**Westinghouse Electric Corporation**

**Water Reactor Divisions**

Nuclear Technology Division

Box 355
Pittsburgh Pennsylvania 15230-0355

February 13, 1987
CAW-87-011

Dr. Thomas Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: RTD Bypass Elimination for Watts Bar

Dear Dr. Murley:

The proprietary material for which withholding is being requested in the reference letter by the Tennessee Valley Authority is further identified in an affidavit signed by the owner of the proprietary information, Westinghouse Electric Corporation. 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 10CFR Section 2.790 of the Commission's regulations.

The proprietary material for which withholding is being requested is of the same technical type as that proprietary material previously submitted with Application for Withholding AW-76-60.

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 this letter, CAW-87-011, and should be addressed to the undersigned.

Very truly yours,

for Robert A. Wiesemann, Manager
Regulatory & Legislative Affairs

/dmr
Enclosure(s)

cc: E. C. Shomaker, Esq.
Office of the General Council, NRC

## 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 10CFR2.790 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 (g) CONTAINED WITHIN PARENTHESES 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)(g) OF THE AFFIDAVIT ACCOMPANYING THIS TRANSMITTAL PURSUANT TO 10CFR2.790(b)(1).

AW-76-60

# AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Robert A. Wiesemann, 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 Corporation ("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:

Robert A. Wiesemann

Robert A. Wiesemann, Manager
Licensing Programs

Sworn to and subscribed
before me this 2 day
of December 1976.

[signature]
Notary Public

(1) I am Manager, Licensing Programs, in the Pressurized Water Reactor Systems Division, of Westinghouse Electric Corporation 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 or rule-making proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Water Reactor Divisions.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse Nuclear Energy Systems 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 2.790 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.

(g) It is not the property of Westinghouse, but must be treated as proprietary by Westinghouse according to agreements with the owner.

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 which 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 in 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 2.790, it is to be received in confidence by the Commission.

(iv) The information is not available in public sources 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 the attachment to Westinghouse letter number NS-CE-1298, Eicheldinger to Stolz, dated December 1, 1976, concerning information relating to NRC review of WCAP-8567-P and WCAP-8568 entitled, "Improved Thermal Design Procedure," defining the sensitivity of DNB ratio to various core parameters. The letter and attachment are being submitted in response to the NRC request at the October 29, 1976 NRC/Westinghouse meeting.

This information enables Westinghouse to:

(a) Justify the Westinghouse design.

(b) Assist its customers to obtain licenses.

(c) Meet warranties.

(d) Provide greater operational flexibility to customers assuring them of safe and reliable operation.

(e) Justify increased power capability or operating margin for plants while assuring safe and reliable operation.

(f) Optimize reactor design and performance while maintaining a high level of fuel integrity.

Further, the information gained from the improved thermal design procedure is of significant commercial value as follows:

(a) Westinghouse uses the information to perform and justify analyses which are sold to customers.

(b) Westinghouse sells analysis services based upon the experience gained and the methods developed.

Public disclosure of this information concerning design procedures is likely to cause substantial harm to the competitive position of Westinghouse because competitors could utilize this information to assess and justify their own designs without commensurate expense.

The parametric analyses performed and their evaluation represent a considerable amount of highly qualified development effort. This work was contingent upon a design method development program which has been underway during the past two years. Altogether, a substantial amount of money and effort has been expended by Westinghouse which could only be duplicated by a competitor if he were to invest similar sums of money and provided he had the appropriate talent available.

Further the deponent sayeth not.

Response to NRC Request for Additional Information
RTD Bypass Modification
on Watts Bar

February, 1987

References:

1. Summary of Meeting to Discuss RTD Bypass System Removal at Watts Bar, dated October 23, 1986.

2. Letter from J. Domer, TVA, to B. J. Youngblood, NRC, dated December 1, 1986.

3. Letter from B. J. Youngblood, NRC, to S. A. White, TVA, Dated January 16, 1987.

Q.1. Provide a discussion of the statistical methodology with values for uncertainty error allowances used to establish revised technical specification setpoints and allowable values for any affected reactor protection function resulting from the new RTD/EAGLE 21/thermowell installation. Include any revised safety analysis limit resulting from new safety analyses.

A.1. Westinghouse will use a calculational methodology that reflects the use of digital process equipment consistent with the basic concepts of the NRC approved Westinghouse Statistical Setpoint Methodology. The details of this methodology will be presented once the design has been finalized and the calculations performed. The uncertainty error allowances for the digital process equipment are expected to remain the same or to improve.

Q.2. An input bias for a failed sensor is discussed in Insert 3 of the enclosure to Reference (2). Provide a detailed discussion on how a value for this bias is determined and include a discussion of how the power fraction is determined.

A.2. The input bias that is used to compensate "Thot average" upon loss of one narrow range Thot signal is based upon "Thot average" with three valid RTD inputs. There is one bias value associated with each narrow range Thot RTD input signal. Simply stated, the bias value for each RTD is calculated while all three RTD's are considered to be valid by subtracting the average of the remaining two RTD's from the "Thot average" value for that loop. Then, if a RTD should fail, "Thot average" for that loop is calculated by adding the bias value for the failed RTD to the average of the remaining two RTD's. This formula ensures that the calculated value of "Thot average" with two valid RTD's is nearly identical to the value of "Thot average" that was calculated with three valid RTD's.

Since streaming patterns are known to have a direct relationship with power level, it is desirable to compensate the bias values for changes in operating power level. The power fraction used to compensate the bias values is calculated by dividing the current value of delta T by the known value of $\Delta T$ at rated thermal power. Thus, this fraction is equal to one at rated thermal power and will decrease as the operating power level decreases.

Q.3. An abbreviated, revised discussion of automatic digital channel testing is provided in Insert 5 of the enclosure to Reference (2). Provide a detailed discussion on digital channel testing planned for the plant including a discussion of the proposed frequency of testing. Also, if channels are tested in bypass, discuss the provision for bypass indication in the control room.

A.3. A detailed discussion of digital channel testing is provided in Section 2.3.6 of "Topical Report, EAGLE 21 Microprocessor-Based Process Protection System, January, 1987. At present, it is expected that Reactor Trip System Instrumentation surveillance tests will be performed every 92 days per WCAP-10271-P-A and that Engineered Safety Features Actuation System Instrumentation surveillance will be performed every 30 days. Provisions for bypass indication in the control room is discussed in Section 2.3.8 of the referenced Topical Report.

Q.4. From past experience it has been found that temperature gradients can exist through the cross section of the hot leg. The solution for improving nonuniform (temperature streaming) hot leg temperature accuracy was to use a Resistance Temperature Device (RTD) bypass system to obtain a representative sample of hot leg fluid and measure its temperature. The new design known as RTD Bypass Elimination Modification has many advantages, including reduced radiation exposure, improved availability, and reduced maintenance. However, there is also an increase in response time from 6.0 to 6.5 seconds (Reference (1)) as a disadvantage. Because this new method uses a single point measurement at locations where a scoop sampled over a length, it appears that some temperature accuracy is lost. Provide information on the relative measuring accuracy of the two methods and the effect on accident and transient analysis.

A.4. The new method of measuring hot leg temperatures, with the thermowell RTDs used in place of the three scoops, has been analyzed to be slightly more effective than the RTD bypass system, since the streaming error caused by imbalances in the scoop sample flows is eliminated. Although the new method measures temperatures at one point, at the thermowell tip, compared to the five sample points in a 5-inch span of the scoop measurement, the thermowell tip [

]. +b,c,e Temperature streaming test data has shown that

[

]+b,c,e

[

]. +b,c,e Since three RTD measurements are averaged, and the nonlinearities at each scoop [

], +b,c,e it has been concluded that the three thermowells will provide a more accurate measurement than the three scoops. The total temperature streaming uncertainty applied to the hot leg temperature measurement with thermowells has been established at [ ] +b,c,e for the scoop measurement. Therefore, a smaller hot leg temperature uncertainty can be used in the accident and transient analyses.

The only increase in temperature uncertainty incorporated into the transient analyses was the uncertainty associated with the replacement of the Rosemount RTDs currently used in the bypass loop with RdF RTDs which will be installed in the thermowells.

The RdF RTDs have a temperature uncertainty of [ ]. +b,c,e This is an increase of [ ] +b,c,e over the Rosemount RTD temperature uncertainty of [ ]. +b,c,e However, all FSAR Chapter 15 safety analyses conducted for Watts Bar have included an additional [ ] +b,c,e temperature uncertainty. As a result, the additional temperature uncertainty of [ ] +b,c,e for the RdF RTDs is bounded and does not impact the overall system accuracy or the safety analyses.

Q.5. Insert A for page 5.6-2 of Reference (2) states - "The combination of the thermowell and RTD have a thermal time constant of 5 seconds or faster." However, Reference (1) states that there is an increase in RTD system response time from the original 6 seconds to 6.5 seconds. Please explain this.

A.5. The overall RTD channel response time will increase slightly. the following table provides a comparison of the original system time response and that of the new system.

| | Present RTD Bypass System | Fast Response Thermowell System |
|---|---|---|
| RTD Bypass Piping and Thermal Lag | [ 2.0 sec | NA ]+a,c |
| RTD Response Time | 2.5 sec | 5.0 sec (*) |
| RTD Filter Time Constant | 0.0 sec | 0.0 sec |
| Electronics Delay | 1.5 sec ]+a,c | 1.5 sec ] |
| Total time Response | 6.0 sec | 6.5 sec |

[ ]+a,c

Q.6. In the proposed Chapter 7 revision of the FSAR there are several places where it is stated that information on temperature accuracy or response time is to be supplied later. These include Table 7.2-3 and page 7.3-10. When will this information be supplied?

A.6. The response time has been confirmed to increase from 6.0 to 6.5 seconds as shown in the answer to Question 5. The information concerning accuracy, if non-conservative, will be provided following completion of equipment testing. Table 7.2-3 and Page 7.3-10 have been revised accordingly (attached).

Q.7. Reference 1 states that Chapter 15 of the FSAR, "Accident Analysis," is to be updated to incorporate the effects of the RTD Bypass Elimination Modification into the Accident Analysis. The effect of the increase response time of the new RTD temperature measuring system and the accuracy, including uncertainties, of the temperature measurement will need to be accounted for, including the resulting calculation for reactor coolant average temperature. A comparison of the results before and after the change should be provided. In plots for accidents showing DNBR vs. time, it should be easy to ascertain the margin to the DNBR limit. Please provide this information in your Chapter 15 submittal.

TABLE 7.2-3

REACTOR TRIP SYSTEM INSTRUMENTATION

| | Reactor Trip Signal | Typical Range | Typical Trip Accuracy | Typical Maximum Time Response (sec) |
|---|---|---|---|---|
| 1. | Power range high neutron | 1 to 120% full power | 1% of full power | 0.5 |
| 2. | Intermediate range high neutron flux | 8 decades of neutron flux overlapping source range by 2 decades and including 100% power | ± percent of full scale ± 1 percent of full scale from $10^{-4}$ to $10^{-3}$ ampers (1) | 0.5 |
| 3. | Source range high neutron flux | 6 decades of neutron flux (1 to $10^6$ counts/sec) | ± 5 percent of full scale (1) | 0.5 |
| 4. | Power range high positive neutron flux rate | + 2 to +30% of full power | ± 5 percent (1) | 0.5 |
| 5. | Power range high negative neutron flux rate | -2 to -30% of full power | ± 5 percent (1) | 0.5 |
| 6. | Overtemperature ΔT: | $T_H$ 530 to 650°F<br>$T_C$ 510 to 630°F<br>$T_{AV}$ 530 to 630°F<br>$P_{PRZR}$ 1700 to 2500 psi<br>F(Δ ) -50 to +50%<br>ΔT Setpoint 0 to 100°F | ± 3.2°F | ~~6.0~~ 6.5<br>~~(Not including transport time)~~ |
| 7. | Overpower ΔT | $T_H$ 530 to 650°F<br>$T_C$ 510 to 630°F<br>$T_{AV}$ 530 to 630°F<br>ΔT Setpoint 0 to 100°F | ± 2.7°F | ~~6.0~~ 6.5<br>~~(Not including transport time)~~ |

consistent with the safety analyses and the Technical Specifications and are systematically verified during plant preoperational startup tests. For the overall engineered safety features response time, refer to Table 3.3-5 of the Technical Specifications. In a similar manner, for the overall reactor trip system instrumentation response time, refer to Table 3.3-2 of the Technical Specifications. 44

These maximum delay times thus include all compensation and therefore require that any such network be aligned and operating during verification testing.

The Engineered Safeguards Actuation System is always capable of having response time tests performed using the same methods as those tests performed during the preoperational test program or following significant component changes.

Maximum allowable time delays in generating the actuation signal for steam line break protection are: 35 31.69

a. Pressurizer pressure — 2.0 seconds 44

Typical maximum allowable time delays in generating the actuation signal for steam line break protection are: 35 31.69

a. Steam line flow — 2.0 seconds

b. Steam line pressure (assume other signals present) — 2.0 seconds

c. Reactor Coolant System $T_{avg}$ as measured) at the resistance temperature detector sensor output including 2 seconds for resistance temperature detector bypass delay) (assume other signals present — ~~6.0~~ 6.5 seconds 44

d. High containment pressure for closing main steam line stop valves — 1.5 seconds

e. Actuation signals for auxiliary feedwater pumps — 2.0 seconds

f. Steamline differential pressure — 2.0 seconds

A.7. The results from the reanalysis of the Watts Bar Chapter 15 FSAR accidents affected by the RTD Bypass Removal (including plots of DNBR vs. time) were transmitted to the NRC on January 27, 1987. A comparison of the results before and after the change can be obtained by comparing the revised FSAR markups transmitted in the letter referenced above with the current FSAR data.

Q.8. The Technical Specifications may need to be revised to include any effects of the RTD Bypass Modification. Please indicate when this information will be supplied.

A.8. Changes to the Technical Specifications will be developed and submitted as part of the WBN Technical Specification Certification Program. These changes are expected to include Overtemperature ΔT time constants, Overtemperature ΔT and Overpower ΔT response times, and Overtemperature ΔT, Overpower ΔT, Reactor Coolant Flow-low and Tavg-low-low allowable values.

Q.9. The RTD bypass removal has an effect on the accuracy of the hot leg temperature reading. The hot leg temperature reading has a major impact on the calculations when flow measurement uncertainty is analyzed. A flow measurement uncertainty analysis for Watts Bar was provided by a letter dated August 30, 1984 with a flow measurement uncertainty of ±1.8% which included a venturi fouling penality of ±0.1%. Also, a revised Technical Specification (Figure 3.2-3 "RCS Total Flow Rate Versus R") to reflect the 1.8% flow measurement uncertainty was provided by letter dated February 7, 1985. However, because of the change in temperature accuracy with the new RTD temperature measurement system a revised flow measurement analysis and Technical Specification is required. Please provide this analysis for review.

A.9. Based upon preliminary calculations, the RCS flow measurement uncertainty is expected to remain unchanged. This will be verified after finalization of the process equipment design and final calculation of the instrument uncertainties. If needed, changes to the Technical Specifications will be developed and submitted as part of the WBN Technical Specification Certification Program.