

PROPRIETARY



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

January 4, 2011

U7-C-STP-NRC-110002

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 Number PROJ0772
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), November 19, 2010

Attached are responses to NRC staff questions included in the reference. The following RAI
questions are addressed:

RAI-34	
RAI-35	RAI-42
RAI-37	RAI-43
RAI-40	RAI-46

The responses to RAI-34, 35, 40, 43, and 46 contain information proprietary to Westinghouse Electric Corporation. Since these responses contain information proprietary to Westinghouse Electric Company LLC, they are 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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STI 32806377

Attachments 1 through 7 contain the responses to RAI-34, 35, 37, 40, 42, 43, and 46. Attachments 8 through 12 contain the non-proprietary versions of the responses to RAI-34, 35, 40, 43, and 46. Attachment 13 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 letter CAW-11-3066 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.

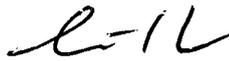
If this letter becomes separated from the proprietary material it is no longer proprietary.

There are no commitments in this letter.

If you have any questions other than those relating to the proprietary aspects of this response, 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 1/4/11



Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

jet

Attachments:

1. RAI-34 (proprietary)
2. RAI-35 (proprietary)
3. RAI-37
4. RAI-40 (proprietary)
5. RAI-42
6. RAI-43 (proprietary)
7. RAI-46 (proprietary)
8. RAI-34 (non-proprietary)
9. RAI-35 (non-proprietary)
10. RAI-40 (non-proprietary)
11. RAI-43 (non-proprietary)
12. RAI-46 (non-proprietary)
13. Request for Withholding of Proprietary Information

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

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RAI-37**QUESTION:****Feedwater**

- a. What is the line length of each feedwater line inside the primary containment, including the three branch lines of each main feed line?
- b. Feedwater line sizes are given in the DCD (Figure 5.1-3). Section 6.3.3.7.4 of the DCD gives a maximum feedwater line break of 839 cm² which is larger than the pipe size of the six feedwater lines penetrating the RPV and smaller than the area of the two main feed lines inside the primary containment. Is there a flow restrictor somewhere in the feedwater lines? If so, what is the restrictor ID?

RESPONSE:

- a. The line lengths of each feedwater line inside the primary containment, including the three branch lines of each main feed line are as shown below. The penetration numbers identified were taken from DCD Tier 2, Figure 5.2-7A.
 - 1) Feedwater line A (22 inches diameter)
Enters primary containment at elevation 13,810 mm, penetration # X-12A.
The total length inside containment of the 22 inch diameter pipe is 78.72 feet. Three 12 inch diameter riser supplies, (A,B, and C) connect to the A 22 inch header.
 - 2) Feedwater line B (22 inches diameter)
Enters primary containment at elevation 13,810 mm, penetration # X-12B.
The B feedwater line is the opposite arrangement as A and has a total length inside containment of 78.72 feet. Three 12 inch diameter riser supplies, (D,E, and F), connect to the B 22 inch diameter header.
 - 3) Riser A (12 inch diameter) (Penetration into vessel is at 030 degrees)
Total length inside containment of 12 inch diameter supply to Penetration N3A is 39.6 feet.
 - 4) Riser B (12 inch diameter) (Penetration into vessel is at 090 degrees)
Total length inside containment of 12 inch diameter supply to Penetration N3B is 21.6 feet.
 - 5) Riser C (12 inch diameter) (Penetration into vessel is at 150 degrees)
Total length inside containment of 12 inch diameter supply to Penetration N3C is 39.6 feet.
 - 6) Riser D (12 inch diameter) (Penetration into vessel is at 210 degrees)
Total length inside containment of 12 inch diameter supply to Penetration N3D is 39.6 feet.
 - 7) Riser E (12 inch diameter) (Penetration into vessel is at 270 degrees)

Total length inside containment of 12 inch diameter supply to Penetration N3E is 21.6 feet.

8) Riser F (12 inch diameter) (Penetration into vessel is at 330 degrees)

Total length inside containment of 12 inch diameter supply to Penetration N3F is 39.6 feet.

- b. The flow area for the determination of the maximum feedwater line break is based on the minimum flow restriction, which is through the feedwater spargers. The break area of 839 cm² represents the combined flow area of the feedwater spargers. There are 54 sparger nozzles, each with an inside diameter, $D=44.5$ mm.

RAI-42**QUESTION:**

Standby Liquid Control System (it was discussed that TRACE boron mixing and transport is an important issue to be addressed at a later date)

- a. What is the line size of the SLCS?
- b. What is the capacity of the SLCS (injection rate)?
- c. What is the boron concentration of the injected fluid?
- d. What is the fluid temperature of the SLCS?

RESPONSE:

- a) The size of the individual and combined discharge lines is 1.5 inches. The size of the individual and combined suction lines is 4 inches.
- b) The injection rate for both pumps operating is 378 L/minute (100 gallons/minute). The injection rate for a single pump operating is 189 L/minute (50 gallons/minute).
- c) The minimum weight percent of boron in the Standby Liquid Control System (SLCS) tank is 13.4% at 20°C. See DCD Figure 16.3.1.7-1.
- d) The SLCS operates at a solution temperature between 20°C and 54.4°C for a tank concentration between 13.4% by weight percent of boron and 28% by weight percent of boron, respectively. See DCD Figure 16.3.1.7-1.

RAI-34**QUESTION:****Reactor Internal Pumps**

- a. What is the pump suction flow area?
- b. Provide pump curves, including the single-phase and fully-degraded homologous and torque curves and the head and torque degradation multiplier curves.
- c. What events cause a runback of the pumps and what is the extent of the runback?
- d. What is the typical coast-down time for the RIPs? The only pump coast down information that could be found are the minimum and maximum coast down delay times and a GOBLIN-calculated coast down curve provided in Section 5.1 and Appendix B of WCAP-17116. We are requesting pump specification coast down curves from the equipment qualification and testing document for the RIPs.

RESPONSE:

- e) The Reactor Internal Pump (RIP) suction flow area is 1.5 m².
- f) The ABWR pump model in GOBLIN makes use of the ABWR single phase homologous curves and the two-phase head degradation model described in NUREG-75/056, "WREM: Water Reactor Evaluation Model," May 1975. The two-phase head degradation model is based on the Semiscale two-phase pump data. The model makes use of normalized head difference curves that provide the difference between the single-phase pump performance and the pump performance at a reference void fraction. A two-phase head multiplier is used to extrapolate this result to other void fractions. It is recognized that the ABWR internal pumps are different than the Semiscale pump and would likely have less head degradation due to two-phase conditions.
- g) RIP runback is initiated by a variety of transient conditions. The nature of these transient conditions determines the extent of the runback.

Normal runback is characterized by pump speed decreasing at a rate of []^{a,c}% per second. RIPs are reduced to a prescribed speed and then held constant at that speed. Normal runback is activated by the following conditions:

- Operator Demand (Initiation requires actuation of both two runback pushbuttons on the main console)

- Low steam flow and high core flow conditions that correspond to a region of the power/flow operating map where excessive carryover occurs in the steam separator.

Fast runback is characterized by pump speed decreasing at a rate of []^{a,c}% per second. RIPs are reduced to a prescribed speed and then held constant at that speed. Fast runback is activated by the following conditions:

- Two or more reactor feedwater pump trip with subsequent or coincident low reactor water level (L-4).
- Any event which activates the trip for four or more RIPs. Runback of the remaining RIPs following an RIP trip is delayed for one second after sensing of RIP trip.
- Detection of the signal of the Fine Motion Control Rod Drive (FMCRD) Run-In. RIP runback is delayed for one second after sensing of FMCRD Run-In.

These events can result in complete RIP runback or RIP runback to 30% speed followed by a subsequent trip.

- h) The design requirement for RIP coastdown is a minimum inertia time constant of []^{a,c} seconds and a minimum moment of inertia of []^{a,c} kg-m². For the safety analysis, the time constant and inertia are assumed to be []^{a,c}% of the design requirement numbers for the core flow decrease events, which are []^{a,c} seconds and []^{a,c} kg-m² respectively.

A representative RIP coastdown is provided in Figure 34-1:



Figure 34-1 Representative RIP Coastdown

RAI-35

QUESTION:

Steam Separators

What is the expected pressure loss through the steam separators during normal operating conditions?

RESPONSE:

The expected pressure loss through the steam separators is []^{a,c} kPa. This is at a 90% flow condition.

RAI-40**QUESTION:****Condensate Storage Tank**

- a. What is the tank geometry – height, diameter, etc?
- b. What is the nominal water level/volume?
- c. DCD Section 6.3.2.2.1 states that in the event CST water level falls below a predetermined setpoint or the suppression pool water level rises above a predetermined setpoint, pump suction for HPCF will automatically transfer from the CST to the suppression pool. What are the values of these levels?

RESPONSE:

- d. The condensate storage tank (CST) dimensions are as follows:

Tank diameter = 12.866 m (42.208 ft)

Tank height = 15.98 m (52.43 ft)

Tank volume = 2078.42 m³ (73398.57 ft³)

- e. The nominal minimum water level and volume of water in the CST are shown below:

Water level = []^{a,c} m ([]^{a,c} ft)

Water volume = []^{a,c} m³ ([]^{a,c} ft³ or []^{a,c} gal)

- f. The minimum CST and maximum suppression pool level trip setpoints for High Pressure Core Flooder (HPCF) injection are as follows:

Minimum CST level = []^{a,c} m ([]^{a,c} ft)

Maximum Suppression Pool level = []^{a,c} m ([]^{a,c} ft)

RAI-43**QUESTION:**

What are the values assumed for the core bypass flows:

- a. From the lower plenum to the guide tubes?
- b. From the lower plenum directly to the core bypass?
- c. The fuel support assembly to the core bypass?
- d. Total core bypass leakage?

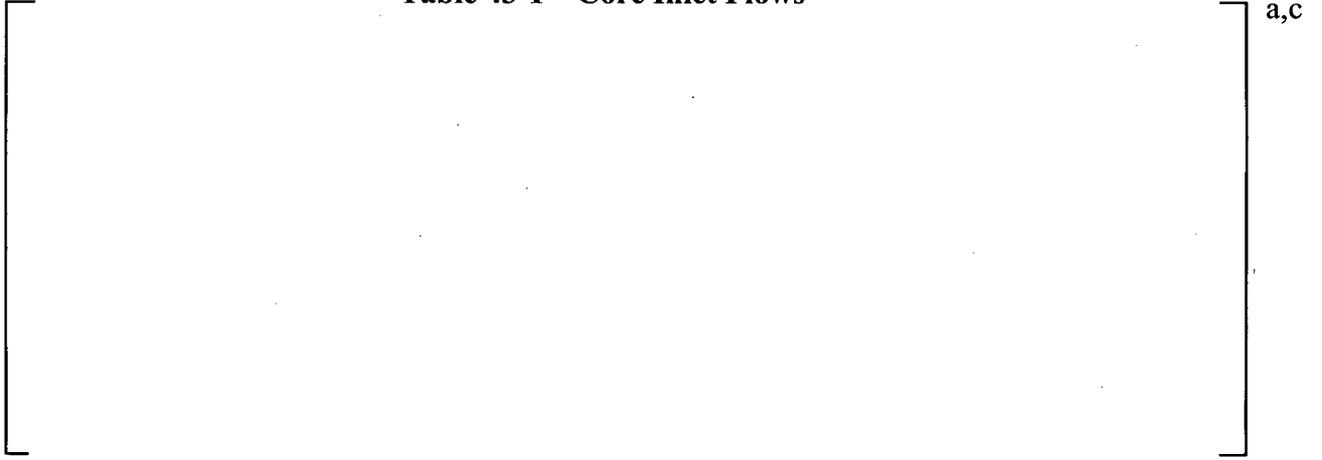
RESPONSE:

With the exception of the bypass flow specified in part a of the question, bypass flows are not assumed; they are calculated by GOBLIN. At steady state conditions, the bypass flows are as follows:

- a) []^{a,c}
- b) Flowpath []^{a,c} shown in Figure 43-1, below, represents the flow from the lower plenum directly to the core bypass. The steady state total core flow through this path corresponds to []^{a,c}% of the total flow through the core. This percentage is calculated by dividing the flow from the lower plenum to the core bypass []^{a,c} by the total core flow, which is the sum of the flow through nodes []^{a,c}. The flow through the core bypass is related to the total core flow but does not contribute to it.
- c) Flowpaths []^{a,c} represent the flow from the fuel support assembly to the core bypass. Together, these make up []^{a,c}% of the total flow through the core. This percentage is calculated by dividing the flow from the fuel support assembly to the core bypass (the sum of nodes []^{a,c} and []^{a,c}) by the total core flow (the sum of nodes []^{a,c} and []^{a,c}).
- d) Total core bypass leakage would include the two flows given in parts b) and c) as well as flow through paths []^{a,c}. This represents flow from the assembly into the water cross region. These four paths, taken together, make up []^{a,c}% of the total flow through the core. This percentage is calculated by dividing the sum of the flows through all four water cross region flowpaths (nodes []^{a,c}) by the total core flow (the sum of nodes []^{a,c} and []^{a,c}). Total core bypass, therefore, would be []^{a,c}% of the total core flow.

A complete list of steady state flows into the core is given in Table 43-1 below.

Table 43-1 – Core Inlet Flows



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Figure 43-1 ABWR GOBLIN Core Nodalization

RAI-46

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Attachment 12

Page 1 of 1

RAI-46

QUESTION:

Steam Dryers

Provide steam dryer inlet and outlet area.

RESPONSE:

The steam dryer inlet and outlet each has an area of []^{a,c} m².

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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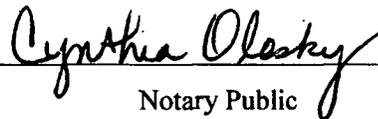
COUNTY OF BUTLER:

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 4th day of January 2011



Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Cynthia Olesky, Notary Public
Manor Boro, Westmoreland County
My Commission Expires July 16, 2014
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 WEC-STP-2010-0058 P-Enclosure, "South Texas Project Units 3 & 4 Response for RAI's 34, 35, 40, 43 and 46 to WCAP-17116-P" (Proprietary) for submittal to the Commission, being transmitted by South Texas Project Nuclear Operating Company (STPNOC) 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 ABWR 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

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