

PROPRIETARY



Nuclear Innovation  
North America LLC  
122 West Way, Suite 405  
Lake Jackson, Texas 77566

April 3, 2014  
U7-C-NINA-NRC-140008  
10CFR 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  
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 six of the RAI questions in the referenced letter. Responses to the following RAI questions are provided in this letter:

RAI 4.04-5  
RAI 4.04-7  
RAI 4.04-8  
RAI 4.04-9  
RAI 4.04-10  
RAI 4.04-11

The responses to two of 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.

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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 and 2 contain the proprietary responses to the first two RAI questions. Attachments 3 through 6 contain the remainder of the responses. Attachments 7 and 8 contain the non-proprietary version of the proprietary responses. Attachment 9 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-14-3931 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 4/3/14



Scott Head  
Manager, Regulatory Affairs  
Nuclear Innovation North America LLC

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Attachments:

1. RAI 4.04-5 (Proprietary)
2. RAI 4.04-7 (Proprietary)
3. RAI 4.04-8
4. RAI 4.04-9
5. RAI 4.04-10
6. RAI 4.04-11
7. RAI 4.04-5 (Non-Proprietary)
8. RAI 4.04-7 (Non-Proprietary)
9. Request for Withholding Proprietary Information

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

(electronic copy)

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

\*Tom Tai  
Fred Brown  
U. S. Nuclear Regulatory Commission

Regional Administrator, Region IV  
U. S. Nuclear Regulatory Commission  
1600 E. Lamar Blvd.  
Arlington, TX 76011-4511

Jamey Seely  
Nuclear Innovation North America

Peter G. Nemeth  
Crain, Caton & James, P.C.

Kathy C. Perkins, RN, MBA  
Assistant Commissioner  
Division for Regulatory Services  
Texas Department of State Health Services  
P. O. Box 149347  
Austin, Texas 78714-9347

Richard Peña  
Kevin Pollo  
L. D. Blaylock  
CPS Energy

Robert Free  
Radiation Inspections Branch Manager  
Texas Department of State Health Services  
P. O. Box 149347  
Austin, Texas 78714-9347

\*Steven P. Frantz, Esquire  
A. H. Gutterman, Esquire  
Morgan, Lewis & Bockius LLP  
1111 Pennsylvania Ave. NW  
Washington D.C. 20004

\*Tom Tai  
Two White Flint North  
11545 Rockville Pike  
Rockville, MD 20852

**RAI 4.04-8. Tech Spec Implementation****QUESTION:**

Provide a synopsis of the ABWR Technical Specification sections related to stability. Provide operability requirements and operator actions required to transition to BSP. Are the BSP regions enforced only when the primary OPRM solution is operable? Or are they enforced at all times? Is there a relation between the BSP regions and the SCRRI region?

**RESPONSE:**

Technical Specification (TS) Table 3.3.1.1-1 (2f) requires all four channels of the Oscillation Power Range Monitor (OPRM) to be trip-enabled when reactor power is  $\geq 30\%$  of rated thermal power (RTP) and core flow rate is  $\leq 60\%$  of rated core flow. Should the OPRM become inoperable, actions are initiated immediately to place the reactor power/flow relationship outside of the trip-enabled region (e.g., core flow rate  $> 60\%$ ). The power supplies to the 10 reactor internal pumps (RIPs) are such that a single failure can disable only 3 RIPs. If the reactor were being operated just outside the OPRM trip enabled region (e.g., 61% core flow), a failure of 3 RIPs would result in a decrease in core flow and power such that the plant would enter the region where the OPRM should be trip-enabled. Although these conditions are outside the region of instability (see Figure 7-2 in WCAP-17137), the operators are required to comply with the TS action statement by immediately increasing the speed of the remaining RIPs to move to conditions outside of the trip-enabled region. However, TS 3.4.1 would also apply, which requires at least 9 RIPs to be in operation during modes 1 and 2. With less than 9 RIPs in operation, the operators are required to be in mode 3 within 12 hours. Therefore, it is very unlikely that the plant would experience thermal-hydraulic instability.

The ABWR also has the Selected Control Rods Run-In (SCRRI) system as a defense-in-depth stability protection system. SCRRI actuates automatically to suppress core power by inserting pre-selected control rods whenever core power is  $\geq 30\%$  of rated thermal power and core flow rate is  $\leq 36\%$  of rated core flow. SCRRI is independent of the Backup Stability Protection (BSP) regions. The BSP regions, which are confirmed each cycle, are based on decay ratio calculations and are enforced administratively at all times.

**RAI 4.04-9. Time History Display****QUESTION:**

Fig 4-3 of WCAP-17137P shows a "Regional Core-Wide Time History Display" block, but the text does not seem to mention it. Provide a description of this function.

**RESPONSE:**

The purpose of Figure 4-3 is to show the protection logic for Selected Control Rods Run-In (SCRRI) and the rod block. The figure was copied from another document, which also shows regional local power range monitor (LPRM) and average power range monitor (APRM) neutron flux time history inputs to displays that are available to control room operators to detect oscillations visually. That part of the figure was not discussed in WCAP-17137-P as it wasn't pertinent to the purpose of the figure, which was to support the discussion regarding protection logic.

**RAI 4.04-10. NMP2 Event Lessons Learned****QUESTION:**

The Nine Mile Point 2 stability event (10 CFR Part 21 report 2003-025) showed that, under some conditions, the OPRM hardware can exhibit confirmation resets that may fail or delay the scram. Please, describe how the lessons learned from the NMP2 event have been incorporated in the ABWR design.

**RESPONSE:**

The Nine Mile Point 2 (NMP2) event is discussed in WCAP-17137 in footnotes on pages 5-1 and 5-7. The event shows that the successive confirmation count could reset if the cutoff frequency is too high and/or the period tolerance is too small. The purpose of the cutoff frequency is to filter out the high frequency fluctuations that are not characteristic of thermal-hydraulic instabilities. If it is too high, the resulting signal may be too noisy and there could be confirmation count resets. The purpose of the period tolerance is to allow for some variation in the oscillation period without resetting the confirmation count. If the period tolerance is too small, small variations in period also can cause confirmation count resets. The cutoff frequency and period tolerance at NMP2 that resulted in the event are 3 Hz and 0.05 second respectively. The lessons learned from this event are to reduce the cutoff frequency to 1 Hz and to increase the period tolerance to be  $\geq 0.1$  second. As discussed in WCAP-17137, the recommended values are used in the ABWR.

**RAI 4.04-11. ABA/GRA****QUESTION:**

Section 5.1 of WCAP-17137P describes the ABA and GRA. Will ABWR use the BWROG generic setpoints for these functions? Provide the ABWR setpoints for these defense-in-depth algorithms.

**RESPONSE:**

The Amplitude Based Algorithm (ABA) examines the relative OPRM cell signal (S) for maximum amplitude. It has three setpoints ( $S_1$ ,  $S_2$  and  $S_{\max}$ ). The value of S is compared at each hardware time step to a threshold setpoint  $S_1$  ( $> 1$ ). If S is  $> S_1$ , the algorithm checks to determine if S decreases below a second setpoint  $S_2$  ( $< 1$ ) within a time period typical of an instability oscillation. If S goes below  $S_2$  in the expected time window ( $T_1$ ), the algorithm looks for the next peak in S. If S exceeds the trip setpoint  $S_{\max}$  in the expected time window ( $T_2$ ), a trip is generated for that OPRM cell.

The Growth Rate Algorithm (GRA) examines the OPRM signals for rapidly growing oscillations. The algorithm follows the same logic as the ABA. After exceeding  $S_1$  and decreasing below  $S_2$  in the expected time window, a trip is generated if a setpoint  $S_3$  is exceeded in the expected time window.  $S_3$  is a setpoint determined from the peak of the previous cycle ( $P_1$ ) and the maximum allowable growth rate ( $GR_3$ ):

$$S_3 = GR_3 \times (P_1 - 1) + 1$$

The BWROG generic setpoints shown in the following table will be used in the ABWR for the ABA and GRA, respectively [NEDO-32465-A].

Setpoint	Value
$S_1$	1.1
$S_2$	0.92
$S_{\max}$	1.3
$GR_3$	1.3
$T_1$	0.3 to 2.5 s
$T_2$	0.3 to 2.5 s

**RAI 4.04-5. BSP Scram Region Uncertainty****QUESTION:**

Section 6.3 "BSP Methodology" provides an acceptance criterion for the BSP Scram Region of "*1.0 minus the uncertainty factor specified in approval documents for the method being applied.*" Provide the values and basis for the approved uncertainty factors for each methodology. Is this uncertainty a one-sigma, 95/95, or other?

**RESPONSE:**

WCAP-17137-P is written so that either of Westinghouse's approved stability methods (RAMONA-3 or POLCA-T) can be used. The uncertainty factors applied are those that have been approved by NRC. As described by footnote 5 on page 6-5, the approved decay ratio uncertainty factor for the RAMONA-3B code is [ ]<sup>a,c</sup>; the approved uncertainty factor for the POLCA-T code is [ ]<sup>a,c</sup>. The uncertainty factor for the RAMONA code was established by the NRC Review. The uncertainty factor for the POLCA-T code is based on [ ]<sup>a,c</sup>.



**RAI 4.04-7. Nodalization**

**QUESTION:**

WCAP-17137P does not seem to provide the axial and/or radial nodalization used for the DIVOM calculations. Provide the axial and radial nodalization scheme used for each method. Is the scheme consistent with the code validation basis against experimental data?

**RESPONSE:**

The DIVOM calculations presented in WCAP-17137 are performed using the POLCA-T code. Nodalization requirements for POLCA-T are described in WCAP-16747-P-A. These requirements are followed in the DIVOM calculations. [ ]<sup>a,c</sup> axial nodes are used in the active core region and, since regional mode oscillations are simulated, [ ]<sup>a,c</sup> are modeled. The nodalization scheme used in POLCA-T is consistent with the nodalization used in the validation.

CAW-14-3931

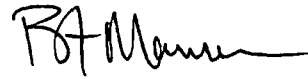
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COMMONWEALTH OF PENNSYLVANIA:

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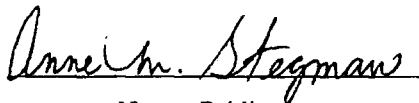
Before me, the undersigned authority, personally appeared Bradley F. Maurer, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit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



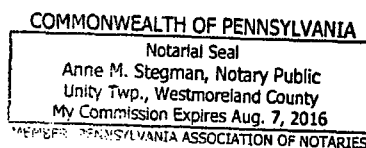
Bradley F. Maurer, Principal Engineer  
Plant Licensing

Sworn to and subscribed before me

This 27<sup>th</sup> day of March 2014



Notary Public



- (1) I am Principal Engineer, Plant Licensing, in Engineering, Equipment and Major Projects, 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.
- (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.
  - (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 WEC-NINA-2014-0003 P-Enclosure: "Responses to RAIs 4.04-5, -7, -8, -9, -10, and -11 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.
    - (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.
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- (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.

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### **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).

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