Westinghouse Electric Company, LLC

Box 355
Pittsburgh Pennsylvania 15230-0355

June 22, 2001

CAW-01-1469

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: Mr. Samuel J. Collins

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

Subject "Responses to Request for Additional Information for the Westinghouse Revised Thermal Design Procedure Instrument Uncertainty Methodology for Beaver Valley Unit 1 and Unit 2, License Amendment Request" (Westinghouse Proprietary Class 2)

Dear Mr. Collins:

The proprietary information for which withholding is being requested in the above-referenced responses to RAIs which are further identified in Affidavit CAW-01-1469 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 2.790 of the Commission's regulations.

Accordingly, this letter authorizes the utilization of the accompanying Affidavit by FirstEnergy Nuclear Operating Company.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-01-1469 and should be addressed to the undersigned.

Very truly yours,

J. S. Galembush, Acting Manager
Regulatory and Licensing Engineering

Enclosures

cc: S. Bloom/NRR/OWFN/DRPW/PDIV2 (Rockville, MD) 1L

# AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared John S. Galembush, 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:

John S. Galembush

John S. Galembush, Acting Manager
Regulatory and Licensing Engineering

Sworn to and subscribed
before me this 22ND day
of June, 2001

Lorraine M. Piplica

Notary Public

Notarial Seal
Lorraine M. Piplica, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Dec. 14, 2003
Member, Pennsylvania Association of Notaries

(1) I am Acting Manager, Regulatory and Licensing Engineering, in Nuclear Services at 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 rulemaking 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 2.790 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 the Westinghouse Electric Company LLC 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.

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

(iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in "Response to NRC Request for Additional Information for the Westinghouse Revised Thermal Design Procedure Instrument Uncertainty Methodology for Beaver Valley Unit 1 and Unit 2 License Amendment Request (Class 2)" [Proprietary] being transmitted by FirstEnergy Nuclear Operating Company letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk, Attention Mr. Samuel J. Collins. The proprietary information as submitted for use by FirstEnergy Nuclear Operating Company for the Beaver Valley Units is expected to be applicable in other licensee submittals in response to certain NRC requirements for uprating.

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

(a) Provide documentation of the analysis, methods, used for determining technical specification setpoints, utilizing the instrumentation uncertainties.

(b) Calculate the instrumentation uncertainties for the Technical Specification setpoints.

(c) Establish systematic and random uncertainties in providing Technical Specification setpoints.

(d) Provide the methods in determining the instrumentation uncertainties.

(e) Assist the customer to obtain NRC approval.

Further this information has substantial commercial value as follows:

(a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for licensing documentation.

(b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

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 calculation, evaluation 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 knowledge 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 for developing analytical methods and performing tests.

Further the deponent sayeth not.

ATTACHMENT A-3 to Letter L-01-090

Attached is a document titled "Responses to Request for Additional Information for the Westinghouse Revised Thermal Design Procedure Instrument Uncertainty Methodology for Beaver Valley Unit 1 and Unit 2, License Amendment Request" (Westinghouse Non-Proprietary Class 3)

**Responses to Request for Additional Information for the Westinghouse Revised Thermal Design Procedure Instrument Uncertainty Methodology for Beaver Valley Unit 1 and Unit 2, License Amendment Request**

*1.* *The BVPS current TS BASES states that the design DNBR limit using the mini-RTDP is 1.21, and the safety analysis DNBR limit is 1.33. By using the RTDP, the design DNBR limits are 1.24 and 1.23 for typical cells and thimble cells, respectively.*

*A.* *Provide the derivation of the design DNBR limits for the typical cells and thimble cells for the RTDP. The derivation should include the uncertainty values of these parameters, (e.g., nuclear peaking factor, fuel fabrication parameters and THINC-IV thermal hydraulic code) included in mini-RTDP, the uncertainty values for the reactor power, pressurizer pressure, RCS flow rate and temperature, as well as the WRB-1 correlation.*

*B.* *The secondary power calorimetric measurement uncertainty have different uncertainty values depending on the use of feedwater venturi or Caldon leading edge flow meter for feedwater flow measurement. Are the RTDP design DNBR limits of 1.23 and 1.24 based on feedwater venturi or Caldon LEFM?*

Response to 1

1.A. The derivation of the DNBR design limits and subsequent margin are as follows.

Table 1 provides the WRB-1 DNB Correlation statistics that are used in the generation of the RTDP DNBR Design Limits. Tables 2 and 3 are listings of the mean ($\mu$), standard deviation ($\sigma$) and sensitivity (S) values for the various parameters used to determine the DNBR Design Limit for the Thimble Cell and Typical Cell respectively. These values are used to calculate the intermediate quantities $S^2(\sigma/\mu)^2$, $(\sigma_y/\mu_y)^2$ and $(\sigma_z/\mu_z)$ as defined in both Tables 2 and 3. The DNBR Design Limits used are conservatively set slightly higher than the calculated values. Tables 4 and 5 are the DNBR Margin Summaries for both Typical Cell and Thimble Cell for the Loss of Flow transient (Table 4) and the remaining transients (Table 5). The Loss of Flow analyses resulted in minimum DNBR values for the Frequency Decay case of less than the original 1.36 value when the 1.4 % RTP uprate was included in the statepoint analysis. As a result, the DNBR Safety Limits were revised to a value of 1.33 for both Typical and Thimble Cells. This reduction resulted in revised DNBR margin values as noted on Tables 4 and 5. In both instances there is still net margin available for all transients after the uprating.

1.B. The secondary side power calorimetric measurement uncertainty used in the determination of the RTDP DNBR Design Limits for both Typical and Thimble Cells is conservatively based on the plant use of the feedwater venturis. A small amount of additional DNBR margin would be generated if the uncertainty associated with the plant use of the LEFM was assumed in the determination of the RTDP DNBR Design Limits.

**Table 1 - WRB-1 DNB Correlation Statistics**

| Number of Data Points | $\mu_{M/P}$ | $\sigma_{M/P}$ | k<br>95/95 one-sided<br>tolerance factor |
|---|---|---|---|
| [ | | | ]+a,c |

**Table 2 - RTDP DNBR Design Limit for Thimble Cell**

| Parameter | $\mu$ | $\sigma$ | S | $S^2(\sigma/\mu)^2$ |
|---|---|---|---|---|
| Power, fraction | 1.0 | [ | | ]+a,c |
| Tin, °F | 542.6 | | | |
| Pressure, psia | 2270 | | | |
| Flow, fraction | 1.0 | | | |
| Effective flow fraction (bypass) | 0.944 | | | |
| FΔH | 1.56 | | | |
| FΔH(E) | 1.0 | | | |
| THINC-IV | 1.0 | | | |
| Transient Code | 1.0 | | | |

$(\sigma_y/\mu_y)^2 = \Sigma[S^2(\sigma/\mu)^2] =$ [ ]+a,c

$$(\sigma_z / \mu_z) = \sqrt{(\sigma_y / \mu_y)^2 + [(k\,\sigma_{M/P})/(1.645\,\mu_{M/P})]^2}$$

A conservative value of 1.23 was used.

$$DNBRDesignLimit = 1/\{\mu_{M/P}[1-1.645(\sigma_z/\mu_z)]\} = [1.224]^{+a,c}$$

**Table 3 - RTDP DNBR Design Limit for Typical Cell**

| Parameter | μ | σ | S | $S^2(\sigma/\mu)^2$ |
|---|---|---|---|---|
| Power, fraction | 1.0 | | | +a,c |
| Tin, °F | 542.6 | | | |
| Pressure, psia | 2270 | | | |
| Flow, fraction | 1.0 | | | |
| Effective flow fraction (bypass) | 0.944 | | | |
| FΔH | 1.56 | | | |
| FΔH(E) | 1.0 | | | |
| THINC-IV | 1.0 | | | |
| Transient Code | 1.0 | | | |

$(\sigma_y/\mu_y)^2 = \Sigma[S^2(\sigma/\mu)^2] = [\qquad]^{+a,c}$

$$(\sigma_z/\mu_z) = \sqrt{(\sigma_y/\mu_y)^2 + [(k\,\sigma_{M/P})/(1.645\,\mu_{M/P})]^2}$$

$$DNBRDesignLimit = 1/\{\mu_{M/P}[1-1.645(\sigma_z/\mu_z)]\} = [1.230]^{+a,c}$$

A conservative value of 1.24 was used.

**Table 4 - DNBR Margin Summary I**

(Loss of Flow at the 1.4 % RTP Uprated Conditions)

| | Typical Cell | Thimble Cell |
|---|---|---|
| DNBR Correlation Limit | 1.17 | 1.17 |
| DNBR Design Limit | 1.24 | 1.23 |
| DNBR Safety Limit | 1.33 | 1.33 |
| DNBR Margin, % | 6.8 | 7.5 |
| Rod Bow Penalty, % | 1.3 | 1.3 |
| Net Remaining Margin, % | 5.5 | 6.2 |

**Table 5 - DNBR Margin Summary II**

(1.4 % RTP Uprate for Remaining Transients)

| | Typical Cell | Thimble Cell |
|---|---|---|
| DNBR Correlation Limit | 1.17 | 1.17 |
| DNBR Design Limit | 1.24 | 1.23 |
| DNBR Safety Limit | 1.33 | 1.33 |
| DNBR Margin, % | 6.8 | 7.5 |
| 1.4 % RTP Uprate, % | 3.3 | 3.1 |
| Rod Bow Penalty, % | 1.3 | 1.3 |
| Net Remaining Margin, % | 2.2 | 3.1 |

2. *As a result of changing from mini-RTDP to RTDP methodology, the design DNBR and safety analysis DNBR limits are changed accordingly. The reactor core safety limits figure, which show the loci points of T-avg as a function of pressurizer pressure and rated thermal power for which the minimum DNBR is no less than the safety analysis DNBR limit, or the average enthalpy at the vessel exit is equal to the saturated liquid enthalpy, is also revised. Attachments A-1 and A-2, respectively, to the December 27, 2000, letter provided revised Figure 2.1-1, "Reactor Core Safety Limits," for Units 1 and 2.*

A. *Describe how this new figure is determined. Is this figure based on the RTDP safety analysis DNBR limit of 1.36?*

B. *Provide a reference to topical report which describe the methodology for the determination of the core safety limit figure. Has the TR referenced in TS Section 6.9.5.*

C. *What is the rated power level the revised figure was based on, the current power level of 2,652 Mwt, or the 1.4% power uprate condition of 2,689 MWt?*

Response to 2

See response to question 5 which addresses question 2.

3. *The DNB-related parameters in TS 3.2.5 for pressurizer pressure, RCS average temperature and total flow are changed from "analysis" values to "indicated" values as follows:*

| | *For Unit 1* | *Unit 2* |
|---|---|---|
| *RCS T-avg:* | *from 580.7°F to 580.0°F* | *from 580.2°F to 579.9°F* |
| *Pressurizer pressure:* | *from 2220 psia to 2215 psia* | *from 2220 psia to 2214 psia* |
| *RCS total flow :* | *from 261,600 to 267,400 gpm* | *from 261,600 to 267,200 gpm* |

*Since the thermal design flow (current analysis value) for both BVPS units is 261,600 gpm, the minimum measured flows (indicated values) of 267,400 and 267,200 gpm, respectively, for Units 1 and 2 reflect the corresponding flow measurement uncertainties of 2.2% and 2.1%, respectively.*

A. *Explain how the indicated values of pressurizer pressure and RCS average temperature are related to the safety analysis values and the uncertainty values.*

B. *Why are the indicated values for the pressurizer pressure lower than the current TS values for Units 1 and 2?*

C. *Explain how the current analysis values and the indicated values of these DNB parameters are related to the RTDP methodology.*

D. *Have new analyses been performed with the revised DNB parameters values as the initial conditions to demonstrate that the RTDP safety analysis DNBR limit is not exceeded for all AOOs? If not, are the existing analyses for all AOOs satisfy the RTDP safety analysis DNBR limit?*

E. *How are the indicated values of the DNB parameters related to the design parameter values?*

Response to 3

3.A. As noted, the DNB – Related Parameters specification limits for Tavg and Pressurizer Pressure are indicated values. These values have a [ ]$^{+a,c}$ with their corresponding safety analyses values. The full power, vessel Tavg is defined as 576.2 °F for both units. This is the nominal value assumed in the safety analyses as the initial plant condition. The indication uncertainty for Unit 1 is calculated in the same manner as noted in WCAP-15264 Rev 3, Table 2, page 8, [ ]$^{+a,c}$. The indication uncertainty for Unit 2 is calculated in the same manner as noted in WCAP-15265 Rev 3, Table 2, page 8, [ ]$^{+a,c}$. The indication uncertainty is added to 576.2 °F to arrive at the appropriate plant Tech Spec limit, 580 °F for Unit 1 and 579.9 °F for Unit 2. These indication uncertainty values are [ ]$^{+a,c}$ the value utilized in determining the RTDP DNBR Design Limit, page 39 of WCAP- 15264, Rev 3.

A similar calculation is performed for Pressurizer Pressure. The nominal Pressurizer Pressure is defined as 2250 psia. The indication uncertainty for Unit 1 is calculated in the same manner as noted in WCAP-15264 Rev 3, Table 1, page 6, [ ]$^{+a,c}$. The indication uncertainty for Unit 2 is calculated in the same manner as noted in WCAP-15265 Rev 3, page 6, [ ]$^{+a,c}$. The indication uncertainty is subtracted from 2250 psia to arrive at the appropriate plant Tech Spec limit, 2215 psia for Unit 1 and 2214 psia for Unit 2. These indication uncertainty values are [ ]$^{+a,c}$ the value utilized in determining the RTDP DNBR Design Limit, page 39 of WCAP-15264 Rev 3.

3.B. The recommendations for the Tech Spec indicated values reflect the current installed plant hardware (transmitters, process racks) and current plant procedures which result in a different combination of uncertainties from previous calculations. Thus the differences reflect changes in the plant configurations.

3.C. As noted in the response to 3.A, the Tech Spec indication values use the same parameter uncertainties and methodology as the RTDP inputs, [

1]$^{+a,c}$. Thus the two sets of calculations are closely related.

3.D. The response has been addressed with the response to RAI #6.

3.E. As noted in the response to 3.A, the Tech Spec limits for Tavg and Pressure are based on the same nominal, full power initial condition values (576.2 °F and 2250 psia) as the RTDP safety analyses. The DNBR design limits are [

]$^{+a,c}$.

4. *For the BVPS Unit 1 OTΔT and OPΔT trip function equations, the T-avg at RATED THERMAL POWER, T' and T", respectively, is changed from 576.3°F to 576.2°F (same as Unit 2), which is said to be necessary to make the values for T' and T" in the TS consistent with the nominal RCS average temperature assumed in the safety analysis. However, the vessel average RC temperature, whereas the revised T-avg values in TS 3.2.5 are 580.0 and 579.9°F, respectively, for Units 1 and 2.*

A. *Explain the difference in the T-avg for the OTΔT and OPΔT trip function and the DNB parameter value.*

B. *What is the value used in the safety analysis? What is the rated thermal power, 2652 or 2689 MWt?*

Response to 4

4.A. The value for T' for Overtemperature ΔT and T" for Overpower ΔT is 576.2 °F. This is the nominal, full power initial condition assumption for the safety analyses and is the starting point for determination of the DNB parameter value for Tavg. The DNB parameter value takes into account [

]$^{+a,c}$. T' and T" are protection system settings, above which a reduction in the trip setpoints should occur. With respect to the protection functions, T' and T" represent the nominal full power, loop specific, indicated Tavg. The values noted in the Tech Specs are upper limits for these settings and can not be set higher. The actual setting may be less if the nominal full power, indicated Tavg for that specific loop is less.

4.B. The nominal, full power Tavg value used in the safety analyses is 576.2 °F. The rated thermal power reflecting the uprating is 2689 MWt for the core power.

5. *Describe how the constants $K_1$, $K_2$, $K_3$, $K_4$, $K_5$ and $K_6$ in the OTΔP and OPΔT trip functions are determined from the revised reactor core safety limits associated with the RTDP.*

Response to 5

The responses to RAI #2 (all three parts) and RAI #5 are related and are discussed together.

The revised core safety limits figure (Figure 2.1-1) represents the locus of conditions where the calculated DNBRs are equal to either a DNBR Limit of 1.36 or where boiling is predicted at the vessel outlet, which ever is more restrictive. The core safety limits are calculated assuming the uprated core power of 2689 MWt and the Minimum Measured Flow of 266800 gpm. Core safety limits based on the uprated power of 2689 MWt are conservative for the pre-uprated power of 2652 MWt.

There is no topical report that discusses how the core safety limits figure is generated. The DNBR calculations are performed using the THINC code (WCAP-12330-A) and using the RTDP methodology (WCAP-11397-P-A / WCAP-11397-A).

Subsequent to generating the core safety limits curve based on a safety analysis limit (SAL) DNBR of 1.36, the SAL was reduced to 1.33. The DNBR Design limits are 1.24 (typical) and 1.23 (thimble). All RTDP transients must meet these limits. The original SAL was set to 1.36 in order to preserve some DNBR margin for future use and to accommodate a generic rod bow penalty of 1.3%. The results of the revised safety analyses show a minimum DNBR of 1.335 for the Complete Loss of Flow event for both Beaver Valley Units. Therefore, to bound the analyses at uprated conditions, the SAL has been reduced to 1.33. This reduced SAL still maintains margin to the design limit of 1.24 (typical) and 1.23 (thimble). Using the core safety limits based on a SAL of 1.36 with the revised SAL of 1.33 is conservative. The Exit Boiling portion of the core safety limits (left side of the figure) is not a function of the SAL and, thus, would be unchanged. If the core safety limits were revised based on the revised limit of 1.33, then the DNB portion of the core safety limits (right side of the figure) would shift upwards slightly. That is, for a given power level and pressure, a slightly higher average temperature would be required to calculate a DNBR of 1.33.

The core safety limits are used to generate the Overtemperature Delta-T (OTΔT) and Overpower Delta-T (OPΔT) setpoints. The methodology used in determining the OTΔT and OPΔT setpoints is described in WCAP-8745-P-A. Basically, the OTΔT and OPΔT setpoints are set to provide a reactor trip prior to reaching conditions where the DNBR would fall below the SAL. The OTΔT and OPDT protective functions protect the portions of the core safety limits that are not protected by the High Pressurizer Pressure Trip, the Low Pressurizer Pressure Trip and the steam generator safety valves.

In the RTDP LAR, only $K_1$ and $K_4$ have been changed from the pre-RTDP setpoints. $K_2$, $K_3$, $K_5$ and $K_6$ remain unchanged.

6. *Since the OTΔT and OPΔT trip functions have been revised, have the safety analysis of various transients (e.g., uncontrolled RCCA bank withdrawal at power, loss of external load/turbine trip, accidental RCS depressurization) been performed with the revised OTΔT and OPΔT trip equations to ensure that the SAFDL limits are not violated? If not, what is the basis for acceptability of the revised OTΔT and OPΔT trip functions setpoints?*

<u>Response to 6</u>

All of the non-LOCA events impacted by the transition to RTDP methodology and/or the revised OTΔT/OPΔT setpoints have been explicitly reanalyzed. The events reanalyzed due to RTDP are: Rod Withdrawal at Power, Partial and Complete Loss of Flow, Loss of Load, RCS Depressurization, Feedwater Malfunction, Excessive Load Increase and Locked Rotor. The events that credit OTΔT for protection are: Rod Withdrawal at Power, Loss of Load and RCS Depressurization. No non-LOCA analysis in either the current licensing basis or the analyses performed in support of this LAR explicitly credits OPΔT for protection. These events were explicitly performed at conditions consistent with the uprated power level. It should be pointed out that nominal initial conditions are assumed consistent with RTDP methodology (see WCAP-11397-P-A / WCAP-11397-A). The specific initial conditions are as follows:

| | |
|---|---|
| NSSS power | 2697 MWt |
| Core power | 2689 MWt |
| Full Power Vessel $T_{avg}$ | 576.2°F |
| No Load Temperature | 547 °F |
| Primary Pressure | 2250 psia |
| Secondary Pressure | 806 psia (0% S/G Tube Plugging) |
| Secondary Pressure | 716 psia (30% S/G Tube Plugging) |
| Minimum measured RCS flow | 266,800 gpm |

Of these parameters, only the Nuclear Steam Supply System (NSSS) Power, Core Power, and Secondary Pressure have changed from the pre-uprated nominal conditions. The effects of the change in secondary pressure (approximately 5 psia decrease) is insignificant on the results of the accidents and the effect of the increased power (1.4 %) is to reduce Departure from Nucleate Boiling Ratio (DNBR) margin by approximately this amount.

The results of those analyses are summarized in the following table:

**Summary of the non-LOCA analyses performed in support of the RTDP Methodology.**

| Event Name | UFSAR Section | Minimum DNBR | Peak Primary Pressure | Peak Secondary Pressure |
|---|---|---|---|---|
| Rod Withdrawal at Power (Unit 1) | 14.1.2 | 1.370 | N/A * | 1171 psia |
| Rod Withdrawal at Power (Unit 2) | 15.4.2 | 1.362 | N/A * | 1171 psia |
| Partial Loss of Flow (Unit 1) | 14.1.5 | 1.787 | 2339.5 psia | 922.2 psia |
| Partial Loss of Flow (Unit 2) | 15.3.1 | 1.790 | 2327.8 psia | 920.6 psia |
| Loss of Load – DNB Case (Unit 1) | 14.1.7 | 1.72 | 2675.2 psia | 1177.4 psia |
| Loss of Load – DNB Case (Unit 2) | 15.2.2/15.2.3 | 1.67 | 2747.5 psia | 1182.5 psia |
| Feedwater Malfunction (Unit 1) | 14.1.9 | 1.835 | 2338 psia | 1123 psia |
| Feedwater Malfunction (Unit 2) | 15.1.1/15.1.2 | 1.894 | 2341 psia | 1179 psia |
| Excessive Load Increase (Unit 1) | 14.1.10 | >1.33 | N/A | N/A |
| Excessive Load Increase (Unit 2) | 15.1.3 | >1.33 | N/A | N/A |
| RCS Depressurization (Unit 1) | 14.1.15 | 1.65 | N/A | N/A |
| RCS Depressurization (Unit 2) | 15.6.1 | 1.76 | N/A | N/A |
| Complete Loss of Flow (Unit 1) | 14.2.9 | 1.335 | 2421.1 psia | 949.4 psia |
| Complete Loss of Flow (Unit 2) | 15.3.2 | 1.335 | 2114.2 psia | 951.0 psia |
| Limits | --- | 1.33 | 2748.5 psia | 1208.5 psia |

| Event Name | UFSAR Section | Percentage of rods in DNB | Peak Primary Pressure |
|---|---|---|---|
| Locked Rotor – DNB Case (Unit 1) | 14.2.7 | < 18% | 2691 psia |
| Locked Rotor – DNB Case (Unit 2) | 15.3.3 | < 18% | 2759.3 psia |
| Limits | --- | 18% | 2997 psia** |

* A generic Westinghouse evaluation addresses peak pressures for Rod Withdrawal at Power analyses.
** The peak Reactor Coolant System pressure reached during the transient is less than that which would cause stresses to exceed the faulted condition stress limits.

*7. In the OTΔT and OPΔT trip functions:*

*A. Explain the basis for adding the inequality "≤" for the coefficients $K_1$ and $K_4$, and "≥" for $K_2$, $K_3$, $K_5$ and $K_6$. Or provide the following reference: NTD-RROI-SSO-430/NTD-NSA-TA-95-370, "Identification of Conservative Directions for Constants in OTΔT and OPΔT Reactor Trip Functions," September 1, 1995.*

B. *Explain the basis for adding the "≥" for the values of lead time constants, and "≤" for lag time constants in the dynamic compensation of the OTΔT and OPΔT trip functions.*

Response to 7

7.A. NTD-RROI-SSO-430/NTD-NSA-TA-95-370 is a Westinghouse internal letter. The internal characteristics have been removed and the letter has been attached per the NRC's request. The primary basis for determining the directions of conservatism is the arithmetic evaluation resulting in the decreasing of the trip setpoint.

7.B. As noted in NTD-RROI-SSO-430/NTD-NSA-TA-95-370, the basis for the direction of conservatism for time constants is an evaluation resulting in the decreasing of the function's response time.

ATTACHMENT 10
RAI 7A & B

NTD-RROI-SSO-95-430

NTD-NSA-TA-95-370

FROM: Risk, Reliability and Operations Improvement/Nuclear Safety Analysis

WIN:

DATE: September 1, 1995

SUBJECT: IDENTIFICATION OF CONSERVATIVE DIRECTIONS FOR CONSTANTS IN OTΔT AND OPΔT REACTOR TRIP FUNCTIONS

TO:

CC:

SSO was requested to identify the conservative directions for the setting of the various constants in the OTΔT and OPΔT reactor trip functions. There appears to be some confusion or possible incorrect inequalities in the and Generic Merits Technical Specifications. The following is provided in an attempt to clarify and solidify the appropriate directions of conservatism for all of the constants for these two functions. The equations noted are from the Generic Merits Technical Specifications Rev. 1 dated 4/7/95. Please forward the attached to at your convenience. If you have any questions concerning the attached, please feel free in contacting the undersigned.

C. R. Tuley
Safety Systems Operations

Approved: D. S. Huegel
Transient Analyses

$$\Delta T \frac{(1+\tau_1 S)}{(1+\tau_2 S)} \frac{(1)}{(1+\tau_3 S)} \leq \Delta T_0 [K_1 - K_2 \frac{(1+\tau_4 S)}{(1+\tau_5 S)} [T \frac{(1)}{(1+\tau_6 S)} - T'] + K_3(P - P') - f_1(\Delta I)]$$

OVERTEMPERATURE $\Delta T$

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $K_1$ | $\leq$ | Identified Value | $K_2$ | $\geq$ | Identified Value | $K_3$ | $\geq$ | Identified Value |
| $\tau_1$ | $\geq$ | Identified Value | $\tau_2$ | $\leq$ | Identified Value | $\tau_3$ | $\leq$ | Identified Value |
| $\tau_4$ | $\geq$ | Identified Value | $\tau_5$ | $\leq$ | Identified Value | $\tau_6$ | $\leq$ | Identified Value |
| $\Delta T_0$ | $\leq$ | Indicated Value | T' | $\leq$ | Indicated Value | P' | $\geq$ | 2235 psig |

For time constants ($\tau$) the direction of conservatism results in a decrease in the function's response time. This results in the basic directions of:

increasing lead/lag ratios,

decreasing lags and

increasing rate lags.

Although a "direction of conservatism" is identified for the Overtemperature $\Delta T$ reactor trip function $K_2$ and $K_3$ gains, the gains should be set as close as possible to the value contained in the plant Technical Specifications to ensure that the Overtemperature $\Delta T$ setpoint is consistent with the assumptions of the safety analyses. It is suggested this statement be included in the Bases of the plant Technical Specifications.

$$\Delta T \frac{(1+\tau_1 S)}{(1+\tau_2 S)} \frac{(1)}{(1+\tau_3 S)} \leq \Delta T_o [K_4 - K_5 \frac{(\tau_7 S)}{(1+\tau_7 S)} \frac{(1)}{(1+\tau_6 S)} T - K_6 [T \frac{(1)}{(1+\tau_6 S)} - T''] - f_2(\Delta I)]$$

OVERPOWER $\Delta T$

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $K_4$ | $\leq$ | Identified Value | $K_5$ | $\geq$ | Identified Value | $K_6$ | $\geq$ | Identified Value |
| $\tau_1$ | $\geq$ | Identified Value | $\tau_2$ | $\leq$ | Identified Value | $\tau_3$ | $\leq$ | Identified Value |
| $\tau_6$ | $\leq$ | Identified Value | $\tau_7$ | $\geq$ | Identified Value | | | |
| $\Delta T_o$ | $\leq$ | Indicated Value | T" | $\leq$ | Indicated Value | | | |

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