PROPRIETARY

NINA

Nuclear Innovation
North America LLC
4000 Avenue F, Suite A
Bay City, Texas 77414

July 6, 2011
U7-C-NINA-NRC-110097
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
PROJ0772
Responses 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)", March 14, 2011 (ML110730488)

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

RAI-38b Supplement 1
RAI-39 Supplement 1

Both of these responses 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.

Attachments 1 and 2 contain the proprietary versions of the responses to the above RAI questions. Attachments 3 and 4 contain the non-proprietary versions of the responses. Attachment 5 contains the request for withholding of proprietary information, the affidavit, the proprietary

T007
NRO

STI 32897422

information notice, and the copyright notice.

The response to RAI-39 refers to information contained in an enclosed compact disc (CD). The enclosed CD is for use by the NRC solely in connection with NRC review of the STP 3 & 4 fuel related topical reports. The CD is not in a format that meets pre-flight requirements. Since the CD is proprietary in its entirety, no non-proprietary version is provided. The NRC may not use the CD for any other purpose, and may not make copies of the CD. The information on the CD may not be made available in the Public Document Room or in the Agency Document Access and Management Systems (ADAMS), either externally or internally. Upon completion of NRC review, proprietary information from, or derived from, the CD should be irretrievably deleted from any computer outside the control of Westinghouse.

Correspondence with respect to the copyright or proprietary aspects of this information or the supporting Westinghouse Affidavit should reference letter CAW-11-3201 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

There are no commitments in this letter.

When separated from the enclosed proprietary CD or the proprietary responses in Attachments 1 and 2, this letter, including Attachments 3 and 4, is non-proprietary.

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 7/6/11

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

jet

Attachments:

1. RAI-38b (Proprietary)
2. RAI-39 (Proprietary)
3. RAI-38b (Non-Proprietary)
4. RAI-39 (Non-Proprietary)
5. Request for Withholding Proprietary Information

Enclosure: CD containing digitized data for RAI-39

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

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

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

Alice Hamilton Rogers, P.E.
Inspection Unit 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

*Tekia Govan
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George F. Wunder
*Tekia Govan
Charles Casto
U. S. Nuclear Regulatory Commission

Jamey Seely
Nuclear Innovation North America

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

Richard Peña
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI-38b, Supplement 1

The information provided in response to RAI-38(b) and (c) is insufficient. Please provide the lattice physiscs input decks and the user's manual for the lattice physics code. In addition, provide the following control blade parameters sufficient for 2-D lattice physics calculations including:

a. **The response to RAI-38(b) referenced Table 8-1 of WCAP-17275 for control blade dimensions. However, some of the terms associates with certain dimensions provided in Table 6-1 and 8-1 of WCAP-17275 are not clearly defined. Please provide all dimensions for both control rod designs and include corresponding drawing(s) or figure(s).**
b. **Table 5-1 of WCAP-17275 provide material composition, but does not provide complete material specifications for all materials. Please provide the material composition and specifications modeled in the Westinghouse methodology ABWR applicability reports for all control rod materials.**
c. **Please provide the material density modeled in the Westinghouse methodology ABWR applicability reports for all control rod materials.**

Response to RAI-38b, Supplement 1

The following information is being provided for the CR 82M-1 control rod design. As stated in the response to RAI-38a, Supplement 1, the CR 99 control rod design was not modeled in the analysis. Therefore, modeling information for the CR 99 control rod design will not be provided as part of this response.

Additionally, Westinghouse can provide input decks and/or user's manuals for NRC review at a Westinghouse office or during an audit.

a. Dimensions for the CR 82M-1 design are provided in Figure 1 and Figure 2. Figure 1 identifies the relevant dimensions of the operational critical attributes listed in Table 8-1 of WCAP-17275. Figure 2 shows the cut-away view of the control wing from the side and provides the relevant mechanical critical attributes listed in Table 6-1 of WCAP-17275. For the CR 82M-1 design, [

]a,c

a,c

[ ]

Figure 1– CR 82M-1 control blade dimensions relating to the operational critical attributes identified in WCAP-17275 Table 8-1 (all dimensions are in mm)

a,c

[ ]

Figure 2 – CR 82M-1 control blade dimensions relating to the mechanical critical attributes in WCAP-17275 Table 6-1 (all dimensions are in mm)

Control blades are modeled in the 2D lattice physics code according to the schematic provided in Figure 3. [ ][a,c]

a,c

[ ]

Figure 3 – Schematic showing the modeling of a control rod blade with respect to a fuel assembly in PHOENIX

Figure 4 provides the dimensional break down of the modeling that takes place in the PHOENIX code. [

]^{a,c}

a,c

[ ]

S	Starting point of the central control rod piece
L1	Length of the central control rod piece
L2	Length of the absorber part with absorber(e.g. B4C)
L3	Length of the "end" control rod piece
r	Radius of the absorber pins
p	Pin to pin pitch of the absorber
ht	Half thickness of the control rod blade (mirror symmetry applied),

Figure 4 – Dimensional inputs provided to PHOENIX in the modeling of control blades

b. Three main materials are used to model the control blade in the Westinghouse 2-D lattice code PHOENIX: Stainless Steel (316L), Boron Carbide (B_4C) and Hafnium (Hf). Table 1 provides a description of the materials used in the absorber cross of the CR 82M-1 control blade.

Table 1 – Materials used in the absorber cross of the CR 82M-1

[ ]a,c

Table 2 provides the material specification for the 316L Stainless Steel components of the control blade as modeled PHOENIX.

Table 2 – Material composition of 316L Stainless Steel as modeled in PHOENIX

[ ]a,c

c. Material densities for those materials modeled in the CR 82M-1 control blades are provided in Table 3.

Table 3 – Material densities used in the modeling of the CR 82M-1 control blade

[ ]a,c

For this response, questions posed by the NRC are identified in **bold** *text. The reponse to the questions follows each part of the question directly and is not* bolded.

RAI-39, Supplement 1

RAI-39 requested fuel and core design information for the reference cycle. However, the information provided is incomplete. Please provide the following information:

a) **The fuel assembly map in Figure 39-1 of U7-C-STP-NRC-110011 leaves out the design information for several bundles, which are indicated with a dash (-) in the figure. Please provide which bundle designs will be located in these positions. The map should include information designating the type of each bundle and accrued exposure at the beginning of cycle for the equilibrium core (figures similar to Figure 4.3-1 and Figure 4A-2a of WCAP-17290-P with additional information for the once and twice burnt fuel).**

Response to RAI-39 a, part 1

Figure 4.3-1 and Figure 4A-2a of WCAP-17290-P are applicable to the core design for the reference cycle as they originated from the same example of a 24-months equilibrium core loading pattern. The only difference from the figures provided in the response to RAI-39 is the naming convention used for each fuel assembly. For this case, EQG2 = 1C, EQJ1 = 1A and EQI1 = 1B. The once and twice burned fuel indicated in Figure 4.3-1 and Figure 4A-2a of WCAP-17290 are the same as those used in this analysis. This core loading is representative of an ABWR equilibrium core, however it is the result of a preliminary assessment, using data for an ABWR core with SVEA-96 Optima2 fuel designed by Westinghouse.

The control rod sequence information is provided in Figures 39-2 through 39-5 of U7-C-STP-NRC-110011. However, the control rod design (CR99 or CR82M-1) to be used in each of these locations is not specified. Please specify which control rod design will be used in each location in the control rod sequence figures.

Response to RAI-39 a, part 2

As discussed in the response to supplemental RAI 38a, only the CR 82M-1 control blades were modeled in this analysis. For future cores the intention is to use CR 99 as power regulating control rods and CR 82M-1 in shut down locations.

b) **In response to RAI-39(b), a CD containing CM2 and POLCA7 files was provided. In order to support this information, please provide the CM2 and POLCA7 User's Manuals.**

Response to RAI-39 b

Westinghouse can provide input decks and/or User's Manuals for NRC review at a Westinghouse office or during an audit.

c) **RAI-39 (e), (f), and (g) requested the Fuel Design report, Thermal Hydraulic Design report, Nuclear Design report, and Reference Core Design report. These documents were not provided in the RAI response in U7-C-STP-NRC-110011. Please provide the following information for the equilibrium core design at exposure points of interest (BOC, MOC, EOC, peak hot excess, end of full power at rated flow, end of full power life)**
- **3-D void histories,**
- **3-D control blade histories,**
- **3-D power profiles,**
- **3-D exposure maps,**
- **3-D instantaneous void fraction**

Response to RAI-39 c

A fuel mechanical design report has not yet been compiled for the ABWR. However, the essential details of the fuel mechanical design are contained in the approved Topical Report WCAP 15942-P-A. A Thermal Hydraulic Design Report based on information from a BWR/6 data has been compiled. This report demonstrates the acceptability of the behavior of the SVEA-96 Optima2 fuel in an ABWR. The Core Design report presents the core design based on a 24-month equilibrium cycle and is the basis to show the applicability of Westinghouse methodology for full scope safety analysis for an ABWR in the US. For the purposes of demonstrating the adequacy of the Westinghouse methodologies for the ABWR core with SVEA-96 Optima2 fuel, the analysis presented for the reference core was based on a BWR/6 core. Because of the similarities between the ABWR and the BWR/6 this is acceptable. However, in the forthcoming Fuel Amendment to the STP 3&4 COL all assumed data will be replaced by confirmed ABWR information. These reports can be made available at Westinghouse's offices or during an audit.

The requested equilibrium core design information is provided in the attached CD labeled "POLCA7-data". The axial nodal distributions for all assemblies in quarter-core format (i.e.218 fuel assemblies) have been exported into an ASCI file per each exposure points of interest (BOC, MOC, EOC etc.). Each new distribution in the file is marked with the word "BEGIN".

Following 3D-distibutions have been provided:

- Exposure (Burnup)
- Coolant density history. POLCA7 follows this quantity instead of void history.
- Control rod history
  (expressed in POLCA7 in terms of coolant density history)
- Power
- Instantaneous void fractions.

Below is the listing of files available:

- BOC-0-dist-3D.txt
- MOC-8520-dist-3D.txt
- Peakreact-11360-dist-3D.txt
- EOC-16900-dist-3D.txt

The equilibrium cycle length (EOC) is 16900 EFPH with no coast down, which means that end of full power at rated flow (EOFP) occurs at EOC.

The following information provides a description for how to read and interpret the information that is contained in the .txt files included on the CD:

[ ] a,c

a,c

d) **The top guide geometry information requested in RAI-39(d) was not submitted. Please submit a figure of a 4-bundle cell showing the geometric features of the top guide with relevant dimensions and any associated flow loss analysis values for LOCA, ATWS, AOO, and Stability modeling.**

<u>Response to RAI-39 d</u>

Below are schematic pictures of the upper core grid including positioning of SVEA-96 Optima2 fuel assemblies in the upper core grid.

a,c

[ ]

Figure 39-d-1 Schematic Axial View of SVEA-96 Optima2 Fuel at Upper Core Grid Elevation

a,c

Figure 39-d-2 Schematic Top View of SVEA-96 Optima2 Fuel at Upper Core Grid Elevation

The core design and corresponding input data used for the Westinghouse ABWR model to show the capabilities of the Westinghouse analysis package was based on preliminary data. In the case of flow losses in the upper plenum, (i.e., from the core grid to the steam separators) data from a BWR/6 was used in CM2/POLCA7 core design analyses as this was the most applicable data available at the time. This is expected to have a minor impact on core design for the purpose of the preliminary assessment of a 24-month equilibrium core.

For AOO, ATWS, and Stability the upper plenum was modeled with elevation loss coefficients as well as two-phase loss coefficients according to the Westinghouse methodology described in the Licensing Topical Report CENPD-300-P-A.

The analysis to be presented in the forthcoming Fuel Amendment application will be based on ABWR specific data.

e) Provide the following information:

Responses are given under each bullet.

- **fuel shuffle sequence**

  Fuel loading pattern (ranking map, in quarter core with mirror symmetry) is shown in Figure 39-e-1. In this figure the numbers 1 – 29 are valid for fresh SVEA-96 Optima2 EQJ1 bundles, 30 – 61 for fresh EQ2 bundles and 62 – 80 for fresh EQI1 bundles. Older, partly depleted fuel assemblies are strictly ranked on reactivity with number 81 (highest) to 218.

a, c

Figure 39-e-1 Ranking Map for the Equilibrium Cycle

- **results of lattice physics calculations specific to the equilibrium core for each lattice as a function of burnup (e.g. eigenvalue trajectories, etc.)**

  Results of lattice physics calculations, k_{inf} and local power peaking factors (F_{int}), for all high enriched segment types of the SVEA-96 Optima2 bundle designs EQG2, EQI1 and EQJ1 are shown in Figures 39-e-2 through 39-e-7.

[ ] a, c

Figure 39-e-2 **Design EQG2, k_{inf} vs. burnup, 40% Void and Void History**

[ ] a, c

Figure 39-e-3 **Design EQG2, Local Power Peaking vs. burnup, 40% Void and Void History**

a, c

Figure 39-e-4 Design EQI1, k_{inf} vs. burnup, 40% Void and Void History

a, c

Figure 39-e-5 Design EQI1, Local Power Peaking vs. burnup, 40% Void and Void History

a, c

Figure 39-6 Design EQJ1, k_{inf} vs. burnup, 40% Void and Void History

a, c

Figure 39-e-7 Design EQJ1, Local Power Peaking vs. burnup, 40% Void and Void History

- **analysis value power peaking factors for hot rod, part length rods, gad-bearing rods, and other relevant rod groups (for example, low enriched rods)**

Figures 39-e-8 through 39-e-18 illustrate local power peaking factors for selected rods in all the high enriched zones of the SVEA-96 Optima2 bundle designs EQG2, EQI1 and EQJ1.

Selected rods – SVEA-96 Optima2 design EQG2:

B10 = 3.80 w/o U-235
C10 = 4.70 w/o U-235
F7 = 4.95 w/o U-235 (2/3 PLR, only Figures 39-e-8 and 39-e-9)
H8 = 4.0 w/o U-235, 7 w/o Gd2O3 (spacer capture rod)
C8 = 4.95 w/o U-235 (spacer capture rod)
A7 = 4.95 w/o U-235
J10 = 2.80 w/o U-235 (1/3 PLR, only Figure 39-e-8)

[ ] a, c

Figure 39-e-8 Design EQG2 Bottom Zone 4.47 w/o U-235 15G7.0-2G2.0 Local Power Peaking, 40% Void and Void History

[ ] a, c

Figure 39-e-9 Design EQG2 Middle Zone 4.57 w/o U-235 13G7.0-2G2.0 Local Power Peaking, 40% Void and Void History

a, c

Figure 39-e-10 Design EQG2 Top Zone 4.53 w/o U-235 13G7.0 Local Power Peaking, 40% Void and Void History

Selected rods SVEA-96 Optima2 design EQI1:

B10 = 3.80 w/o U-235
G7 = 4.95 w/o U-235, 2.0 w/o Gd_2O_3
F7 = 4.95 w/o U-235 (2/3 PLR, only Figures 39-e-11 through 39-e-13)
H8 = 4.0 w/o U-235, 9 w/o Gd_2O_3 (spacer capture rod)
C8 = 4.95 w/o U-235 (spacer capture rod)
A7 = 4.95 w/o U-235
J10 = 2.80 w/o U-235 (1/3 PLR, only Figures 39-e-11 and 39-e-12)

a, c

Figure 39-e-11 Design EQI1 Bottom Zone 1, 4.49 w/o U-235 13G9.0-1G2.0 Local Power Peaking, 40% Void and Void History

a, c

Figure 39-e-12 Design EQI1 Bottom Zone 2, 4.47 w/o U-235 15G9.0-1G2.0 Local Power Peaking, 40% Void and Void History

a, c

Figure 39-e13 Design EQI1 Middle Zone 4.57 w/o U-235 13G9.0-1G2.0 Local Power Peaking, 40% Void and Void History

a, c

[ ]

Figure 39-e-14 Design EQI1 Top Zone 4.53 w/o U-235 13G9.0-1G2.0 Local Power Peaking, 40% Void and Void History

Selected rods SVEA-96 Optima2 design EQJ1:

B10 = 3.80 w/o U-235
C10 = 4.70 w/o U-235, 2.0 w/o Gd2O3
F7 = 4.95 w/o U-235 (2/3 PLR, only Figures 39-e-15 through 39-e-17)
G9 = 4.0 w/o U-235, 9 w/o Gd2O3 (tie rod)
C8 = 4.95 w/o U-235 (spacer capture rod)
A7 = 4.70 w/o U-235
A10 = 2.80 w/o U-235 (1/3 PLR, only Figure 39-e-15 and 39-e-16)

a, c

[ ]

Figure 39-e-15 Design EQJ1 Bottom Zone 1, 4.50 w/o U-235 13G9.0 Local Power Peaking, 40% Void and Void History

a, c

Figure 39-e-16 Design EQJ1 Bottom Zone 2, 4.48 w/o U-235 15G9.0 Local Power Peaking, 40% Void and Void History

a, c

Figure 39-e-17 Design EQJ1 Middle Zone 4.57 w/o U-235 13G9.0 Local Power Peaking, 40% Void and Void History

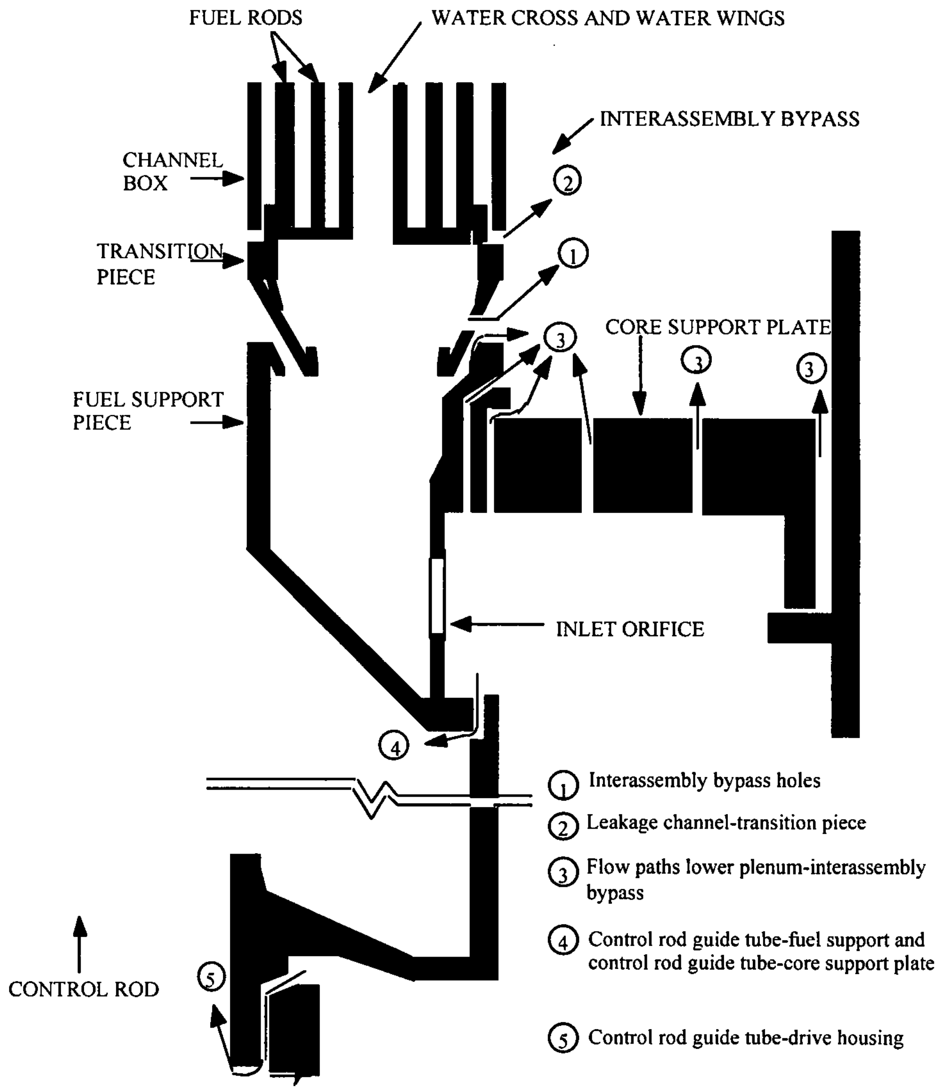
a, c

[ ]

Figure 39-e-18 Design EQJ1 Top Zone 4.53 w/o U-235 13G9.0 Local Power Peaking, 40% Void and Void History

- **Inlet nozzle geometry including orifice loss coefficient, local losses, and flow areas (if these differ for central and peripheral assemblies, provide both sets)**

  Flow paths are given in Figure 39-e-19 and areas, loss coefficients etc. are given in Tables 39-e-1 and Table 39-e-2.



Leakage through path 2 above is zero in all SVEA-96 fuel assemblies

Figure 39-e-19 Flow paths in a GE/KWU reactor core.

Table 39-e-1 SVEA-96 Optima2 main data

Fuel assembly	-	4×24	
Number of fuel rods	-	96	
- full length Ø 9.84 mm	-	84	
- part length, 2/3 long, Ø 9.84 mm	-	8	
- short length, 1/3 long, Ø 9.84 mm	-	4	
Number of spacers	-	4×8	
Rod pitch, nominal	m	13.0×10^{-3}	a,c
Flow area (active flow) lower part	m^2		
Flow area (active flow) mid part	m^2		
Flow area (active flow) upper part	m^2		
Flow area in Water Cross central canal	m^2		
Flow area in Water Cross wings	m^2		
Hydraulic diameter, lower part	m		
Hydraulic diameter, middle part	m		
Hydraulic diameter, upper part	m		
Outer dimension for fuel channel	m		
Width of fuel channel wall	m	1.4×10^{-3}	
Total heat transfer area	m^2	10.68	
Number of bypass holes in the transition piece	-	2	
Diameter of bypass holes in the transition piece	m	10.3×10^{-3}	
Type of inlet	-	8×8*)	
Bundle weight in air	kg	291	
Sub-bundle weight in air	kg	63.1	

*) Standard type of inlet for continental reactors (GE/KWU).

Table 39-e-1 Loss coefficients used in the analysis

Component	$\Delta p = \xi \times (G^2_{ref}/2\rho)$ with $\xi = a \times Re^{-b}$			
	a	b	Reference area	a,c
Inlet (incl transition piece, bottom tie plate, debris filter)				
Spacer grids, 96 rods				
Spacer grids, 92 rods				
Spacer grids, 84 rods				
Outlet (irreversible losses)				
Bypass holes				
Water Cross Central Canal, inlet				
Water Cross Central Canal, outlet				
Water Wings, inlet				
Water Wings, outlet				
Core inlet throttling, center				
Core inlet throttling, periphery				

- **End piece loss coefficient and flow area**

See above.

- **Spacer loss coefficient(s)**

  See above.

- **Effective channel leakage loss coefficient and flow area**

  See above.

- **Water wing dimensions (i.e. a figure similar to Figure 2-4 of WCAP-15942-P-A that includes length, thicknesses, and radii for the water wings).**

  Figures 2-2 and 2-4 in Licensing Topical Report WCAP-15942-P-A has all relevant information with regards to the water wing dimensions. There are no design changes associated with the water wing for the ABWR.

- **Active, bypass, and water rod flow fractions (normal operating conditions)**

  Results from generic analysis are given in Table 39-e-3.

Table 39-e-3 Thermal-hydraulic generic analysis – Summary of results

Parameter	Value	Case	Design criterion	Fulfilment
Total Inter-assembly Bypass flow in the homogeneous core, min/max	[		]^{a,c}	√
Void in Inter-assembly bypass, max	[		]^{a,c}	√
Void content in Water Cross central canal, max	[		]^{a,c}	√
Void content in Water Cross wings, max	[		]^{a,c}	√

- **Water rod inlet and outlet axial elevations**

  The elevations are given in Table 39-e-4

Table 39-e-4 SVEA-96 Optima2 ABWR Axial Elevations

Position	**Axial Elevation (mm)**	**Comment**
Interassembly bypass flow hole	[ ]^{a,c}	
Central water canal inlet	[ ]^{a,c}	
Water wings inlet	[ ]^{a,c}	Four water wings in assembly
Pellet stack lower end	[ ]^{a,c}	Start of active fuel
Central water canal outlet	[ ]^{a,c}	
Water wings outlet	[ ]^{a,c}	

- **Water rod inlet and outlet loss coefficients and flow areas**

  See above.

- **Heat transfer coefficient between the channel box outer wall and the bypass**

  Using GOBLIN the heat transfer coefficient between channel box outer wall and the bypass coolant is based on local conditions in the bypass region as described in Section 3 of Licensing Topical Report RPB 90-93-P-A. The heat transfer coefficient map is shown below in Figure 39-e-20 for a non-dryout situation.

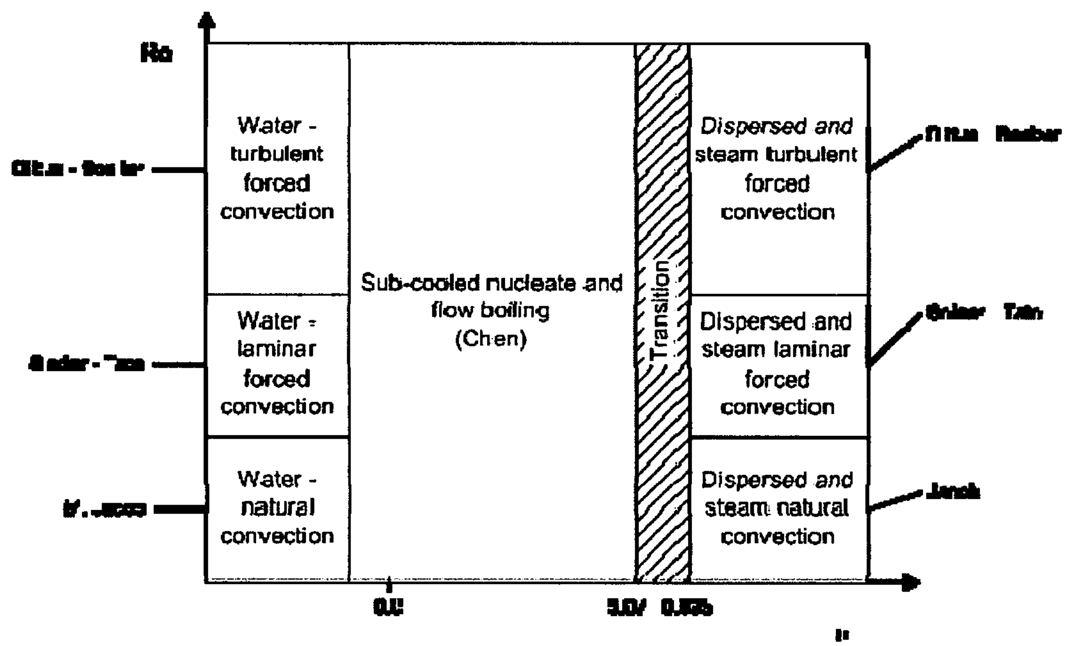


Figure 39-e-20 Heat Transfer Coefficient Map.

- **Fuel pin cladding surface roughness**

  Max surface roughness inside and outside is [ ]^{a,c}, as described in Licensing Topical Report WCAP-15942-P-A Section C, Chapter 5.1.2.1

- **Fuel rod emissivity**

  For fuel rod emissivity 0.67 is used for dry surfaces and 0.96 for wet surfaces as described in Licensing Topical Report RPB 90-93-P-A.

- **Channel box emissivity**

  For channel emissivity 0.67 is used as described in Licensing Topical Report RPB 90-93-P-A.

- **The distribution of enrichment and gadolinia loading both axially and radially for each fuel bundle type in the core**

  This information can be provided for NRC review at a Westinghouse office or during an audit.

- **assumed power operating history for nominal and peak rods used in fuel performance calculations to determine thermal-mechanical properties (such as gas gap composition) for all relevant rod groups identified in the previous bullet including:**

  No evaluation of the actual fuel rod design has been done explicitly; instead a Thermal Mechanical Operating Limit used in BWR/6 with similar power density and active fuel length was used. For the forthcoming Fuel Amendment, these analyses will be performed on the final ABWR core(s). Data given below is BOL at cold condition unless otherwise stated.

  - **cladding material**

    [ ][a,c], see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.2.2.

  - **cladding outer diameter**

    [ ][a,c], see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.2.1.

  - **cladding inner diameter**

    [ ][a,c], see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.2.1.

  - **cladding thickness**

    [ ][a,c],see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.2.1.

- **cladding arithmetic mean roughness**

  Nominal value will be used as input. Max surface roughness, R_a, in and outside is [ ]^{a,c}, See Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.2.1.

- **gap thickness**

  Nominal cold BOL gap is [ ]^{a,c} derived from data in Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1 and Chapter 5.1.2.1.

- **fuel pellet diameter**

  [ ]^{a,c}, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **fuel pellet length**

  [ ]^{a,c}, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **fuel pellet dish depth**

  [ ]^{a,c}, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **fuel pellet dish shoulder width**

  [ ]^{a,c}, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **fuel pellet dish spherical radius**

  [ ]^{a,c}, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **fuel pellet core radius**

  See Licensing Topical Report WCAP-15942-P-A, Section C, Figure 2-12.

- **fuel pellet sintering temperature**

  Maximum sintering temperature is [ ]^{a,c}, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.3.

- **fuel pellet true density**

  [ ]a,c, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.2.

- **fuel pellet resinter density change**

  Pellet densification is given in Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.3.

- **fuel volume**

  See Licensing Topical Report WCAP15942-P-A, Section C, Chapter 5.1.1.1, where pellet diameter, pellet height and lost volume vs. an ideal cylinder are given.

- **fuel arithmetic mean roughness**

  Nominal value will be used as input. Max surface roughness is [ ]a,c, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **fuel stack height**

  [ ]a,c, see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.3, Style 1.

- **fuel dish and annulus volume fraction**

  [ ]a,c see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.1.1.

- **U-235 enrichment**

  Average enrichment is [ ]a,c
  Detailed enrichment distributions can be made available for NRC review at a Westinghouse office or during an audit.

- **fuel fission atoms(Xe + Kr)/100 fissions**

  No calculations for the 24-months equilibrium cycle were performed. A tentative TMOL curve from a BWR/6 high power plant was used as assumption; however when calculations are performed X_r and K_r concentrations in Mol are derived. This information can be provided once fuel rod analyses are completed for the forthcoming Fuel Amendment.

- **fuel water concentration**

  [ ]^{a,c} is given in Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 4.3.4.

- **fuel nitrogen concentration**

  This information is currently not available. This may be investigated further during the forthcoming Fuel Amendment.

- **plenum length**

  Full length rod: [ ]^{a,c}
  2/3 length: [ ]^{a,c}
  1/3 length: [ ]^{a,c}
  see Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.4.

- **plenum spring diameter**

  See Licensing Topical Report WCAP-15942-P-A, Figure 2-11.

- **plenum spring wire diameter**

  See Licensing Topical Report WCAP-15942-P-A, Figure 2-11.

- **plenum spring volume**

  Plenum spring volume [ ]^{a,c} for full length rods, 2/3 part length rods and 1/3 part length rods, respectively.

- **plenum volume**

  Plenum volumes are given in Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.4.

- **plenum spring turns**

  See Licensing Topical Report WCAP-15942-P-A Figure 2-11.

- **rod total void volume**

  Total void volumes are given in Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.4, style 1.

- **rod internal helium pressure**

  [ ]^{a,c} MPa is given in Licensing Topical Report WCAP-15942-P-A, Section C, Chapter 5.1.5.

- **fuel rod pitch**

  See Licensing Topical Report WCAP-15942-P-A, Figure 2-4.

- **channel equivalent diameter**

  Hydraulic diameter: $4*A_{min}/P_w$, where A = Minimum Boiling Water Area and P_w = the wetted perimeter. For SVEA-96 Optima2 for an ABWR this gives for:
  Zone 1 [ ]^{a,c} (96 rods)
  Zone 2 [ ]^{a,c} (92 rods)
  Zone 3 [ ]^{a,c} (84 rods)

- **fill gas pressure**

  [ ]^{a,c} MPa is given in Licensing Topical Reports WCAP-15942-P-A, Section C, Chapter 5.1.5.

- **axial power profiles as a function of time**

  Detailed power profiles can be obtained from appended files given in 39 c. Overall axial profiles for BOC, MOC and EOFP (EOC) can be seen in Figure 39-e-21 below.

[ ] a,c

Figure 39-e-21 Axial power distribution at BOC, MOC (8520 EFPH) and EOFP (16900 EFPH)

- **axial fast flux**

  No analysis performed and thus no axial flux profiles chosen. The methodology is described in the Licensing Topical Reports WCAP-15942-P-A and CENPD-287-P-A.

- **crud buildup**

  CRUD deposited on the cladding surface is a function of the irradiation time. This calculation can be given when fuel rod analyses are performed for the forthcoming Fuel Amendment.

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

Before me, the undersigned authority, personally appeared J. A. Gresham, 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:

J. A. Gresham
J. A. Gresham, Manager
Regulatory Compliance

Sworn to and subscribed before me
this 28th day of June 2011

Joyce A. Szepessy
Notary Public

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Joyce A. Szepessy, Notary Public
Parks Twp., Armstrong County
My Commission Expires April 16, 2013
Member, Pennsylvania Association of Notaries

(1) I am Manager, Regulatory Compliance, 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-2011-0022 P-Enclosure, "South Texas Project Units 3 & 4 Supplemental Responses to RAI's 38b and 39 for WCAP-17116-P" (Proprietary), for submittal to the Commission, being transmitted by Nuclear Innovations 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 ABWR ECCS analysis methodology in support of Westinghouse ABWR fuel products.

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

(a) Assist customers 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 the 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 fuel design 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