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Our ref: LTR-NRC-04-51

August 24, 2004

References: 1. Email, W. Macon (NRC) to R. Sisk (Westinghouse), "WCAP-16078" August 18, 2004
2. Email, W. Macon (NRC) to R. Sisk (Westinghouse), "WCAP-16078" dated June 9, 2004
3. WCAP-16078-P, Rev. 0, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel," April 2003

Subject: Revision 1 to the Responses to Round 4 NRC Request for Additional Information for WCAP-16078-P, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel" (Proprietary/Non-Proprietary)

Transmitted herewith are three (3) proprietary and two (2) non-proprietary copies of Westinghouse Electric Company LLC (Westinghouse) Revision 1 to the responses to the Nuclear Regulatory Commission's Request for Additional Information (Reference 1) regarding WCAP-16078-P, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel" (Reference 2). Also transmitted are an Application for Withholding, AW-04-1885, with its associated affidavit and proprietary information notice.

This transmittal contains Westinghouse proprietary information comprising trade secrets, commercial or financial information which are considered privileged or confidential pursuant to 10 CFR 2.390. Accordingly, Westinghouse requests that the proprietary information attached hereto be handled on a confidential basis and be withheld from public disclosure.

This material is for internal use by the Nuclear Regulatory Commission and may only be used 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 Nuclear Regulatory Commission without the expressed prior written approval of Westinghouse. Correspondence with respect to the Application for Withholding should reference AW-04-1885 and should be addressed to J. A. Gresham, Manager of

1007

Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P.O. Box 355,
Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,



J. A. Gresham, Manager
Regulatory Compliance and Plant Licensing

cc: W. A. Macon, Jr./NRC (w/ 3 proprietary copies)
F. M. Akstulewicz/NRC (w/o enclosures)
E. S. Peyton/NRR



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Our ref: AW-04-1885

August 24, 2004

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Revision 1 to the Responses to Round 4 NRC Request for Additional Information for WCAP-16078-P, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel" (Proprietary)

Reference: Letter from J. A. Gresham to Document Control Desk, LTR-NRC-04-51, dated 8/24/04

The Application for Withholding is submitted by Westinghouse Electric Company LLC (Westinghouse), pursuant to the provisions of Paragraph (b) (1) of Section 2.390 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10 CFR Section 2.390, Affidavit AW-04-1885 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 2.390 of the Commission's regulations.

Correspondence with respect to this Application for Withholding or the accompanying affidavit should reference AW-04-1885 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,

A handwritten signature in black ink, appearing to read 'J. A. Gresham', written over a horizontal line.

J. A. Gresham, Manager
Regulatory Compliance and Plant Licensing

Enclosures

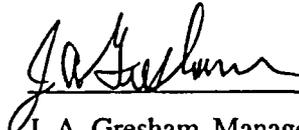
AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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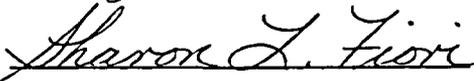
COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared J. A. Gresham, 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:



J. A. Gresham, Manager
Regulatory Compliance and Plant Licensing

Sworn to and subscribed
before me this 24th day
of August, 2004



Notary Public

Notarial Seal
Sharon L. Fiori, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires January 29, 2007
Member, Pennsylvania Association Of Notaries

- (1) I am Manager, Regulatory Compliance and Plant Licensing, 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 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 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 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 2.390, 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, Revision 1 to the Responses to Round 4 NRC Request for Additional Information for WCAP-16078-P, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel" (Proprietary) dated August 24, 2004, for submittal to the Commission, being transmitted by Westinghouse letter (LTR-NRC-04-51) and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted by Westinghouse is that associated with Westinghouse's request for NRC approval of WCAP-16078 – Westinghouse's BWR ECCS Evaluation Model.

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

- (a) Obtain NRC approval of WCAP-16078 Westinghouse's BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima 2 Fuel.
- (b) Perform BWR safety analyses employing Westinghouse safety analysis methodology for SVEA-96 Optima 2 fuel to ensure regulatory limits are met.
- (c) Assist our customer in obtaining enhanced nuclear design input data for fuel reload analysis designs

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of this information to its customers for purposes of meeting NRC requirements for licensing documentation.
- (b) Westinghouse can sell support and defense of BWR Loss Of Coolant Accident analysis.
- (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 calculations 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).

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.390 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

**Enclosure to LTR-NRC-04-51
(Non-Proprietary)**

**Revision 1 to the Responses to Round 4 NRC Request for
Additional Information for WCAP-16078-P**

The NRC Request for Additional Information (RAI) regarding WCAP-16078-P, "Westinghouse BWR ECCS Evaluation Model: Supplement 3 to Code Description, Qualification and Application to SVEA-96 Optima2 Fuel" is in the form of an initial request for background material previously submitted to the NRC and thirty additional RAIs. These RAIs were issued in several sets, the most recent of which were received by Westinghouse on June 9, 2004 and contained RAIs #29 through #30 with a request for clarification on the response to #14, which was submitted on May 28, 2004. Clarification to RAI 14 and responses to RAIs 29 and 30 are provided below.

NRC ROUND 3 RAI 14:

Please explain how was the core average channel being modeled for a mixed core; i.e., how to determine the averaged local loss coefficients, flow area, hydraulic diameter and spacer locations if different spacer locations exist in different bundle designs?

Clarification of Westinghouse Response to RAI 14:

The GOBLIN code is fully capable of modeling a mixed core as a series of parallel channels having different characteristics (i.e., loss coefficients, flow areas, hydraulic diameters, spacer locations, fuel rod dimensions, etc.). The Westinghouse methodology is to [[

.]]^{a,c}

ECCS core-wide system response has been demonstrated in numerous U.S. and European applications not to be very sensitive to the unique fuel design features. For example, a comparison was presented in Section 9.3 of RPB 90-94-P-A of system response analyses performed with a full core of SVEA-64 fuel and a mixed core containing two-thirds SVEA-64 fuel and one-third 8x8 fuel of an open lattice design. The SVEA-64 fuel is an 8x8 water-cross design. The results showed [[

.]]^{a,c}

A similar result is expected for applications involving the introduction of SVEA-96 Optima2 fuel, which is also a 10x10-4 water-cross design with part-length fuel rods. However, Westinghouse will perform an evaluation to determine if this approach can continue to be applied for future applications of the evaluation model. This evaluation will compare a system analysis of a core containing a full load of SVEA-96 Optima2 fuel to a mixed core containing approximately one-third SVEA-96 Optima2 fuel and two-thirds legacy fuel (e.g., GE14). In the event this simplification is not justified, the mixed core model will be used for the system response analysis that is used to determine the MAPLHGR limits for the Westinghouse fuel.

If the mixed core model is determined to be limiting for the first transition cycle, it is anticipated that the system response would improve in subsequent reload cycles as the legacy fuel is replaced by Westinghouse fuel. Therefore, the MAPLHGR limits determined for the Westinghouse fuel during the first transition cycle and subsequent is expected to remain conservative to the end of life if based on the system response determined by the mixed core model.

Westinghouse performed a review of the previous Safety Evaluation Reports (SERs) performed by the NRC on previous BWR LOCA evaluation models. No restrictions were identified that would prevent using GOBLIN to derive the system response using a mixed core model that contained fuel manufactured by another fuel vendor. The information necessary to develop a mixed core model is provided by the utility. In addition, the individual constitutive models in GOBLIN are sufficiently general that non-Westinghouse fuel can be represented adequately.

NRC ROUND 4 RAI 29

The Safety Evaluation Report and the accompanying Technical Evaluation Report, ITS/NRC/95-1, both related to CENPD-283-P, state that the CCFL coefficient values (K1 and Ku) for SVEA-96 fuel, which were shown to have little effect on predicted system and core behavior, should not be extended further to other fuels without being directly supported and validated by experimental data for those particular fuels. While it is noted that the effective diameter formulation has been shown to be more conservative based on the QUAD+ experimental data depicted in Figure 5-5, WCAP-16078-P, explain how the previous SER limitation has been addressed and overcome in demonstrating the appropriateness of the GOBLIN/DRAGON CCFL correlation for SVEA-96 Optima2 fuel.

Westinghouse Response to RAI 29

As indicated in the Safety Evaluation Report (SER) related to CENPD-283-P-A, the CCFL correlation was approved for applications to SVEA-96 fuel. Since the correlation was originally validated using CCFL data taken on QUAD+ CCFL test facility, the correlation should be applicable to fuel designs like QUAD+ (same as SVEA-64) and SVEA-96. Table 4-1 of WCAP-16078-P compares the key thermal hydraulic parameters associated with the SVEA fuel designs (e.g., fuel rod diameter, active flow area, hydraulic diameter, etc.). As shown, the hydraulic diameter, fuel rod diameter and active flow area of the SVEA-96 Optima2 fuel design fall between the SVEA-64 design and the SVEA-96/96+ designs. Therefore, it is concluded that the SVEA-96 Optima2 fuel design falls between the SVEA-64 and SVEA-96/96+ fuel designs from a thermal-hydraulic perspective, and within the range of applicability of the CCFL correlation.

In addition, the CCFL correlation is expressed in terms of physical quantities (e.g., vapor and liquid fluxes, hydraulic diameter, effective channel diameter, etc.). Since the CCFL correlation is expressed in terms of these physical quantities, it can accommodate the differences between the fuel designs.

NRC ROUND 4 RAI 30

As stated in the SER related to CENPD-283-P, the conservative bias for the base CCFL correlation was prescribed based on vendor-supplied data submitted by facsimiles dated September 19, 1995, and September 27, 1995. The data showed that the CCFL correlation had a 100 F sensitivity in the temperature range of the Appendix K limit and that the limit was exceeded as the APLHGR approached 36 KW/m. Demonstrate how the effective diameter formulation affects the CCFL correlation in the Appendix K limit (1800 F to 2200 F) temperature range by making a direct comparison with the results displayed in Figure A7-1, Appendix A, CENPD-283-P-A.

Westinghouse Response to RAI 30

The sensitivity study presented in Appendix A of CENPD-283-P-A was in response to NRC Question No. 7 regarding the review of that licensing topical report (LTR). The results of the sensitivity study presented in

Section 7.1 of that LTR were extended to show the impact on peak cladding temperature. The sensitivity study presented in CENPD-283-P-A consisted of making an arbitrary 30% increase in the CCFL liquid flow restriction at the upper tie plate and fuel spacers for a particular plant model. Figure A7-1 in CENPD-283-P-A shows that the difference in predicted peak cladding temperature (PCT) increases as the average planar linear heat generation rate (APLHGR) increases. Near the acceptance limit, the difference in PCT was approximately [[.]]^{a,c}

The result of a sensitivity study showing the impact of using the CCFL model proposed in WCAP-16078-P was presented in the response to RAI 4. This sensitivity study, which was performed at an APLHGR of 33.9 kW/m, showed a difference in PCT of approximately [[.]]^{a,c} relative to an identical case using the existing CCFL model. In response to this question, this study was extended to show the impact of the proposed change to the CCFL model for a range of APLHGRs to obtain the sensitivity near the 10 CFR 50.46 acceptance limit. The results from this study are presented in the following figure. As shown, the difference in PCT increases as the APLHGR increase. Near the acceptance limit, the difference for the reference plant is approximately [[.]]^{a,c} This sensitivity study further supports the previous conclusion that small variations in fuel design geometric parameters that impact CCFL have a very small impact on the LOCA PCT results.

Note that the magnitude of the sensitivity to the change to the CCFL model depends in part on the blowdown and reflood performance of the reference plant (e.g., the timing of dryout, the timing of core spray actuation, the timing of reflood, etc.). Therefore, a simple comparison between the results presented in CENPD-283-P-A and the results presented here can be misleading, as the reference plants used for these two sensitivity studies are different.

a,c

NRC ROUND 4 RAI 31

Please identify the application range/limitations (if there is any) of the existing STAV6.2 type models in the CHACHA-3D code. Justify their applicabilities to Optima-2 fuel. These models include the following: Burn-up-induced degradation of the fuel pellet conductivity model; Pellet-cladding mechanical interaction model.

Westinghouse Response to RAI 31

The differences between the SVEA-96 and the SVEA-96 Optima2 fuel rods do not diminish the applicability of STAV6.2 within the code limitations specified in CENPD-285-P-A. STAV6.2 is equally applicable to the SVEA-96 and SVEA-96 Optima2 fuel rods. While the STAV6.2 fuel pellet conductivity model does not include burnup degradation, comparison with test rod temperature measurements in CENPD-285-P-A demonstrates that the integral effect of all of the STAV6.2 models (e.g. pellet conductivity, fission gas release, pellet-clad mechanical interaction, cladding creep, etc.) lead to pellet temperature predictions which are conservative within the approved burnup range of STAV6.2 (less than 50 MWd/kgU rod-average) and recognizing the uncertainties associated with the test rod results. In practice, the absence of a burnup degradation term in the STAV6.2 pellet conductivity models does not have an important effect on the LOCA since the LOCA tends to be limiting relatively early in the life of the fuel rod. It should also be noted that the methodology for initializing the LOCA analyses described in CENPD-287-P-A requires the use of minimum gap conductance's, conservative power histories, and fuel rod dimensions to maximize stored energy.