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Wolf Creek

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WCAP-15996-P
Project Number 694

September 14, 2004

WOG-04-461

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

**Subject: Westinghouse Owners Group
Response to Request for Additional Information Related to
WCAP-15996-P, "Technical Description Manual for the CENTS Code"
(TAC No. MB 6982)**

Reference: 1) Letter, G. S. Pavis (CEOG) to USNRC Document Control Desk, "Submittal of Combustion Engineering Owners Group Reports: WCAP-15996-P, (Proprietary) and WCAP-15996-NP, (Non-Proprietary), entitled "Technical Description Manual for the CENTS Code"", CEOG-02-256, December 13, 2002
2) Letter, G. S. Pavis (WOG) to USNRC Document Control Desk, "Submittal of Combustion Engineering Owners Group Reports: WCAP-15996-P, Volume 4 (Proprietary) and WCAP-15996-NP, Volume 4 (Non-Proprietary), entitled "Technical Description Manual for the CENTS Code"", February 19, 2003

Via letters dated December 13, 2002 and February 19, 2003 (References 1 and 2, respectively), the Westinghouse Owners Group (WOG) submitted a revision to the CENTS computer code topical report (i.e., WCAP-15996-P, Rev. 0) for Nuclear Regulatory Commission (NRC) review and approval. In February 2004, a telephone conference call was held between Westinghouse Electric Company LLC (Westinghouse) and members of the NRC staff to discuss aspects of the ongoing CENTS topical report review for the Control Element Assembly (CEA) Ejection Event. This letter provides the WOG response to an NRC Request for Additional Information (RAI). The response to the NRC RAI is provided in Enclosures 1-P (Proprietary) and 2 (Non-Proprietary).

Enclosure 3 contains:

1. One (1) copy of the Application for Withholding Proprietary Information From Public Disclosure, CAW-04-1887 (Non-Proprietary).
2. One (1) copy of Affidavit CAW-04-1887 (Non-Proprietary).
3. Proprietary Information Notice.
4. Copyright Notice.

As this response contains information proprietary to Westinghouse, it is being transmitted

DD48

with an affidavit signed by Westinghouse, the owner of the information. The affidavit 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 Section 2.390 of the Commission's regulations. Accordingly, it is respectfully requested that the information which is proprietary be withheld from public disclosure in accordance with 10CFR Section 2.390 of the Commission's regulations.

Correspondence with respect to the proprietary aspect of the Application for Withholding or the supporting Westinghouse affidavit should reference CAW-04-1887, as appropriate, and should be addressed to:

Mr. J. A. Gresham
Manager, Regulatory Compliance and Plant Licensing
Westinghouse Electric Company LLC
P. O. Box 355
Pittsburgh, PA 15230-0355

All correspondence and invoices related to the review of WCAP-15996-P should be addressed to:

Mr. Gordon Bischoff
Manager, Owners Group Program Management Office
Westinghouse Electric Company LLC
20 International Drive
Windsor, CT 06095

If you have questions regarding this matter, feel free to contact Mr. Charles Molnar in the Westinghouse Windsor Office at (860) 731-6286.

Sincerely,



Frederick P. "Ted" Schiffley, II, Chairman
Westinghouse Owners Group

FPS:PJH:las

cc: C. B. Brinkman, Westinghouse, w/o enclosures
S. Dembek, NRC, w/o enclosures
J. A. Gresham, Westinghouse, w/o enclosures
M. C. Janke, Westinghouse, w/ enclosures
C. M. Molnar, Westinghouse, w/ enclosures
Y. Orechwa, NRC, w/ enclosures
E. J. Schulz, Westinghouse, w/ enclosures
G. Shukla, NRC, w/ enclosure 1 (3copies), enclosure 2 and enclosure 3 (via Federal Express)
J. L. Uhle, NRC, w/ enclosures
WOG Analysis Subcommittee
WOG Project Management Office, w/o enclosures
WOG Steering Committee, w/o enclosures

Ref: PA-ASC-0141

Enclosure 2 to WOG-04-461

Westinghouse Owners Group

Non-Proprietary Response to Request for Additional Information

WCAP-15996-P

Technical Description Manual for the CENTS Code

Westinghouse Non-Proprietary Class 3

WCAP-15996-P, "Technical Description Manual for the CENTS Code"

NRC Request for Additional Information

NRC Request for Additional Information

The analysis of the CEA ejection event is governed by the approved methodology described in CENPD-190-A, "C-E Method for Control Element Assembly Ejection Analysis", January, 1976. This methodology is a synthesis method consisting of zero, one and two-dimensional calculations. It has eight steps. The first six are mainly to define the problem and to compute peaking factors and reactivity weights that account for three-dimensional effects in a one-dimensional calculation.

It is Steps 7 and 8 that are germane to the issue at hand. In Step 7, the STRIKIN-II code is used to compute for an average channel and the hot channel the maximum fuel and clad temperatures, the maximum fuel rod enthalpy and the time-dependent energy deposition in the reactor coolant. In effect, the STRIKIN-II code performs the same calculations as the core model described in Chapter 3.0 of WCAP-15996-P. In Step 8, the computed time-dependent energy deposition in the reactor coolant system is input into the CEFLASH-4AS (Reference 4) code. This code, utilizing the Small Break LOCA model, calculates the reactor coolant system pressure transient.

If the CEOG desires a generic approval for analyses of CEA ejection events with CENTS in place of CEFLASH-4AS in the approved methodology CENPD-190-A, then such a specific request should be made, and agreement with the analyses that led to the approval of CENPD-190-A demonstrated.

WOG Response to Request for Additional Information

The WOG does desire specific approval for analyses of CEA ejection events using the CENTS Code (Reference 1) in place of CEFLASH-4AS (Reference 2) identified in the accepted methodology described in CENPD-190-A (Reference 3). Fuel performance calculations will continue to use the STRIKIN-II code (Reference 4). This approach is consistent with that already approved by the NRC for use by Arizona Public Services (APS) at their Palo Verde Nuclear Generating Station, Units 1, 2 and 3 (Reference 5).

A benchmarking study was performed comparing the results of CENTS, STRIKIN-II and CEFLASH-4AS which shows good agreement between the proposed methodology and the previously accepted methodology. This study was based on comparison runs using input data generated during a recent analysis of a CE NSSS design. Important parameters for this study are:

Initial Core Power	100.5% of rated core power
Worth of Ejected CEA	0.2% $\Delta\rho$
Fuel Gap Conductance	Maximum
Beta Fraction	Minimum
Moderator Temperature Coefficient	$-0.2 \times 10^{-4} \Delta\rho/^\circ\text{F}$
Core inlet temperature	554 $^\circ\text{F}$
Initial Pressurizer Pressure	2336 psia

Westinghouse Non-Proprietary Class 3

Three cases were run based on these inputs. The first case used STRIKIN-II to calculate core average power and heat flux. The second case used CENTS to calculate core average power and heat flux and the resulting NSSS thermal hydraulic response. The third case used CEFLASH-4AS to calculate NSSS thermal hydraulic response based on the heat flux previously calculated by STRIKIN-II. Results of this comparison are shown in Figures 1-3.

Figure 1 shows that the power calculated by CENTS was almost identical to the power calculated by STRIKIN-II. The only difference is that the power calculated by STRIKIN-II decreased slightly more rapidly after the time of reactor trip. This occurs because of different treatment of the spatial weighting of Doppler and moderator feedbacks.

Figure 2 shows that the core average heat flux calculated by CENTS is almost identical to the heat flux calculated by STRIKIN-II. The STRIKIN-II calculated heat flux increased slightly more rapidly at the beginning of the event and decreased more rapidly after the time of reactor trip. This occurs in response to the differences in the calculated core average power and differences in the modeling of the heat transfer from the fuel to the coolant. Figure 2 also shows the core average heat flux used in the CEFLASH-4AS calculation. The curve differs slightly from the STRIKIN-II curve because CEFLASH-4AS accepts a table of power vs. time rather heat flux vs. time. For this study, it was necessary to iterate to match the CEFLASH-4AS heat flux curve to that calculated by STRIKIN-II.

Figure 3 compares the reactor coolant system (RCS) pressure calculated by CEFLASH-4AS using the heat flux calculated by STRIKIN-II with the RCS pressure calculated by CENTS using the heat flux calculated by CENTS. The peak RCS pressure calculated by CENTS is seen to be slightly higher than the pressure calculated by CEFLASH-4AS. Also, the two curves show a somewhat different pressure versus time behavior. This difference in pressure versus time behavior occurs because of differences in the models. Westinghouse believes that the CENTS results are more accurate than those of CEFLASH-4AS for the CEA Ejection Event. First, CENTS has been extensively benchmarked for pressure increasing events whereas CEFLASH-4AS has not. Secondly, the pressure response calculated by CENTS is more consistent with the time behavior of the core average heat flux shown in Figure 2.

This set of cases confirms that CENTS is conservative for the calculation of peak RCS pressure for the CEA Ejection Event relative to the use of CEFLASH-4AS.

References:

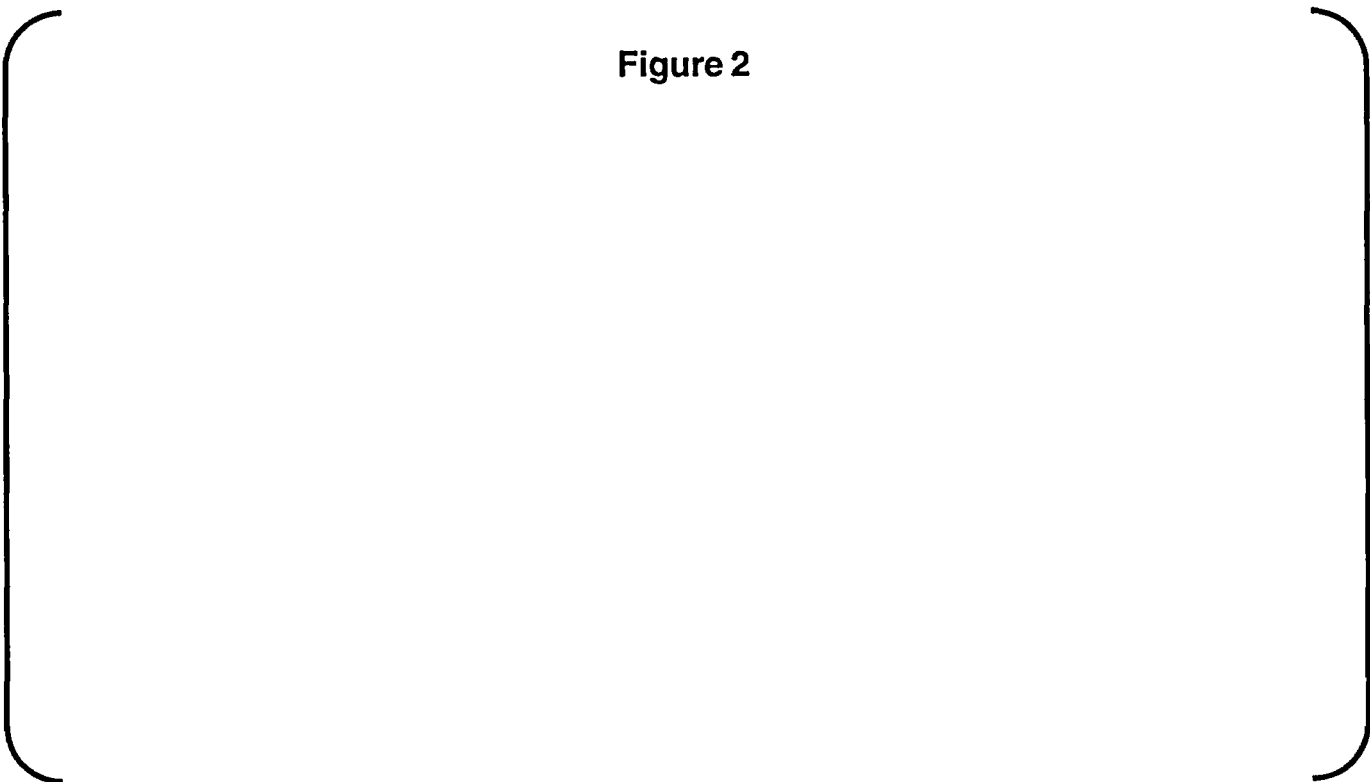
1. WCAP-15996-P, Volumes 1 to 3, "Technical Description Manual for the CENTS Code", December 2002
WCAP-15996-P, Volume 4, "Technical Description Manual for the CENTS Code", February, 2003
2. CENPD-133, "CEFLASH-4AS, A Computer Program for the Reactor Blowdown Analysis of the Small Break Loss of Coolant Accident", August 1974
3. CENPD-190-A, "C-E Method for Control Element Assembly Ejection Analysis", January, 1976
4. CENPD-135, "STRIKIN-II, A Cylindrical Geometry Fuel Rod Heat Transfer Program", August 1974
5. NRC Letter, L. R. Wharton (NRC) to G. R. Overbeck (APS), "Palo Verde Nuclear Generating Station, Units 1,2, and 3 -Issuance of Amendments Re: Various Administrative Controls (TAC Nos. MB1668, MB1669, and MB1670)", October 15, 2001

Figure 1
CEA Ejection – Power versus Time



a, c

Figure 2
CEA Ejection – Heat Flux versus Time



a, c

Figure 2

Figure 3
CEA Ejection – RCS Pressure versus Time



a. c

Enclosure 3

Westinghouse Electric Company LLC

Affidavit

Proprietary Response to Request for Additional Information

WCAP-15996-P

Technical Description Manual for the CENTS Code



Westinghouse Electric Company
Nuclear Services
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
Document Control Desk
11555 Rockville Pike
Rockville, Maryland 20852-2738

Direct tel: 412/374-5282
Direct fax: 412/374-4011
e-mail: greshamja@westinghouse.com
Project No.: 694

Our ref: CAW-04-1887

September 14, 2004

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

Subject: Response to Request for Additional Information Related to the Westinghouse CENTS Topical Report (WCAP-15996-P)

Reference: Letter from F. P. Schiffler, II (WOG) to USNRC Document Control Desk, "Response to Request for Additional Information Related to the Westinghouse CENTS Topical Report (WCAP-15996-P)," WOG-04-461, September 14, 2004

The application for withholding is submitted by Westinghouse Electric Company LLC (Westinghouse), a Delaware limited liability company, 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 CAW-04-1887 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 CAW-04-1887 and should be addressed to the undersigned.

Very truly yours,

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

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

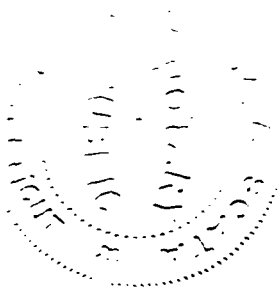
AFFIDAVIT


STATE OF CONNECTICUT:

ss: TOWN OF WINDSOR

COUNTY OF HARTFORD:

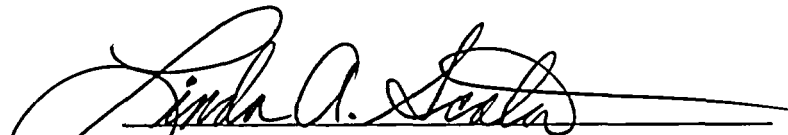
Before me, the undersigned authority, personally appeared Ian C. Rickard, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC, a Delaware limited liability company ("Westinghouse") and that the averments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





Ian C. Rickard
Licensing Project Manager

Sworn to and subscribed before me
this 14th day of September 2004.



Linda A. Scata
Notary Public

My commission expires: May 31, 2008

- (1) I am the Licensing Project Manager, Regulatory Compliance and Plant Licensing, in Nuclear Services, of the Westinghouse Electric Company LLC (Westinghouse), a Delaware limited liability company 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 rulemaking proceedings, and am authorized to apply for its withholding on behalf of the 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 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 2.390 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.
 - (iii) 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.
- (iv) 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.
- (v) 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.
- (vi) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in , Enclosure 1-P to WOG-04-1887, "Response to Request for Additional Information Related to the Westinghouse CENTS Topical Report (WCAP-15996-P)," September 14, 2004, for submittal to the Commission 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 other licensee submittals in response to certain NRC requirements for justification of the application of the CENTS computer code.

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

- (a) Perform non-LOCA accident transient analyses using a more accurate representation of the nuclear steam supply system response using the upgraded CENTS computer code.
- (b) Support licensees in evaluating non-LOCA accident transient analyses.

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 provide reload analyses to customers, which are fully compliant with NRC requirements, without the need for unnecessarily restrictive limits.
- (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 2.390 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).

Copyright Notice

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