Ameren Corporation

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February 11, 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

ULNRC-05117

Ladies and Gentlemen:

Ameren

DOCKET NUMBER 50-483
UNION ELECTRIC COMPANY
CALLAWAY PLANT
TECHNICAL SPECIFICATION REVISIONS ASSOCIATED WITH THE STEAM GENERATOR REPLACEMENT PROJECT

References: 1. ULNRC-05056 dated September 17, 2004
2. NRC Request for Additional Information Letter dated December 20, 2004 (TAC No. MC4437)

In Reference 1 above, AmerenUE transmitted an application for amendment to Facility Operating License Number NPF-30 for the Callaway Plant. In Reference 2, NRC requested additional information to support their review of the amendment application. The attachments to this letter provide the responses to those questions.

Westinghouse Electric Company LLC has determined that Figure 2, Callaway GOTHIC Containment Model for LOCA Events, on page 8 of 11 in Attachment 1 hereto is proprietary and is 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 10 CFR 2.390. Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR 2.390.

Correspondence with respect to the copyright or proprietary aspects of Attachment 1 or the supporting Westinghouse affidavit should reference CAW-05-1944 and be addressed to J. A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, LLC, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

AP01

Attachment 1 contains the proprietary version of the response to questions 1 through 3 of Reference 2. Attachment 2 contains the non-proprietary version of the response to questions 1 through 3 of Reference 2. Two topical reports, WCAP-10325 and WCAP-8822, are cited in the response to question 2.g in Attachments 1 and 2. Complete citations for those topical reports are as follows:

WCAP-10325-P-A, (Proprietary) and WCAP-10326-A (Non-Proprietary), "Westinghouse LOCA Mass and Energy Release Model for Containment Design - March 1979 Version," May 1983

WCAP-8822 (Proprietary) and WCAP-8860 (Non-Proprietary), "Mass and Energy Releases Following a Steam Line Rupture," September 1976; WCAP-8822-S1-P-A (Proprietary) and WCAP-8860-S1-A (Non-Proprietary), "Supplement 1 – Calculations of Steam Superheat in Mass/Energy Releases Following a Steam Line Rupture," September 1986; WCAP-8822-S2-P-A (Proprietary) and WCAP-8860-S2-A (Non-Proprietary), "Supplement 2 – Impact of Steam Superheat in Mass/Energy Releases Following a Steam Line Rupture for Dry and Subatmospheric Containment Designs," September 1986.

Attachment 3 contains the Westinghouse application for withholding, including authorization letter CAW-05-1944 with accompanying affidavit, Proprietary Information Notice, and Copyright Notice. Attachment 4 contains the response to questions 4 through 11 of Reference 2. Attachment 5 contains the containment pressure and temperature curves requested in question 5 and corresponding changes to Attachment 1 of Reference 1. Attachment 5 also contains changes to TS Bases Insert B 3.4.13.D from Attachment 4 of Reference 1 that are required to reflect the response to question 10.

If you have any further questions on this amendment application, please contact us.

Very truly yours,

Keith D. Young

Keith D. Young
Manager-Regulatory Affairs

Attachments:
1) Response to Request for Additional Information, Questions 1-3 (Proprietary Version)
2) Response to Request for Additional Information, Questions 1-3 (Non-Proprietary Version)
3) Westinghouse Application for Withholding
4) Response to Request for Additional Information, Questions 4-11
5) Containment Pressure and Temperature Curves and Changes to Attachments 1 and 4 of Reference 1

cc:

U.S. Nuclear Regulatory Commission (Original and 1 copy)
Attn: Document Control Desk
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Washington, DC 20555-0001

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Deputy Director
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STATE OF MISSOURI)
) SS
COUNTY OF CALLAWAY)

Keith D. Young, of lawful age, being first duly sworn upon oath says that he is Manager, Regulatory Affairs, for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Keith D. Young
Keith D. Young
Manager, Regulatory Affairs

SUBSCRIBED and sworn to before me this 11th day of February, 2005.

CATHY J. CRISP
MY COMM. EXP.
NOTARY SEAL
NOTARY PUBLIC
JAN. 29, 2006
STATE OF MISSOURI

Cathy J. Crisp
Notary Public
State of Missouri
Expiration 1-29-06

ATTACHMENT 2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION QUESTIONS 1-3 (NON-PROPRIETARY)

Responses to NRC Request for Additional Information on WCAP-16265-P, Rev. 0, "Callaway Replacement Steam Generator Program NSSS Licensing Report"

TAC No. MC4437

February 2005

Westinghouse Electric Company LLC
P.O. Box 355
Pittsburgh, PA 15230-0355

By letter dated September 17, 2004, Union Electric Company (the licensee) requested NRC approval for changes to the Technical Specifications for the Callaway Plant, Unit 1 (Callaway) to support the installation of the replacement steam generators in the fall of 2005 in refueling outage 14. Based on its review of the licensee's application in the area of containment integrity, the NRC staff requests the following additional information:

1. What version of the GOTHIC computer code was used for the containment integrity calculations for Callaway?

GOTHIC version 7.1p1 was used for the Callaway containment integrity calculations.

2. Discuss and describe the containment model used for the containment integrity calculations for Callaway, including the following (subroutines in the GOTHIC 7.0 manual may be referenced, if appropriate):

    a. Noding (if more than one node, provide noding diagram).

The Callaway GOTHIC containment model for a MSLB event is shown in Figure 1. The containment (Volume 1) is modeled with a single lumped parameter node. Two boundary conditions (1F and 2F) are used to represent the sources of mass and energy from the break. The spray injection system is modeled with boundary condition (3F). Flow paths connect the boundary conditions to the containment volume. Fifteen heat sinks and a fan cooler component are also shown.

The Callaway GOTHIC containment model for a LOCA event is shown in Figure 2. Additional boundary conditions, volumes, flow paths, and components are used to model accumulator nitrogen release and sump recirculation. The recirculation system model uses GOTHIC component models for the residual heat removal (RHR) and component cooling water (CCW) heat exchangers and the CCW pumps. Recirculation flow from the sump is modeled using a boundary condition.

    b. Initial conditions (temperature, pressure, relative humidity).

The containment initial conditions are listed below:

- Pressure – 14.7 psia
- Relative Humidity – 50%
- Temperature – 120°F

The LOCA containment response model contains volumes representing the RHR system and the CCW system. The RHR system volumes were initially filled with hot (200°F) water at the containment pressure. Most of the CCW system volumes in the LOCA containment response model were also initially filled with hot water, but at a higher pressure of 60 psia; the CCW surge tank was modeled as half full.

    c. Assumed containment volume.

A containment minimum free volume input value of 2500000 cf was used in the Callaway GOTHIC containment model.

d. Heat sinks (a description, not a detailed list).

The Callaway GOTHIC containment heat sinks were taken from the Callaway CONTEMPT containment model. The area, thickness and material property data for the 15 containment heat sinks are shown in Table 1.

A thin air gap is assumed to exist between the steel and concrete for steel-jacketed heat sinks. The gap thickness and air properties used in the GOTHIC analyses were the same values used in previous Callaway Analyses that were performed with either COPATTA or CONTEMPT.

The volumetric heat capacity and thermal conductivity for the heat sink materials are summarized in Table 2. Values for the density of concrete, steel, zinc, and air were taken from Reference1 and the specific heat values were calculated based on the volumetric heat capacity values specified in the Callaway CONTEMPT containment model. The specific heat for the paint was assumed to be 1.0 BTU/lbm-F; the density was calculated based on the volumetric heat capacity given in Callaway CONTEMPT containment model.

e. Modelings of the containment spray (including drop size assumption) and fan coolers.

The containment fan coolers are modeled with a cooler component. There are two fan coolers per train and two trains are normally available. The fan coolers in the containment evaluation model are modeled to actuate after the containment HI-1 setpoint (6 psig) is reached and begin removing heat from containment after a specified 60 second delay. The fan cooler heat removal rate per train is given as a function of containment temperature in the Callaway CONTEMPT containment model and is shown in Figure 3. This represents a 34% reduction in the original fan cooler heat removal capability. The heat removal rate is read into a GOTHIC function and a multiplier, based on the number of fan cooler trains running, is used to calculate the heat removal rate from containment.

Containment spray is modeled with a flow boundary condition. There is one spray pump per train and two trains are normally available. The spray pumps in the containment evaluation model are modeled to actuate after the containment HI-3 setpoint (30 psig) is reached and spray flow begins to enter containment after a specified 35 second delay. The spray flow rate given in the Callaway CONTEMPT containment model (426.4 lbm/s) was used as input for the GOTHIC spray flow rate function.

GOTHIC also requires an input value for the spray drop diameter. From Figure 6.5-2 of the Callaway FSAR, most of the drops created by the containment spray nozzles have diameters that are less than 1000 microns. A mean drop diameter value of 526 microns is specified in the FSAR and is used in the GOTHIC containment evaluation model.

f. Modeling of heat transfer from the water on the containment floor to the containment atmosphere, for the design-basis loss of coolant (LOCA) analyses.

A pool surface area for interface heat and mass transfer is typically modeled in GOTHIC. The GOTHIC pool surface area input value is the sum of the horizontal floor heat sink areas. Condensation occurs when the containment steam partial pressure is higher than the saturation pressure at the pool surface; evaporation occurs when the containment steam partial pressure is lower than the saturation pressure at the pool surface.

g. Modeling of the break flow including behavior of drops (e.g., settling, coagulation, impact, etc.) in the flow, if modeled.

The LOCA and MSLB transient mass and energy releases are calculated separately and input to the GOTHIC containment models via boundary conditions. The break mass and enthalpy are input to the containment model through forcing functions on flow boundary conditions 1F and 2F.

The break mass and energy input used in the LOCA GOTHIC containment evaluation model was calculated using the Westinghouse method for LOCA M&E as described in WCAP-10325. The break mass and energy input used in the MSLB GOTHIC containment evaluation model was calculated using the Westinghouse method for MSLB M&E as described in WCAP-8822.

GOTHIC determines the blowdown phase separation based on fundamental models for interface heat and mass transfer at the containment conditions. The liquid portion of the break flow is released as drops with an assumed diameter of 100 microns (0.00394 inches). This is consistent with the methodology approved for Kewaunee (Reference 2) and is based on data presented in Reference 4. Liquid break flow released to the containment evaporates based on the difference in steam partial pressure at the drop surface and in the atmosphere. The droplets can eventually come to thermal equilibrium with the containment atmosphere and fall into the sump.

h. Heat transfer correlations for heat transfer to heat sinks and drops.

GOTHIC has a number of heat transfer coefficient options that can be used for containment analyses. These include the film, direct, Tagami, and user specified heat transfer coefficient options. GOTHIC also has a number of condensation options that can be used for containment analyses. These include the Uchida, Gido-Koestel, and DLM options.

The direct heat transfer coefficient set is used, along with the diffusion layer model (DLM) mass transfer correlation, for all of the internal heat sinks in the Callaway containment DBA evaluation model. This heat and mass transfer methodology was recently reviewed and approved for use in the Kewaunee containment DBA analyses (Reference 2). The DLM correlation does not require the user to specify a revaporization input value, as was done in previous analyses using the Uchida correlation.

The direct heat transfer coefficient set (with split option) is used for the heat sinks representing floors. The split option will shut off heat transfer to the floor once the containment liquid volume fraction exceeds 0.0001. There are currently no floor heat sinks modeled in the Callaway containment DBA evaluation model.

To match the CONTEMPT modeling of heat transfer outside containment, a constant heat transfer coefficient of 2 BTU/hr-ft2-F and boundary temperature of 95 F was specified for the Surface B boundary of heat sinks 1 and 2 (containment wall and dome). The Surface B boundary was modeled as adiabatic (no heat or mass transfer allowed) for heat sinks 3-15. This also matches the CONTEMPT heat transfer modeling for the heat sinks inside containment.

GOTHIC performs mass and energy balances for the droplet phase. GOTHIC calculates the interface temperature from first principles. Spray droplets condense steam based on the difference in steam partial pressure at the drop surface and in the atmosphere. The droplets can eventually come to thermal equilibrium with the containment atmosphere and fall into the sump.

i. Significant conservative assumptions.

The values for containment volume, heat sink areas and setpoints for the Containment Hi and Hi-Hi pressure setpoints included conservatisms. The conservatisms used in previous Licensing Bases pressure-temperature analyses have been retained for the RSG analyses performed in GOTHIC.

3. Discuss and verify that the calculations were done consistent with the NRC safety evaluation (SE) on GOTHIC 7.0, dated September 29, 2003, which was issued on the Kewaunee plant docket.

The Callaway GOTHIC containment evaluation model was constructed based on the recently accepted Kewaunee GOTHIC containment evaluation model (Reference 2). Both the Kewaunee and Callaway containment evaluation models use GOTHIC code version 7.1p1 with the DLM heat and mass transfer option.

The Kewaunee containment evaluation model was developed with GOTHIC version 7.0p2 and submitted for NRC review. The NRC conditions for acceptance (primarily the change from MDLM to the DLM correlation), along with other improvements and error corrections, were incorporated into GOTHIC version 7.1p1 and subsequent analyses for the Kewaunee UFSAR were performed with that version. The differences between GOTHIC version 7.0 and 7.1 are documented in Appendix B of the GOTHIC User Manual Release Notes (Reference 3). When compared with version 7.0p2, use of the DLM heat and mass transfer model in GOTHIC 7.1p1 produces essentially the same or slightly more conservative containment pressure and temperature results, so no margin is created by the change in code version.

4. Describe the quality assurance program used for the application of the GOTHIC computer code to Callaway.

5. Provide curves of containment peak pressure and temperature for the design-basis LOCA and main steam line break (MSLB) accident.

References:

1. Kreith, "Principles of Heat Transfer," Third Edition, 1973.

2. NRC Letter from Anthony C. McMurtray (NRC) to Thomas Coutu (NMC), Enclosure 2, Safety Evaluation, September 29, 2003.

3. NAI 8907-02, Revision 14, "GOTHIC Containment Analysis Package User Manual," Version 7.1, January 2003.

4. Brown and York, "Sprays formed by Flashing Liquid Jets," AICHE Journal Vol. 8, #2, May 1962

Containment Model - MSLB Case 12rd
Jul/01/2004 14:23:07
GOTHIC Version 7.1Patch1(QA) - September 2003
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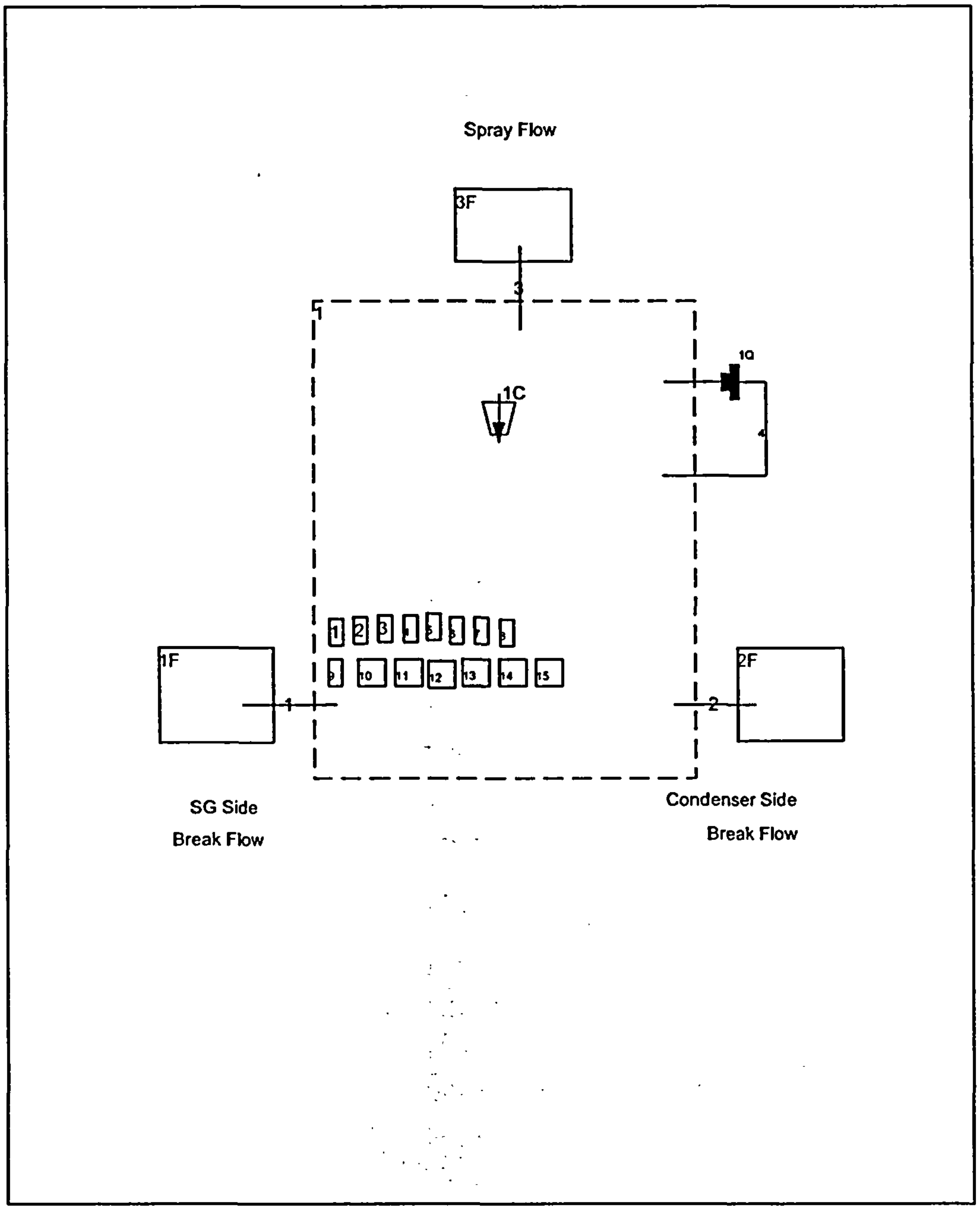

Figure 1 Callaway GOTHIC Containment Model for MSLB Events

a.c

Figure 2 Callaway GOTHIC Containment Model for LOCA Events

Containment Model - MSLB Case 12
Jun/02/2004 13:41:32
GOTHIC Version 7.1Patch1(QA) - September 2003
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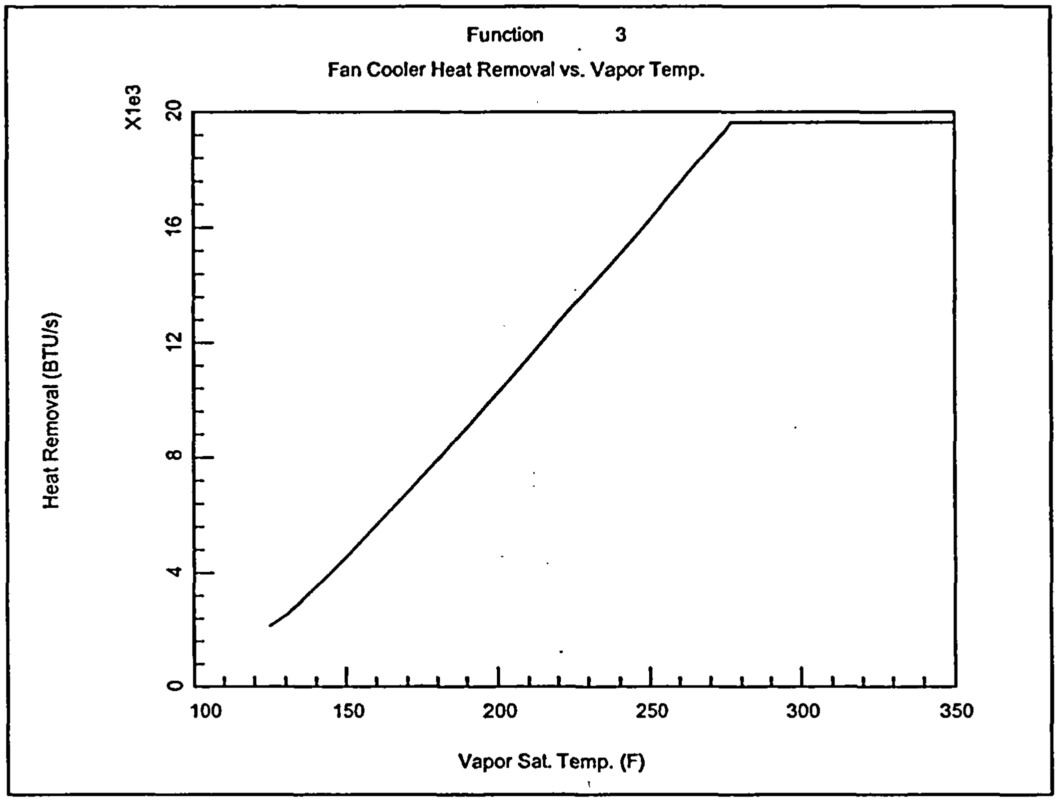

Figure 3 Fan Cooler Heat Removal Rate per Train

	Table 1 Callaway Heat Sinks										
		Area (ft2)	Sides	Paint[1] (in)	Primer (in)	Zinc (in)	Actual SS Steel (in)	Actual CS Steel (in)	Air (in)	Actual Concrete (in)	Model Total (in)
1	Shell	58807	1	0.0212	0.004			0.25	0.01	48	48.2852
2	Dome	30806	1	0.0212	0.004			0.25	0.01	36	36.2852
3	Unlined Concrete	65831	1							20.64	20.6400
4	SS Lined Concrete	7197	1				0.25		0.01	24	24.2600
5	GS Lined Concrete	6679	1			0.00132		0.0635	0.01	16.116	16.1908
6	Stainless Steel	18648	1				0.215				0.2150
7	Galvanized Steel	68451	1			0.00132		0.094			0.0953
8	CS w/o Paint	1769	1					0.25			0.2500
9	Painted CS	13450	1	0.0212	0.004			0.0835			0.1087
10	Painted CS	84088	1	0.0212	0.004			0.2			0.2252
11	Painted CS	40471	1	0.0212	0.004			0.338			0.3632
12	Painted CS	24306	1	0.0212	0.004			0.708			0.7332
13	Painted CS	11932	1	0.0212	0.004			1.343			1.3682
14	Painted CS	7805	1	0.0212	0.004			3.347			3.3722
15	CS Lined Concrete	6464	1	0.0212	0.004			0.25	0.01	24	24.2852

Notes:

1. The paint thickness used in the CONTEMPT model and benchmark analyses was 4 mils; it was increased to 21.2 mils for the GOTHIC containment DBA evaluation model.

Table 2 Thermal Conductivity, Density, & Volumetric Heat Capacity for Heat Sink Materials				
	Conductivity (Btu/hr-ft-°F)	Density (lbm/cf)	Vol. Heat Capacity (Btu/cf-°F)	Specific Heat (Btu/lbm-°F)
Paint – Epoxy	0.97	49.9	49.9	1.0
Paint – Primer	0.63	21.7	21.7	1.0
Concrete	. 0.8	144	30.03	0.209
Carbon Steel	28.35	490	54.3	0.1108
Stainless Steel	8.4	488	53.9	0.1105
Zinc	64.8	446	40.9	0.0917
Air (gap)	0.0174	0.06	0.0145	0.241

ATTACHMENT 3

WESTINGHOUSE APPLICATION FOR WITHHOLDING

Westinghouse

Westinghouse Electric Company
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USA

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Our ref: CAW-05-1944

February 2, 2005

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Responses to NRC Request for Additional Information on WCAP-16265-P, Rev. 0, "Callaway Replacement Steam Generator Program NSSS Licensing Report," dated February 2005, (Proprietary) TAC No. MC4437

The proprietary information for which withholding is being requested in the above-referenced document is further identified in Affidavit CAW-05-1944 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 AmerenUE.

Correspondence with respect to the proprietary aspects of the application for withholding or the Westinghouse affidavit should reference this letter, CAW-05-1944, and should be addressed to J. A. Gresham, Manager, Regulatory Compliance and Plant Licensing, Westinghouse Electric Company LLC, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

Very truly yours,

J. A. Gresham, Manager
Regulatory Compliance and Plant Licensing

Enclosures

cc: B. Benney
L. Feizollahi
S. Bloom, NRR/OWFN/DRPW/PD1V2 (Rockville, MD)

bcc: J. A. Gresham (ECE 4-7A) 1L
R. Bastien, 1L (Nivelles, Belgium)
C. Brinkman, 1L (Westinghouse Electric Co., 12300 Twinbrook Parkway, Suite 330, Rockville, MD 20852)
RCPL Administrative Aide (ECE 4-7A) 1L, 1A (letter and affidavit only)

CAW-05-1944

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF ALLEGHENY:

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, Manager
Regulatory Compliance and Plant Licensing

Sworn to and subscribed
before me this 4th day
of February, 2005

Sharon L. Fiori
Notary Public

Notarial Seal
Sharon L. Fiori, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires January 29, 2007
Member, Pennsylvania Association Of Notaries

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

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.390 of the Commission's regulations and in conjunction with the Westinghouse "Application for Withholding" 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 "Responses to NRC Request for Additional Information on WCAP-16265-P, Rev. 0, 'Callaway Replacement Steam Generator Program NSSS Licensing Report'," dated February 2005, (Proprietary) TAC No. MC4437, being transmitted by AmerenUE Company letter and Application for Withholding Proprietary Information from Public Disclosure, to the Document Control Desk. The proprietary information as submitted for use by AmerenUE for the Callaway Nuclear Plant is expected to be applicable for other licensee submittals in response to certain NRC requirements for containment integrity calculations.

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

(a) Provide documentation of the methods for determining acceptable containment integrity.

(b) Provide the specific analysis or evaluation results related to calculation of the containment integrity.

(c) 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 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

ATTACHMENT 4

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
QUESTIONS 4-11

REQUEST FOR ADDITIONAL INFORMATION
CALLAWAY STEAM GENERATOR REPLACEMENT
UNION ELECTRIC COMPANY
CALLAWAY PLANT, UNIT 1
DOCKET NO. 50-483

By letter dated September 17, 2004, Union Electric Company (the licensee) requested NRC approval for changes to the Technical Specifications (TSs) for the Callaway Plant, Unit 1 (Callaway) to support the installation of the replacement steam generators (RSGs) in the Fall of 2005 in Refueling Outage 14. Based on its review of the licensee's application in the areas of containment integrity, plant systems, and steam generator tube integrity, the NRC staff requests the following additional information (the responses to questions 1 through 3 are provided in Attachments 1 and 2 hereto):

Containment Integrity Review

4. Describe the quality assurance program used for the application of the GOTHIC computer code to Callaway.

Response to question 4:

The GOTHIC computer code for the Callaway RSG Program was developed and implemented by Westinghouse in accordance with their Quality Assurance Program that invokes the requirements of 10 CFR 21 and 10 CFR 50 Appendix B. Westinghouse is currently listed on the AmerenUE Qualified Supplier List for Engineering Services.

5. Provide curves of containment peak pressure and temperature for the design-basis LOCA and main steam line break (MSLB) accident.

Response to question 5:

As stated in Section 4.1 of the OL Amendment, the RSG containment peak pressures and temperatures are less than the peak pressures and temperatures currently listed in FSAR Table 6.2.1-8 Cases 1 and 2, and FSAR Table 6.2.1-58 Cases 6 and 12. Based on this, these current FSAR curves will continue to be reported in the FSAR and used in all future operability and 10 CFR 50.59 evaluations. The licensing-basis LOCA and MSLB peak pressure and temperature (P/T) curves are provided in FSAR Figures 6.2.1-1, 6.2.1-8, 6.2.1-79, and 6.2.1-82. Attachment 5 hereto contains the RSG LOCA and MSLB peak P/T curves, as well as corresponding changes to Attachment 1 of the RSG amendment application.

Plant Systems Review

6. Item 15 located on page 5 of Attachment 1 to the application, starting with the second sentence, the following is stated: "A revised Loss of Load/Turbine Trip analysis covering operation with inoperable MSSVs [main steam safety valves] was performed by Westinghouse for the RSG project. From the results of that analysis it was determined that operation with 3 OPERABLE MSSVs per steam generator could not be supported above 45% RTP [Rated Thermal Power]."

   In its review of the application, the NRC staff could not find the basis to justify the operation of the reactor at 45 percent RTP with only 3 operable MSSVs per steam generator. Provide the justification for operation at this power level with only three operable MSSVs per steam generator and include the basis for such justification.

Response to question 6:

The change to TS Table 3.7.1-1 is based on the analysis discussed in Appendix A (see Sections 6.3.0.1 and 6.3.4, pages 6-42 and 6-112). Westinghouse initially analyzed the Loss of Load / Turbine Trip transient for the case where 3 MSSVs are operable per SG (2 inoperable MSSVs per SG) using the existing Technical Specification power level of 49% RTP. Three 49% RTP cases were analyzed. The result was that for one of the less than maximum positive MTC values, the 110% of SG shell design pressure value was exceeded. Therefore, Westinghouse lowered the initial power to 45% RTP and repeated the simulations. The result was that at 45% RTP, the 110% of SG shell design pressure value was not violated, even at the less than maximum positive MTC values.

7. In the seventh bullet on page 12 of Attachment 1 to the application, it is stated that the full power normal operating T-avg range is from 570.7°F to 588.4°F. In the two paragraphs following this bullet, the following is also stated: "The analysis of the steam dump valve capacity resulted in a restriction on the proposed T-avg range. The installed steam dump valve capacity is adequate at the RSG conditions, provided that the full-load T-avg is no lower than 573°F. The T-avg range of 570.7°F to 588.4°F is a change to the current Callaway analysis basis and required additional analytical work to demonstrate the acceptability of the plant."

   In its review of the application, the NRC staff could not find the basis to justify the operation of Callaway with T-avg below 573°F. Provide justification for operation with T-avg below 573°F and include the basis for such justification.

Response to question 7:

The entire reanalysis documented in Appendix A was done for a T-avg range from 570.7°F to 588.4°F (although cited throughout the WCAP, here are a few specific references in Appendix A: Section 1.3 page 1-1, Table 2-1 Cases 3 and 4, Table 6.2.1-1 page 6-8, Table 6.3-3 page 6-53, Table 6.3-5 page 6-56, Table 6.6.1-2 page 6-407, and Table 7.3-1 page 7-14).

Section 6.5.2 of WCAP-16265-P discusses the analysis of the short-term LOCA-related mass and energy releases which are used as an input to the containment subcompartment analyses performed to ensure that the walls of a subcompartment can maintain their structural integrity during the short pressure pulse (generally less than 3 seconds) accompanying a high energy line pipe rupture within that subcompartment. The analysis of the pressurizer and surge line compartments assumed that the LBB methodology of WCAP-15983-P Revision 0 would be approved for the pressurizer surge line. Since the LBB methodology has not been approved and AmerenUE has decided to not pursue surge line LBB, additional analysis work is ongoing to confirm the acceptability of the lower end of the T-avg range (570.7°F). That additional analysis work will be completed by April 15, 2005.

Although we anticipate the analysis will support operation between 570.7°F and 573°F, the steam dump valve design will only support operation with a lower permissible T-avg of 573°F. The mechanical design limitations of the steam dump system will constrain the low end of the T-avg range to 573°F. After the RSG amendment is approved, Technical Specification (TS) 3.3.1 will restrict T-avg to ≤ 585.3°F. The RTS setpoints for the OTΔT and OPΔT reactor trips will be dialed in such that the nominal T-avg will be 585.3°F. In order to go to a nominal T-avg lower than 585.3°F, we would have to process a modification package that would reset the OTΔT and OPΔT setpoints in the 7300 Process Protection System racks. In order to go to a nominal T-avg lower than 573°F, we would have to process a modification package that would modify the design of the steam dump system and also reset the OTΔT and OPΔT setpoints in the 7300 Process Protection System racks. Appropriate FSAR changes would be involved with these design changes. We would anticipate being able to make these design changes under 10 CFR 50.59 since the low end of the T-avg range is not a TS limit.

TS 3.3.1 and TS 3.4.1 establish upper limits for T-avg for instrumentation setpoints (≤ 585.3°F after RSG) and DNB prevention (≤ 590.1°F after RSG). TS 3.4.2, which is unchanged by the RSG amendment, provides the only lower limit for T-avg in the Technical Specifications. T-avg must be ≥ 551°F prior to taking the reactor critical.

Steam Generator Tube Integrity Review

The following four questions apply to the TS Bases in Attachment 4 to the application.

8. The first paragraph in TS Bases 3.4.13, "Applicable Safety Analyses," states that the safety analyses for events resulting in a steam discharge to the atmosphere assume that primary to secondary leakage through all steam generators is 1.0 gpm. However, the third paragraph states that the safety analysis for the steam line break assumes 1.0 gpm leakage in the affected steam generator as an initial condition. Is there a discrepancy between these sentences? If so, what revision to these sentences is necessary to resolve this discrepancy? If not a discrepancy, please provide a short explanation of why this is so.

Response to question 8:

In the analysis of radiological dose consequences for accidents that result in a steam release, the total primary-to-secondary leakage rate is assumed to be 1.0 gpm. There is no discrepancy, only analysis modeling differences.

For steamline break, it is conservative to assume that all of the 1.0 gpm leakage is in the faulted SG, resulting in a larger source term released to the containment.

For SGTR, it is conservative to assume the 1.0 gpm leakage is in the three unaffected SGs since the source term in the ruptured SG is overwhelmingly due to the break flow.

For other events, such as loss of AC power, locked rotor, and rod ejection, the analysis is affected only by the total value of the assumed leakage rate, 1.0 gpm.

9. In TS Bases 3.4.13, "Surveillance Requirements SR 3.4.13.1," the words "containment atmosphere radioactivity" are to be revised to "containment atmosphere particulate radioactivity." This change is not included as part of the generic TSTF-449, Revision 2 package. What is the justification for adding the word "particulate" without also adding the words "and gaseous"?

Response to question 9:

This change is unrelated to TSTF-449. It was intended to reflect the resolution of a separate issue on the ability of the gaseous channels in the containment atmosphere radioactivity monitoring function to detect a 1.0 gpm leak in 1 hour. This change will be deleted from the RSG amendment and handled under the licensing document changes that will eventually be made to address the separate RCS leak detection issue.

10. In TS Bases 3.4.13, "Surveillance Requirements SR 3.4.13.2," the last sentence of the third paragraph states that (for Modes 3 and 4) if steam generator water samples are less than the minimum detectable activity for each principle gamma emitter, primary to secondary leakage may be assumed to be less than 150 gpd through any one steam generator. Is this sentence supported by an analysis and, if not, discuss the justification for the sentence. The staff notes that Draft Revision 3 to the Electric Power Research Institute (EPRI) PWR [pressurized water reactor] Primary to Secondary Leakage Guidelines, Section 3.3.3, states that measurement of primary to secondary leakage during Mode 3 shall be performed using tritium sampling and analysis. Is tritium sampling and analysis employed in Mode 3 at Callaway, and if not, why not?

Response to question 10:

INSERT B 3.4.13 D in Attachment 4 to the application establishes the new Bases for SR 3.4.13.2. The paragraph questioned by this RAI is repeated below:

> "The Surveillance Frequency of 72 hours is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. During normal operation the primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling. In MODES 3 and 4, the primary system radioactivity level may be very low, making it difficult to measure primary to secondary LEAKAGE. If SG water samples are less than the minimum detectable activity for each principal gamma emitter, primary to secondary LEAKAGE may be assumed to be less than 150 gallons per day through any one SG (Ref. 8)."

Reference 8 is EPRI TR-104788, "Pressurized Water Reactor Primary-to-Secondary Leak Guidelines." The above wording was based on Revision 1 of TSTF-449 (INSERT B 3.4.13 D (WOG)).

TSTF-449 continues to be reviewed by NRC. AmerenUE prefers to let the review of that generic change package be coordinated between the Technical Specification Task Force, NEI, and the NRC. For that reason, AmerenUE included a commitment to supplement the amendment application within 60 days of NRC approval of the final revision to TSTF-449. Revision 3 of TSTF-449 was submitted to NRC on January 14, 2005. Revision 3 deletes the last two sentences quoted above.

AmerenUE will revise the above Bases wording based on TSTF-449 Revision 3, with consideration also given to the Bases wording adopted by STP Nuclear Operating Corporation in their license amendment request dated August 12, 2004 (amendment approved on November 24, 2004 by NRC in Amendment 164 to Facility Operating License Number NPF-76 and Amendment 154 to Facility Operating License Number NPF-80 for South Texas Project, Units 1 and 2, respectively), as follows:

> "The Surveillance Frequency of 72 hours is a reasonable interval to trend primary to secondary LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents. The primary to secondary LEAKAGE is determined using continuous process radiation monitors or radiochemical grab sampling in accordance with the methodology of Reference 8. Leakage verification is provided by chemistry procedures that provide alternate means of calculating and confirming primary to secondary leakage is less than or equal to 150 gallons per day through any one SG."

The last sentence above was adopted by STP. The chemistry procedures in place at Callaway for EPRI TR-104788 include provisions for using chemical tracers like boron or lithium, or to use long-lived radionuclides such as tritium, Cs-137, or Cs-134.

11. In TS Bases 3.4.17, "Applicable Safety Analyses," the second sentence of the first paragraph states that the steam generator tube rupture analysis assumes a primary to secondary leakage rate of 1.0 gpm to the unaffected steam generators, in excess of the operational leakage rate limits in Limiting Condition for Operation (LCO) 3.4.13. Please clarify whether the 1.0 gpm refers to the total leakage rate for all of the unaffected steam generators or to the leakage rate for each unaffected steam generator. Also, please clarify whether the 1.0 gpm is in addition to leakage up to the LCO limits or whether the 1.0 gpm includes leakage up to the LCO limits. If the latter, this might be made more clear by replacing the words "in excess of" with "exceeding".

Response to question 11:

The primary to secondary leakage rate of 1.0 gpm refers to the **total** leakage rate **for all three unaffected** steam generators. The 1.0 gpm is **NOT** in addition to leakage up to the LCO limit. The intent of the Bases statement is to compare the 1.0 gpm analysis assumption with the LCO 3.4.13 limit, i.e., 1.0 gpm > 600 gpd.

AmerenUE agrees with the suggested Bases change to replace "in excess of" with "exceeding."