Proprietary Information Withhold from Public Disclosure Under 10 CFR § 2.390.
This letter is decontrolled when separated from Enclosure 2.

Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

CNL-15-221

October 9, 2015

10 CFR 50.36

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 2
Construction Permit No. CPPR-92
NRC Docket No. 50-391

Subject: **Watts Bar Nuclear Plant Unit 2 – Technical Specification 3.2.1, Heat Flux Hot Channel Factor (FQ (Z)), Revision 0 License Condition and Margin Assessment**

References:
1. TVA Letter to NRC, CNL-15-190, "Watts Bar Nuclear Plant Unit 2 – Submittal of Final Revision 0 of the Technical Specifications & Technical Specification Bases, and Final Revision 0 of the Technical Requirements Manual & Technical Requirements Manual Bases," dated September 23, 2015 [ML15267A183]

2. TVA Letter to NRC, CNL-15-208, "Watts Bar Nuclear Plant Unit 2 – Technical and Regulatory Basis for Technical Specification 3.2.1, Heat Flux Hot Channel Factor (FQ (Z)), Revision 0," dated September 30, 2015 [ML15274A328]

The Tennessee Valley Authority (TVA) submitted Revision 0 of the Watts Bar Nuclear Plant (WBN) Unit 2 Technical Specifications (TS) including a modified TS 3.2.1, "Heat Flux Hot Channel Factor (FQ (Z))," in Reference 1 to address a potential non-conservatism in the TS. TVA provided a technical and regulatory basis for TS 3.2.1 Revision 0 in Reference 2. During a telephone conference held on October 7, 2015, TVA and Nuclear Regulatory Commission (NRC) staff discussed the margins provided in TS 3.2.1.

This letter has two purposes. The first purpose is to provide a license condition where the margins provided in TS 3.2.1 will be evaluated each fuel cycle to assure that the related assumptions in the accident analyses are maintained. The second purpose of this letter is to submit a Westinghouse Electric Corporation (Westinghouse) margin assessment report providing additional information related to the changes to TS 3.2.1, "Heat Flux Hot Channel Factor (FQ(Z))," described in Reference 2. The margin assessment report provides additional detail on the increase in conservatism of the Required Actions in Condition B of TS 3.2.1 Revision 0 when compared to earlier versions of the developmental WBN Unit 2 TS.

Enclosure 1 provides a new license condition 2.C(X) to perform cycle specific evaluations of the margins of the Required Actions in TS 3.2.1 Condition B. The enclosure provides a general discussion of the purpose of the license condition and the process by which the evaluations will be performed each fuel cycle.

Enclosure 2 provides a proprietary copy of the margin assessment report. Enclosure 3 provides the non-proprietary version of the margin assessment report.

Enclosure 4 provides the supporting proprietary information notice and copyright notice 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. Correspondence from the NRC with respect to the copyright or proprietary aspects of the items listed above or the supporting Westinghouse affidavit should reference CAW-15-4302 and should be addressed to J. A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3, Suite 310, Cranberry Township, Pennsylvania 16066.

There are no new regulatory commitments discussed in this letter. Please contact Gordon Arent at 423-365-2004 if there are questions regarding this submittal.

Respectfully,

J. W. Shea

Digitally signed by J. W. Shea
DN: cn=J. W. Shea, o=Tennessee Valley Authority, ou=Nuclear Licensing, email=jwshea@tva.gov, c=US
Date: 2015.10.09 13:45:48 -04'00'

J. W. Shea
Vice President, Nuclear Licensing

Enclosures:

1. Hot Channel Factor License Condition
2. Westinghouse Electric Corporation, ”Watts Bar Unit 2 F_Q Margin Assessment,” (Proprietary)
3. Westinghouse Electric Corporation, ”Watts Bar Unit 2 F_Q Margin Assessment,” (Non-Proprietary)
4. Westinghouse Electric Company Affidavit Supporting the Request to Withhold Westinghouse Proprietary Information (Enclosure 2) from Public Disclosure

cc (Enclosures):

NRC Regional Administrator – Region II
NRC Senior Resident Inspector – Watts Bar Nuclear Plant, Unit 2
NRC Project Manager – Watts Bar Nuclear Plant, Unit 2

ENCLOSURE 1

Hot Channel Factor License Condition

Hot Channel Factor License Condition

TVA proposes that the following license condition, 2.C(X), be added to the Watts Bar Nuclear Plant Unit 2 Operating License.

2.C(X) TVA will verify for each core reload that the actions taken if $F_Q^W(Z)$ is not within limits will assure that the limits on core power peaking $F_Q(Z)$ remain below the initial total peaking factor assumed in the accident analyses.

In Technical Specification (TS) 3.2.1, "Heat Flux Hot Channel Factor (FQ(Z))," TVA added additional actions to take if the transient heat flux $F_Q^W(Z)$ was not within the TS limits. TVA provided a technical and regulatory evaluation supporting the new actions (Reference 1). In Enclosure 2 of this submittal, TVA has provided a margin assessment that was prepared by the Westinghouse Electric Corporation (Westinghouse). The margin evaluation provides details about how the TS actions ensure that peaking factors which support the total peaking factor used in the WBN Unit 2 FSAR accident analyses is not exceeded for the initial fuel cycle. These actions also support high level regulatory requirements such as establishing that the peak fuel clad temperature will not exceed 2200ºF as required by 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors." This license condition requires that TVA evaluate each WBN Unit 2 cycle specific core to provide such assurance on an ongoing basis.

The verification will be completed as part of the calculations performed for the normal reload safety analysis process under WCAP-9272-P-A (Reference 2). Documentation of the results of this verification will be added to the final Reload Safety Evaluation produced for each reload core by Westinghouse. The reload safety evaluations are reviewed by TVA, as required by TVA procedures, as part of the design control process. The core reload safety evaluations are Quality Assurance records as defined in 10 CFR 50, Appendix B.

References:

1. TVA Letter to NRC, CNL-15-208, "Watts Bar Nuclear Plant Unit 2 – Technical and Regulatory Basis for Technical Specification 3.2.1, Heat Flux Hot Channel Factor (FQ (Z)), Revision 0," dated September 30, 2015 [ML15274A328]

2. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985

ENCLOSURE 3

Westinghouse Electric Corporation,
"Watts Bar Unit 2 F_Q Margin Assessment,"
dated October 2015, (Non-Proprietary)

MT-15-146-NP-Attachment

Watts Bar Unit 2 F_Q Margin Assessment

(Non-Proprietary version)

Watts Bar Unit 2 F_Q Margin Assessment

Question to be Answered: Do the interim actions identified in both NSAL-09-5 Revision 1 and NSAL-15-1 remain conservative and applicable for Watts Bar Unit 2 in both Cycle 1 and subsequent reload cycles?

Answer: Yes, the interim actions identified in both NSAL-09-5 Revision 1 and NSAL-15-1 remain conservative and applicable for Watts Bar Unit 2 Cycle 1 and for subsequent reload cycles in Watts Bar Unit 2. A technical justification for this answer is provided below.

Background:

Interim actions from both NSALs have been incorporated into the proposed Watts Bar Unit 2 version of Technical Specification 3.2.1. The interim actions recommended by each NSAL are summarized as follows:

NSAL-09-5 Revision 1

When Condition B of the F_Q Surveillance Technical Specification (TS 3.2.1B in Reference 1) is entered for a RAOC AFD band plant (i.e., when $F_Q^W(Z)$ exceeds the limit) for a surveillance performed at ≥ 75% RATED THERMAL POWER (RTP), the following actions are required in addition to the current standard Required Action B.1 to reduce the Axial Flux Difference (AFD) band by ≥1% for each 1% $F_Q^W(Z)$ exceeds the limit:

1. Reduce the maximum allowable power by 3% for each 1% $F_Q^W(Z)$ exceeds the limit within 4 hours.
2. Reduce the power range neutron flux – high trip setpoints ≥ 1% for each 1% that the maximum allowable power level is reduced within 72 hours.
3. Reduce the Overpower Delta-T trip setpoints by ≥ 1% for each 1% that the maximum allowable power level is reduced within 72 hours.
4. Perform SR 3.2.1.1 and SR 3.2.1.2 prior to increasing THERMAL POWER above the limit of action 1. Note that this action must be completed whenever the $F_Q^W(Z)$ limit is not met following a surveillance performed at ≥ 75% RTP.

NSAL-15-1

NSAL-15-1 establishes additional conditions under which it is recommended that the F_Q^W penalty factor specified in the Core Operating Limits Report (COLR) should be applied to the measured $F_Q^W(Z)$ result to account for a potential increase in the $F_Q^W(Z)$ over the next month of operation. These additional conditions are precautionary, and include cases where the measured $F_Q^W(Z)/K(Z)$ was observed to increase over the previous month of operation, and cases where the $F_Q^W(Z)/K(Z)$ is expected to increase over the next month of operation, regardless of the past observed trend in the measured $F_Q^W(Z)$.

Technical Justification for Answer:

NSAL-09-5, Revision 1

The above interim actions are based on a conservative generic analysis performed by Westinghouse in 2009, when the issue with TS 3.2.1.B Required Action B.1 was first identified. The purpose of the reduction in RTP is to increase the margin in the middle axial elevations of the core, where a reduction in the allowed AFD band is less effective at restoring margin. The purpose of the reduction in the trip setpoints is simply to establish an upper limit of operation consistent with the reduced RTP, which will limit the potential change in power during a transient to the same amount considered in the safety analysis.

The generic analysis performed by Westinghouse in support of NSAL-09-5 established that a reduction in RTP of 3% in conjunction with a reduction in the RAOC AFD operating space of 1% would establish at least 1% additional margin in the transient $F_Q^W(Z)$ surveillance. As noted in NSAL-09-5 Revision 1, the interim actions were developed in a conservative manner to bound all plants. Based on the results, the generic analysis also concluded that it may be possible to reduce the required reduction in RTP to approximately 2% RTP for each 1% that $F_Q^W(Z)$ exceeds the limit, if a plant/cycle specific analysis is performed.

For Watts Bar Unit 2 Cycle 1, the continued conservatism of the required 3% RTP reduction for each 1% that $F_Q^W(Z)$ exceeds the limit has been confirmed based on the results from a plant/cycle specific RAOC analysis performed for Cycle 1 at two different power levels. The results are summarized below.

This analysis repeated the Condition I RAOC analysis in full detail, using both the 3411 and 3459 MWt as-built models of the Unit 2 Cycle 1 core. The assumed AFD band in both cases was +7 to -12% at HFP. The safety analysis assumed a RTP of 3459 MWt and an F_Q limit of 2.50, which corresponds to a peak local linear heat rate of 13.7 kW/ft at hot nominal fuel dimensions. The difference in maximum allowed RTP between these two RAOC analyses was 1.4%. A comparison of these two analyses established that reducing the RTP by 1.4% relative to the RTP assumed in the safety analysis decreases the peak transient linear heat rate by at least **[ ]**[a,c] kW/ft. This corresponds to a minimum margin gain of approximately **[ ]**[a,c] relative to the safety analysis limit. In addition, this result conservatively assumes that there is no reduction in the allowed AFD operating band. Thus, the observed sensitivity for Watts Bar 2 Cycle 1 is approximately **[ ]**[a,c] transient F_Q margin gain per every 1% decrease in RTP (i.e., **[ ]**[a,c]). This exceeds the minimum sensitivity assumed in the interim guidance established in NSAL-09-5 Revision 1 of 0.33% transient F_Q margin gain per every 1% decrease in RTP. Therefore, it is concluded that the interim guidance established in NSAL-09-5 Revision 1 remains conservative for Watts Bar Unit 2 Cycle 1.

In addition, Figure 1 shows the maximum transient F_Q as a function of burnup for Watts Bar Unit 2 Cycle 1, including the appropriate calculational uncertainties. As shown in Figure 1, this cycle is predicted to have at least **[ ]**[a,c] margin to the transient F_Q limit at 3459 MWt RTP. Therefore a violation of the transient F_Q limit during operation is considered highly unlikely during Cycle 1 operation.

Reload cycles for Watts Bar Unit 2 are expected to resemble typical reload cycles for Unit 1 and other Westinghouse 4-loop plants. Therefore, the guidance provided in NSAL-09-5 Revision 1 applies to Watts Bar Unit 2 in the same manner it applies to any other Westinghouse 4-loop plant with a RAOC AFD band. Similar to

the Unit 2 Cycle 1 results discussed above, a plant/cycle specific RAOC analysis was performed for the Watts Bar Unit 1 Cycle 4 core at both 3459 and 3411 MWt RTP conditions at beginning of cycle, where the peak transient F_Q is predicted to occur near the middle of the core. The results from this analysis showed that a 1.4% reduction in RTP resulted in a **[ ]**[a,c] increase in transient F_Q margin. The analysis performed for Unit 1 Cycle 4 confirms that the guidance provided in NSAL-09-5 Revision 1 remains conservative for a typical reload cycle at the Watts Bar plant.

NSAL-15-1

The interim actions identified in NSAL-15-1 were not based on any specific generic analyses, but rather on the observation that recent reload cycles can have periods of the cycle where the transient F_Q is predicted to increase and the steady state F_Q is predicted to decrease. This phenomenon tends to occur when a reload cycle transitions from a flattened cosine type axial power shape to a saddle type axial power shape. In the case of Watts Bar Unit 2 Cycle 1, as shown in Figure 1, the phenomenon is not expected to occur, since the predicted steady state and transient F_Q as a function of burnup follow the same trends. However, implementation of the recommended actions from NSAL-15-1 will still conservatively apply the transient F_Q^W penalty factor specified in the COLR to the measured $F_Q^W(Z)$ results in case the measured trend does not match the predictions.

For reload cycles, Watts Bar Unit 2 may experience similar cases where the transition in the axial power shape results in an increasing transient F_Q and a decreasing steady state F_Q. In this case, the recommended actions from NSAL-15-1 will still conservatively correct the transient F_Q measurements for potential increases during the next month of operation.

Reference:

NUREG-1431 Volumes 1 and 2, Rev. 3.0, “Standard Technical Specifications Westinghouse Plants,” USNRC, June 2004

a,c

Figure 1: Watts Bar Unit 2 Cycle 1 Predicted Steady State and Transient FQ versus Burnup at 3459 MWt

ENCLOSURE 4

Westinghouse Electric Company Affidavit Supporting the Request to Withhold Westinghouse Proprietary Information (Enclosure 2) from Public Disclosure

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USA

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CAW-15-4302

October 8, 2015

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject: MT-15-146 P Attachment, "Watts Bar Unit 2 F_Q Margin Assessment" (Proprietary)

The Application for Withholding Proprietary Information from Public Disclosure is submitted by Westinghouse Electric Company LLC (Westinghouse), pursuant to the provisions of paragraph (b)(1) of Section 2.390 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary information for which withholding is being requested in the above-referenced report is further identified in Affidavit CAW-15-4302 signed by the owner of the proprietary information, Westinghouse Electric Company LLC. The Affidavit, which accompanies this letter, 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 10 CFR Section 2.390 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying Affidavit by Tennessee Valley Authority.

Correspondence with respect to the proprietary aspects of the Application for Withholding or the Westinghouse Affidavit should reference CAW-15-4302, and should be addressed to James A. Gresham, Manager, Regulatory Compliance, Westinghouse Electric Company, 1000 Westinghouse Drive, Building 3 Suite 310, Cranberry Township, Pennsylvania 16066.

James A. Gresham, Manager
Regulatory Compliance

CAW-15-4302
October 8, 2015

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF BUTLER:

I, James A. Gresham, am authorized to execute this Affidavit on behalf of Westinghouse Electric Company LLC (Westinghouse), and that the averments of fact set forth in this Affidavit are true and correct to the best of my knowledge, information, and belief.

James A. Gresham, Manager
Regulatory Compliance

(1) I am Manager, Regulatory Compliance, Westinghouse Electric Company LLC (Westinghouse), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rule making proceedings, and am authorized to apply for its withholding on behalf of Westinghouse.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse Application for Withholding Proprietary Information from Public Disclosure accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(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 constitute Westinghouse policy and provide the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of

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.

(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 MT-15-146 P-Attachment, "Watts Bar Unit 2 F_Q Margin Assessment" (Proprietary), for submittal to the Commission, being transmitted by Tennessee Valley Authority 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 information requested by the Nuclear Regulatory Commission from the Tennessee Valley Authority, and may be used only for that purpose.

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

(i) Support the Watts Bar Unit 2 Completion Program.

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

(i) Westinghouse plans to sell the use of similar information to its customers for the purpose of determining F_Q margin.

(ii) Westinghouse can sell support and defense of industry guidelines and acceptance criteria for plant-specific applications.

(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 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).

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