PROPRIETARY

Nuclear Innovation
North America LLC
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November 27, 2012
U7-C-NINA-NRC-120070
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
Response to Request for Additional Information

Reference: Letter from Michael Eudy to Mark McBurnett, "Request for Additional Information re: South Texas Project Nuclear Operating Company Topical Report WCAP-17202-P, Supplement 4 to BISON Topical Report 90-90-A" (TAC NO. ME4504), June 22, 2012 (ML121710447)

Attached are the responses to the following NRC staff questions included the reference:

NRR RAI-01	NRR RAI-08
NRR RAI-03	NRR RAI-09
NRR RAI-04	NRR RAI-10
NRR RAI-05	NRR RAI-11
NRR RAI-06	NRR RAI-12

The responses to some 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.

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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NRO

STI 33622928

Attachments 1 through 10 contain the responses to the RAI questions. Attachments 11 through 17 contain the non-proprietary versions of the proprietary responses. Attachment 18 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-12-3566 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 Scott Head at (979) 316-3011, or Bill Mookhoek at (979) 316-3014.

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

Executed on 11/27/12

Mark McBurnett
Chief Executive Officer and Chief Nuclear Officer
Nuclear Innovation North America LLC

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Attachments:

1. NRR RAI-01 (Proprietary)
2. NRR RAI-03
3. NRR RAI-04 (Proprietary)
4. NRR RAI-05 (Proprietary)
5. NRR RAI-06
6. NRR RAI-08 (Proprietary)
7. NRR RAI-09 (Proprietary)
8. NRR RAI-10 (Proprietary)
9. NRR RAI-11
10. NRR RAI-12 (Proprietary)
11. NRR RAI-01 (Non-Proprietary)
12. NRR RAI-04 (Non-Proprietary)
13. NRR RAI-05 (Non-Proprietary)
14. NRR RAI-08 (Non-Proprietary)
15. NRR RAI-09 (Non-Proprietary)
16. NRR RAI-10 (Non-Proprietary)
17. NRR RAI-12 (Non-Proprietary)
18. Request for Withholding Proprietary Information

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

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Richard Peña
Kevin Pollo
L. D. Blaylock
CPS Energy

NRR RAI-03

Please describe how the channel powers in Equation 3-38 are calculated.

Response to NRR RAI-03

Channel powers in Equation 3-38 correspond to the steady-state power calculated by a 3-D core simulator (for example POLCA7) for each fuel assembly at a given operating state-point. The process POLCA7 uses to calculate channel power is described in topical report CENPD-390-P-A.

NRR RAI-06

Please provide a qualitative and quantitative description of how the moment of inertia for the pump, *Ipump* in Equation 3-39, is calculated. Is the scalar moment of inertia used? If so, is the pump approximated as a single point mass or multiple point masses?

Response to NRR RAI-06

The moment of inertia *Ipump* is the scalar moment of inertia and is provided by the pump manufacturer. According to a manufacturer the moment of inertia is calculated by means of a 3D computer analysis based on the 3D-Model of the rotor which has been designed with their graphic design program.

NRR RAI-11

Please provide a short description of the nature of the experiments used to validate the cladding temperature model in Section 3.6.3 and what is meant by peak cladding temperature (PCT) increases. What is this increase in relation to?

Response to NRR RAI-11

The experiments used to validate the post dryout model are the FRIGG loop experiments that are used to verify new Westinghouse fuel designs. In particular the SVEA-96 Optima2 tests and the SVEA-96 Optima3 transient tests have been used in the validation. The FRIGG loop experiments are described in WCAP-16081-P-A "10x10 SVEA Fuel Critical Power Experiments and CPR Correlation: SVEA-96 Optima2".

The peak cladding temperature increase is defined as the difference between the steady state cladding temperature and the peak transient cladding temperature. The FRIGG experiments are initiated from a steady state condition where the process parameters are steady (flow, power, cladding temperature etc). From this point, the transient is initiated and the increase in cladding temperature is measured for each thermocouple. The largest temperature increase for the thermocouples is noted as the peak cladding temperature (PCT) increase.

NRR RAI-01

Section 3.2.2 states the BISON "Multiple Fuel Types" (or Method B) methodology generates cross section polynomials for all fuel elements in a 3D core using a 3D nodal code. Section A.3 of the original BISON topical (Reference 1) describes how the methodology originally generated cross section polynomials for each fuel type (a fuel type being defined as the properties at a selected horizontal plane of a fuel assembly, characterized by geometry, uranium enrichment distribution and burnable absorber distribution). Please clarify the difference, if any, between the two terms "fuel element" and "fuel type". For example, are the terms synonymous, or are cross-section polynomials now calculated for all fuel bundles of a given fuel type?

Response to NRR RAI-01

In WCAP-17202, the term "fuel type" is used to distinguish between different types of fuel bundles in a mixed core. A reactor core usually consists of several different fuel bundle types, provided by different vendors, or even fuel bundles from the same vendor with different nuclear properties (such as enrichment, gadolinium content etc.). The term "different fuel types" is therefore designated to distinguish between different bundle types.

On the other hand, the term "fuel element" is defined on an intra-assembly level and is used to define the homogenous parts of a fuel assembly.

The term "fuel element" in WCAP-17202 is a synonym to "fuel type" in RPA 90-90-P-A, while the term "fuel type" in WCAP-17202 is a synonym to "fuel bundle type" in RPA 90-90-P-A.

Even though the terminology in these reports is not the same, the method of interpolation itself, described in WCAP-17202, is the same as the one described in the original BISON topical report (RPA 90-90-P-A), except for the modifications described in WCAP-17202.

To maintain the consistency between the original BISON topical and the current LTR, the term "fuel element" will be replaced by "fuel type" and the term fuel type" will be replaced by the term "fuel bundle type". Following occurrences will be replaced (changes are marked in *italics*):

Original formulation (Section 3.2.2 on page 3-14):

- For all fuel elements in a 3D core, the cross-section ...

Updated formulation (Section 3.2.2 on page 3-14):

- For all fuel *types* in a 3D core, the cross-section ...

Original formulation (Section 3.2.4 on page 3-23):

The improved method validation included two cases, a core with one fuel type and one core with mixed fuel types. The obtained axial power profiles ...

Updated formulation (Section 3.2.4 on page 3-23):

The improved method validation included two cases, a core with one fuel *bundle* type and one core with mixed fuel *bundle* types. The obtained axial power profiles ...

Original formulation (Section 3.6.2 on page 3-35):

The first part is fuel type dependent and utilizes the U.S. NRC approved CPR correlation for the fuel type in question to determine the time for dryout and start of the rewet process. The CPR correlation is approved during the licensing process for a new fuel type, and is not discussed any further in this topical.

Updated formulation (Section 3.6.2 on page 3-35):

The first part is fuel *bundle* type dependent and utilizes the U.S. NRC approved CPR correlation for the fuel *bundle* type in question to determine the time for dryout and start of the rewet process. The CPR correlation is approved during the licensing process for a new fuel *bundle* type, and is not discussed any further in this topical.

Original formulation (Section 3.6.3 on page 3-39):

The BISON cladding temperature model has been validated against [ ]^{a,c} data for two different fuel types; [ ]^{a,c}

Updated formulation (Section 3.6.3 on page 3-39):

The BISON cladding temperature model has been validated against [ ]^{a,c} data for two different fuel *bundle* types; [ ]^{a,c}

NRR RAI-04

For section 3.2.3.2 "Mixed Core", please supply a figure and accompanying analysis comparing POLCA7 results and the improved method of cross section collapsing for a mixed core representative of BWR/2-6 plants.

Response to RAI-04

Figure 1 shows the comparison of axial power profile obtained by POLCA7 and BISON for a representative [

]^{a,c} a,c

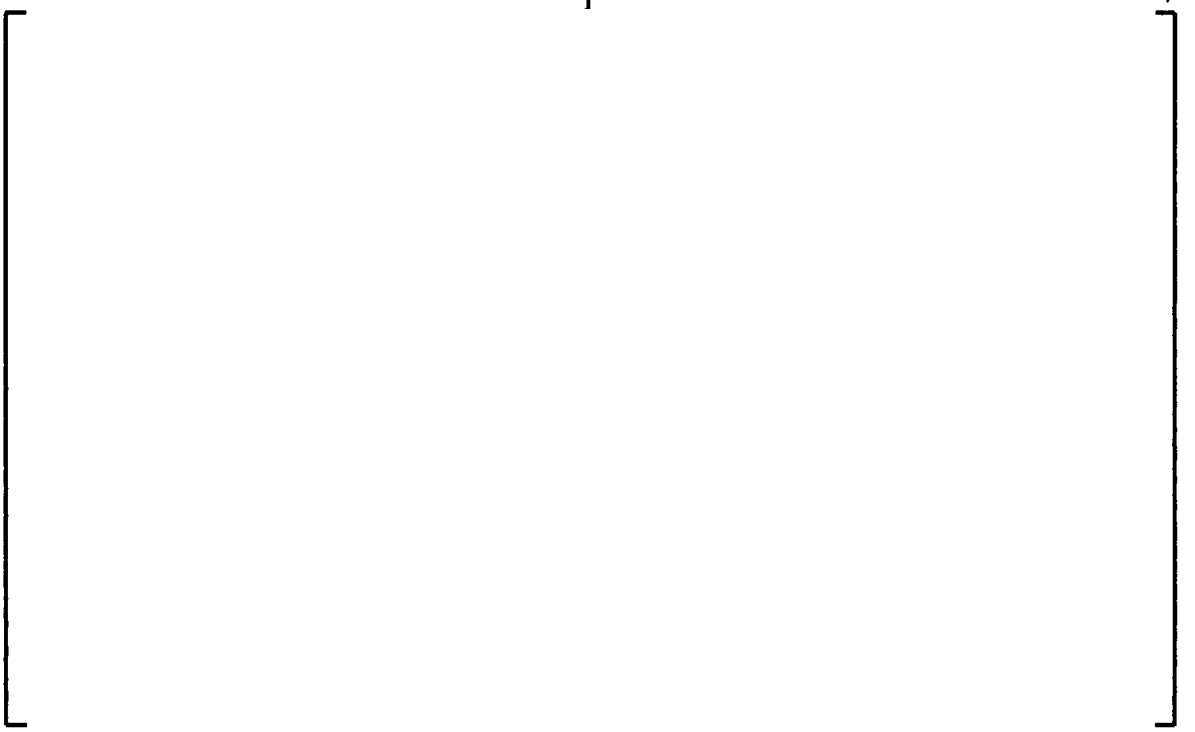

Figure 1 Comparison of axial power profile obtained by POLCA7 and BISON for cycle at a [ ]^{a,c}

A comparison of the reactivity change from a [ ]^{a,c} change in recirculation flow obtained by POLCA7 and BISON steady-state calculation is performed in the same way as for the ABWR mixed core in Section 3.2.3.2 in the LTR. The corresponding change in reactivity in POLCA7 is [ ]^{a,c} while the corresponding BISON change in reactivity is [ ]^{a,c}.

The level of agreement between BISON and 3D core simulator POLCA7 for the representative [ ]^{a,c} is similar to the one presented in Section 3.2.3.2 in the LTR for ABWR.

NRR RAI-05

For each of Figure 3-9, 3-11, and 3-13, please provide the percent difference between the peaks of the BISON Method B and Turbine Trip test results.

Response to NRR RAI-05

Table 1 shows the percentage differences between the peaks of the improved BISON Method B and Turbine Trip test results presented in Figures 3-9, 3-11 and 3-13 in the topical report.

a,c

[ ]

Table 1 – Percentage differences between peaks of the improved Method B and Turbine Trip test results.

The percent differences are calculated using

$$\Delta APRM = 100 * \frac{\max(APRM_{BISON}) - \max(APRM_{meas})}{\max(APRM_{meas})} \qquad \text{Equation 1}$$

Where $\max(APRM_{BISON})$ is the APRM peak value calculated by BISON and $\max(APRM_{meas})$ is the measured APRM peak value.

NRR RAI-08

In order to better evaluate the results of the Steam Dome Water Surface Condensation Model, please provide a figure similar to Figure 3-20 wherein the measured pressure model result with CONDR = 0 is plotted alongside the model results with CONDR = 1, 2, and 4 for the Main Steamline Isolation Valve Closure (MSIVC) transient from time t = 0s to t = 100s.

Response to NRR RAI-08

An updated Figure 3-20 with results for CONDR=0, i.e. with the surface condensation model is not used is provided below.

a,c

Figure 1 Pressure (Pa) as a Function of Time (seconds) for a Main Steamline Isolation Valve Closure Transient

NRR RAI-09

In section 3.5.1 "Purpose," it is stated that by studying the Hamaoka 5 start-up tests, it was observed the current approved BISON code (Reference 1) appears to overestimate the water level during the LRWBP and Main Steamline Isolation Valve Closure (MSIVC) transients. It also states that to obtain better agreement between analysis and measurements, a steam dome water surface condensation model is introduced. The implication is that the BISON predicted water level should more closely approximate the measured water level with the introduction of the condensation model. However, no results of the water level improvement, if any, are supplied. Please provide plots of the measured and BISON predicted water levels before and after introduction of the condensation model for the LRWBP and MSIVC transients.

Response to NRR RAI-09

a,c

[

]

Figure 1 [

]a,c

[ ]a,c This figure can be compared with the Figure 4 in Appendix A, which shows a comparison of BISON results and measurements data for LRWBP. As a comparison, [

]a,c

a,c

Figure 2 [

]^{a,c}

This figure can be compared with Figure 4 in Appendix A (simulated with [ ]^{a,c}), which shows that the use of the steam dome water condensation model improves the agreement with the experimental data.

NRR RAI-10

Section 3.6.2.2 states a node starts the [

]^{a,c} Please describe the conditions under which a node is considered to be fully rewetted.

Response to NRR RAI-10

When the [

]^{a,c}

NRR RAI-12

When observing the scatter plots of Figures 3-22 through 3-26, [

]^{a,c} Please explain the criteria used when determining in the conclusions that the calculated PCT is in good agreement with the experimental. Also, please provide a quantitative description of the bias.

Response to NRR RAI-12

The Westinghouse methodology for determining code capability is described in WCAP-17203-P "Fast Transient and ATWS Methodology". The model capability of phenomena is stated according to a three-level scale: High/Medium/Low. This is related to how the phenomenon is calculated or used in determining the figures-of-merit.

- High (H) - the average bias and deviation, when comparing the code model results with experimental data, is low and the code results follows the general trend of experimental data.
- Medium (M) - Either the low averaged bias is combined with high deviation, or the low deviation is combined with high average bias, when comparing the code results with experimental data.
- Low (L) - General trend in code results does not follow the experimental data and/or both the bias and deviation are high. Low ranking applies also when the phenomenon is not modeled by the code.

[

]^{a,c}

[

]^{a,c}

CAW-12-3566

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

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, Manager
ABWR Licensing

Sworn to and subscribed before me
this 7th day of November 2012

Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Anne M. Stegman, Notary Public
Unity Twp., Westmoreland County
My Commission Expires Aug. 7, 2016
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

(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 "Response to the NRR RAIs for WCAP-17202, 'Supplement 4 to BISON Topical Report RPA 90-90-P-A'" (Proprietary), dated November 7, 2012, 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 Westinghouse's request for NRC approval of WCAP-17202, "Supplement 4 to BISON Topical Report RPA 90-90-P-A," and may be used only for that purpose.

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

(a) Obtain NRC approval of WCAP-17202-P, "Supplement 4 to BISON Topical Report RPA 90-90-P-A."

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of this information to its customers for the purpose of obtaining changes to their licenses.

(b) 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.

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.