application for Withholding Proprietary Information from Public Disclosure, to the NRC Document Control Desk. The proprietary information as submitted for use by Westinghouse is expected to be applicable in various licensee submittals in response to certain NRC requirements for justification for the application of the Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs.

This information is part of that which will enable Westinghouse to:

- (a) Conduct analyses of Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs and ensure appropriate safety limits are met.
- (b) Support licensees in implementing Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs.

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 Zirconium Diboride Burnable Absorber Coatings in CE Nuclear Power Fuel Assembly Designs.
- (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 technical evaluation justifications 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 for developing the enclosed improved core thermal performance methodology.

Further the deponent sayeth not.

Proprietary Information Notice

Transmitted herewith are proprietary and 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 2.790 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 2.790(b)(1).

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