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December 16, 2014 U7-C-NINA-NRC-140038

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 Response to Request for Additional Information

Reference:

Letter from Tom Tai to Scott Head, Request for Additional Information re: South Texas Project Nuclear Operating Company Topical Report WCAP-17137-P, "Westinghouse Stability Methodology for the ABWR", February 27, 2014 (ML14034A268)

Attached are responses to three of the RAI questions in the referenced letter. Responses to the following RAI questions are provided:

RAI 4.04-12 RAI 4.04-14 RAI 4.04-15

The responses to these RAI questions contain 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.

Attachments 1 through 3 contain the proprietary responses to the RAI questions. Attachments 4 through 6 contain the non-proprietary version of the responses. Attachment 7 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-14-4066 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. If you have any questions, please contact me at (979) 316-3011, or Bill Mookhoek at (979) 316-3014.

There are no commitments in this letter.

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

Executed on 12/16/14

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Scott Head Manager, Regulatory Affairs Nuclear Innovation North America LLC

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Attachments:

- 1. RAI 4.04-12 (Proprietary)
- 2. RAI 4.04-14 (Proprietary)
- 3. RAI 4.04-15 (Proprietary)
- 4. RAI 4.04-12 (Non-Proprietary)
- 5. RAI 4.04-14 (Non-Proprietary)
- 6. RAI 4.04-15 (Non-Proprietary)
- 7. Request for Withholding Proprietary Information

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

Director, Office of New Reactors U. S. Nuclear Regulatory Commission One White Flint North 11555 Rockville Pike Rockville, MD 20852-2738

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RAI 4.04-12. Cycle Specific DIVOM

QUESTION:

Section 6.2.3 "Methodology" of WCAP-17137P seems to specify the calculation of cycle-specific DIVOM slopes that involves [[

[[

]]. However, Step 2 of Section 6.2.3 appears to indicate that the transient initiation is an]].

12.a Define what is the DIVOM transient used. [[

]].

- 12.b How are initial conditions set? Section 6.2.1 "Background" states that the conditions are [[]]. Describe the procedure and implications in more detail. Does the choice of initial condition affect significantly the DIVOM slope of the HCOM factor?
- 12.c If the [[]] induces growing unstable power oscillations, the DR is >1. How is the steady state solution converged if the steady state conditions are unstable? Does the steady state solver use a numerical method with artificial damping? If the initial transient is a pump trip, how is a steady state reached for the rod perturbations?
- 12.d What is the procedure if the [[oscillation? (i.e., DR_{cw}>1, while DR_{OOP}<1)

]] results in a growing core-wide

12.e What is the procedure if the prescribed transient does not result in any oscillation? Will the Generic BWROG slope be used?

RESPONSE:

12a.

As described in Reference 1, Section 6.2.3, the DIVOM curve is determined at the least stable state point achievable, which is the condition following the inadvertent trip of 3 RIPs while operating at steady state on the maximum rod line with 9 RIPs operating at minimum speed. It is correct that [

]^{2,0}

As an example, at BOC for the equilibrium core evaluated in Reference 1, the pump trip starts from the following core conditions;

The end state point, for which the oscillating transient is analyzed, after the trip of 3 RIPs:



12b.

Since the ABWR is quite stable, [

]^{2c}. Therefore, the initial OLMCPR [

J^{Le} anticipated operational occurrence (AOO). The slope of the DIVOM curve is dependent on the core and fuel design in such a way that a less stable core with relatively high power peaking results in a larger amplitude flow response for the same power disturbance. The larger amplitude flow response results in a larger CPR oscillation and therefore a steeper DIVOM slope than a more stable core with a less heterogeneous power distribution.

12c.

The approach described in Section 6.2.3 of Reference 1 to use [$]^{a,c}$ is the general procedure to determine the DIVOM curve. However, the ABWR design is more stable than current reactor designs [$]^{a,c}$. Using the general approach [

]^{a,c}. Instead, the DIVOM curve was determined by [

]^{a,c}

The steady state solution is based on an eigenvalue solution with time derivatives set to zero, which means a convergent solution can be reached even in cases where the stationary state point is dynamically unstable. In other words, the steady state solver does not use a numerical method with artificial damping since it does not solve time dependent equations.

12d.

Regional oscillations are forced by boundary conditions, which means that global oscillations do not develop in the regional cases. That is, the pressure drop over the core is kept constant and the bypass flow is kept constant. The boundary conditions are established from a global steady state calculation. In the regional mode, the channel inlet flow oscillates out of phase in one core half to the other core half. This mode is thereby forced by boundary conditions.

12e.

For the ABWR, the pump trip transient [

]^{2,c}

References for RAI 4.04-12

1. WCAP-17137-P (Proprietary), "Westinghouse Stability Methodology for the ABWR," Revision 0, October 2010.

RAI 4.04-14. Channel Losses

QUESTION:

Provide the assumed channel inlet, spacer and outlet loss coefficients, including any core pressure losses due to the core support plate, inlet nozzle, outlet nozzle and other local losses for the stability calculations performed using POLCA-T as reported in Table 7-1 of WCAP-17137-P. If different from loss coefficients derived from FRIGG pressure drop measurements, provide a thorough listing of the differences.

RESPONSE:

The following are the loss coefficients used in the analysis, which comply with the coefficients derived from FRIGG measurements).

Inlet (includes lower tie plate and debris filter) loss coefficient:



a,c

where

RCUTP - Pressure resistance base coefficient of upper tie plate. The upper tie plate pressure loss is computed with ARUTP as reference area ARUTP - Upper Tie Plate "Reference" area

Spacer loss coefficients:

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Reference area: [ ]<sup>a,c</sup>
Spacer #1-3;
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Friction loss coefficient:

[

Leakage from main channel to interassembly bypass channel before the lower tie plate:



J^{a,c}

RAI 4.04-15. Analysis Conditions

QUESTION:

Provide detailed information about the initial conditions for the POLCA-T stability calculations performed using POLCA-T as reported in Table 7-1 of WCAP-17137-P. Specifically provide the radial power peaking factors, active core flow rate, core outlet pressure, representative gap conductance, and core inlet enthalpy.

RESPONSE:

Table 7-1 in Reference 1 provides [

Reference 1). The initial conditions for [

]^{ac}, based on the results in Table 5.2-5 (in]^{ac} are given in the table below.

The nominal core flow is [[

]^{a,c}, and the nominal reactor power is []^{a,c}. POLCA-T has a]^{a,c}, and the gap conductance in the table below is given as []^{a,c}.

ן a,c

References for RAI 4.04-15

1. WCAP-17137-P (Proprietary), "Westinghouse Stability Methodology for the ABWR," Revision 0, October 2010.

CAW-14-4066 December 10, 2014

<u>AFFIDAVIT</u>

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF BUTLER:

l, James A. Gresham, am 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 my knowledge, information, and belief.

James A. Gresham, Manager Regulatory Compliance

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- (1) I am Manager, Regulatory Compliance, 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.
 - 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 constitute Westinghouse policy and provide 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

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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 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.

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- (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.
- 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 WEC-NINA-2014-0010 P-Enclosure: "Responses to RAIs 4.04-12, -14, and -15 for WCAP-17137-P, Revision 0, 'Westinghouse Stability Methodology for the ABWR'" (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 NRC's review of the Westinghouse ABWR stability methodology in support of Westinghouse ABWR fuel products and may be used only for that purpose.

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

(i) Assist the customer in obtaining NRC review of the Westinghouse stability methodology as applied to ABWR plant designs.

(b) Further this information has substantial commercial value as follows:

(i) Westinghouse plans to sell the use of this information to its customers for purposes of plant specific ABWR stability analyses and implementation for licensing basis applications.

(ii) Its use by a competitor would improve their competitive position in the design and licensing of a similar product for ABWR stability analysis methodology.

(iii) 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 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 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).

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