



PROPRIETARY

**Nuclear Innovation**  
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4000 Avenue F, Suite A  
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August 21, 2012  
U7-C-NINA-NRC-120056  
10 CFR 2.390

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738

South Texas Project  
Units 3 and 4  
Docket No. PROJ0772

Supplemental Response to Request for Additional Information

Reference: Letter from Tekia Govan to Mark McBurnett, "Request for Additional Information Re: South Texas Project Nuclear Operating Company Topical Report (TR) WCAP-17116-P Revision 0, Supplement 5 – Application to the Advanced Boiling Water Reactor" (TAC No. RG0007), June 7, 2010

Attached is a supplemental response to the following NRC staff question included in the reference:

RAI 13

This supplemental response provides clarification on how the reactivity coefficients in WCAP-17116-P, Table B-1 are interpreted for use with GOBLIN for the ABWR LOCA analyses.

The response to this RAI question contains information proprietary to Westinghouse Electric Corporation. Since this letter contains information proprietary to Westinghouse Electric Company LLC, it is supported by 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 to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.390 of the Commission's regulations.

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Attachment 1 contains the supplemental response to the RAI question. Attachment 2 contains the non-proprietary version of the proprietary response. Attachment 3 contains the request for withholding of proprietary information, the affidavit, the proprietary information notice, and the copyright notice.

Correspondence with respect to the copyright or proprietary aspects of this information or the supporting Westinghouse Affidavit should reference CAW-12-3518 and should be addressed to: J. A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, Suite 428, 1000 Westinghouse Drive, Cranberry Township, Pennsylvania, 16066.

If this letter becomes separated from the proprietary material it is no longer proprietary.

There are no commitments in this letter.

If you have any questions, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 8/21/12



Scott Head  
Manager, Regulatory Affairs  
Nuclear Innovation North America LLC

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Attachments:

1. RAI 13 Supplement 1 (Proprietary)
2. RAI 13 Supplement 1 (Non-proprietary)
3. Request for Withholding Proprietary Information

cc: w/o attachment except\*  
(paper copy)

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**WCAP-17116-P RAI-13 Supplement 1****QUESTION**

As shown in Figure 4.3, the upper plenum appears to be modeled as a single node. As a result of this, the mass inflow to this node from the HPCF would be automatically distributed uniformly throughout its volume. The HPCF mass flow would also immediately reach thermally equilibrium condition. This uniformity does not seem realistic. The temperature and density could have large non-uniformity in this region. Furthermore, if there is a mixture level in the upper plenum, the modeling of where and how the HPCF flow is injected is important. If injected into the steam volume, immediate condensation results. If injected into the two phase mixture region, a one dimensional model will condense steam voids first and then decrease the enthalpy of the fluid. Condensation can result in local pressure depressions which will increase flow into the affected volume. Condensation effects in the upper plenum can increase flow through the core, artificially increasing the mixture level or decreasing the steam void volume in the core.

Section 11.3 of Appendix K to 10 CFR 50 requires that "appropriate sensitivity studies shall be performed for each evaluation model, to evaluate the effect on the calculated results of variations in noding, phenomena assumed in the calculation to predominate, including pump operation or locking, and values of parameters over their applicable ranges. For items to which results are shown to be sensitive, the choices made shall be justified."

- a) Justify the use of a single control volume for the entire upper plenum and explain how the use of such nodalization leads to conservative results. It appears that the upper plenum should be refined with enough nodes to enable an accurate determination of fluid condition as delivered to the hottest fuel channel for subsequent cooling analysis.
- b) At various pressures, how far does the ECCS flow penetrate from the nozzle to the center of the core?
- c) Section 3.3.5 "Injection Flow - Fluid Interaction" of WCAP-11284-P-A, "Westinghouse Boiling Water Reactor Emergency Core Cooling System Evaluation Model: Code Description and Qualification" describes how external water can be added as core spray, feedwater and flooding injection water. Describe how the ECCS flow from the HPCF is assumed to mix with fluid in the upper plenum for the ABWR application.
- d) Provide values used for the following model parameters (see Eq. 3.3-56 in WCAP-11284-PA):  
  
F<sub>s</sub> = maximum condensation  
parameter z<sub>c,d</sub> = falling distance  
  
Provide justification for the selected values.
- e) If the HPCF flow is available from only one sparger, discuss the asymmetric effects on core cooling and how this is conservatively accounted for in the ABWR analysis.

**RESPONSE SUPPLEMENT 1**

STPNOC provided a response to RAI-13 on October 14, 2010 in letter U7-C-STP-NRC-100227 regarding Topical Report WCAP-17116-P Revision 0, Supplement 5. In its review of the Westinghouse Licensing Topical Reports (LTRs), the NRC identified a discrepancy in the description for the reactivity coefficients between the LTR supporting the use of GOBLIN for ECCS evaluation (WCAP-11284-P-A) and the LTR supplement specific to the ECCS evaluation for the ABWR (WCAP-17116-P). The discussion in WCAP-11284-P-A indicates that GOBLIN uses a point kinetics model that incorporates reactivity feedback through coefficients that describe the effect of Doppler broadening (fuel temperature changes), moderator temperature changes, and void fraction. However, Table B-1 in WCAP-17116-P, on page B-9, shows a list of reactivity coefficients for fuel temperature and moderator density (not moderator temperature or void fraction). Furthermore, the moderator density reactivity coefficients appear to have units equivalent to moderator temperature reactivity coefficients.

This supplemental response provides clarification on how the reactivity coefficients in WCAP-17116-P, Table B-1 are interpreted for use with GOBLIN for the ABWR LOCA analyses.

GOBLIN has inputs for either void or moderator density reactivity coefficients. When void reactivity coefficients are used, there is an additional model that is activated to account for moderator temperature changes. However, the GOBLIN user manual [

] <sup>a,c</sup>. Moderator density coefficients shown in Table B-1 of WCAP-17116-P are used in the following equation for the change in reactivity ( $\rho$ ) due to changes in moderator density ( $\rho$ ):

$$\left[ \right]^{a,c}$$

As noted above, the units for the moderator density reactivity coefficients  $C_1$ ,  $C_2$ , and  $C_3$ , shown in Table B-1 of the current revision of WCAP-17116-P, are incorrect. It was also found that Table B-1 shows an error message instead of the correlations used by GOBLIN to account for reactivity changes due to moderator density changes and fuel temperature changes. A markup of Table B-1 that corrects these errors is attached to this response with changes highlighted in gray shading. These changes will be reflected in Revision 1 to WCAP-17116-P to be issued with the approved version of the report.

Table B-1 (cont.) ABWR LOCA Analysis Model Input Parameters		
Parameter		Toshiba/W Values
<b>Reactivity Inputs</b>		
Moderator density reactivity coefficients*		
Linear coefficient <del>(C1)</del> (C <sub>1</sub> )	[ ] <sup>a,c</sup>	1/°C m <sup>3</sup> /kg
Quadratic coefficient <del>(C2)</del> (C <sub>2</sub> )	[ ]	1/°C <sup>2</sup> m <sup>6</sup> /kg <sup>2</sup>
Cubic coefficient <del>(C3)</del> (C <sub>3</sub> )	[ ]	1/°C <sup>3</sup> m <sup>9</sup> /kg <sup>3</sup>
<del>Error! Objects cannot be created from editing field codes.</del>	[ ] <sup>a,c</sup>	
Fuel temperature reactivity coefficients		
Square root coefficient (B <sub>3</sub> )	[ ] <sup>a,c</sup>	1/°C <sup>1/2</sup>
<del>Error! Objects cannot be created from editing field codes.</del>	[ ] <sup>a,c</sup>	

CAW-12-3518

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF BUTLER:

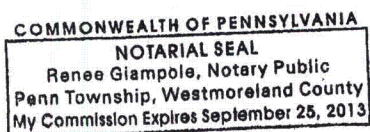
Before me, the undersigned authority, personally appeared B. F. Maurer, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit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



\_\_\_\_\_  
B. F. Maurer, Manager  
ABWR Licensing

Sworn to and subscribed before me  
this 20th day of August 2012

  
\_\_\_\_\_  
Notary Public



- (1) I am Manager, ABWR 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 Proprietary Information from Public Disclosure 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 in WEC-NINA-2012-0038 P-Enclosure, "South Texas Project Units 3 & 4 Response Supplement 1 to RAI 13 for WCAP-17116-P" (Proprietary) for submittal to the Commission, being transmitted by Nuclear Innovation North America (NINA) letter 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 the review of the ECCS analysis methodology in support of Westinghouse ABWR fuel products.

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

- (a) Assist the customer in obtaining NRC review of the Westinghouse ECCS analysis methodology as applied to ABWR plant 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 plant specific ECCS analysis methodology development for ABWR licensing basis applications.
- (b) Its use by a competitor would improve their competitive position in the design and licensing of a similar product for ABWR ECCS analysis methodology.
- (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 evaluations 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.