Westinghouse Electric Corporation Energy Systems

Box 355
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AW-93-521

September 3, 1993

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

ATTENTION: MR. R. W. BORCHARDT

APPLICATION FOR WITHHOLDING PROPRIETARY INFORMATION FROM PUBLIC DISCLOSURE

SUBJECT: INFORMATION IN SUPPORT OF REQUEST FOR ADDITIONAL INFORMATION ON THE AP600 DESIGN (RAI 480.12)

Dear Mr. Borchardt:

The application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10CFR Section 2.790, Affidavit AW-93-521 accompanies this application for withholding setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-93-521 and should be addressed to the undersigned.

Very truly yours,

N. J. Liparulo, Manager
Nuclear Safety And Regulatory Activities

/nja

cc: Kevin Bohrer NRC 12H5

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In order to conform to the requirements of 10CFR 2.790 of the commission's regulation 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 on the brackets remain, the information that was contained within brackets and where the proprietary information has been deleted in the non-proprietary versions only the brackets remain, the information t. 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) 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 Section (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10CFR2.790(b)(1).

AW-93-521

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

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COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Brian A. McIntyre, 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:

Brian A. McIntyre, Manager
Advanced Plant Safety & Licensing

Sworn to and subscribed
before me this 9 day
of September, 1993

Rose Marie Payne
Notary Public

Notarial Seal
Rose Marie Payne, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Nov. 4, 1996
Member, Pennsylvania Association of Notaries

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(1) I am Manager, Advanced Plant Safety and Licensing, in the Nuclear and Advanced Technology Divisions, of the 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 and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Energy Systems Business Unit.

(2) I am making this Affidavit in conformance with the provisions of 10CFR 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 Energy Systems Business Unit 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 10CFR 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) Enclosed is Letter ET-NRC-93-3961, September 3, 1993, being transmitted by Westinghouse Electric Corporation (W) letter and Application for Withholding Proprietary Information from Public Disclosure, N. J. Liparulo (W), to Mr. R. W. Borchardt, Office of NRR. The proprietary information as submitted for use by Westinghouse Electric Corporation is in response to questions concerning the AP600 plant and the associated design certification application and is expected to be applicable in other licensee submittals in response to certain NRC requirements for justification of licensing advanced nuclear power plant designs.

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

(a) Demonstrate the design and safety of the AP600 Passive Safety Systems.

(b) Establish applicable verification testing methods.

(c) Design Advanced Nuclear Power Plants that meet NRC requirements.

(d) Establish technical and licensing approaches for the AP600 that will ultimately result in a certified design.

(e) Assist customers in obtaining NRC approval for future plants.

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 advanced plant licenses.

(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 advanced nuclear power designs 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 for developing analytical methods and receiving NRC approval for those methods.

Further the deponent sayeth not.

ENCLOSURE 2

Enclosure to Westinghouse Letter ET-NRC-93-3961

Phase 2 Large Scale Test Matrix Rationale

Introduction

The following discussion is provided in support of the Westinghouse response to NRC Request for Additional Information 480.12 (RAI Q480.12) received from the NRC in a letter dated July 1, 1993. The RAI requests, in part, that Westinghouse:

> "provide the rationale for the tests in the 1/8-Scale Facility Test Matrix. Include discussion of test descriptions, conditions, and range of parameters as it relates to scaling analysis. The document should clearly delineate the purposes of the test, and whether they are primarily to investigate design basis accidents or severe accidents."

Discussion

The purpose of the passive containment cooling system (PCCS) heat transfer test is to examine, on a large scale, the interior natural convection and steam condensation, combined with the exterior water film evaporation, air cooling heat removal and water film behavior expected for the AP600 containment. This experiment is designed to induce similar containment dome heat transfer processes and circulation/stratification patterns inside containment.

The phase 2 tests provide data to validate the Westinghouse-GOTHIC (WGOTHIC) containment heat and mass transfer correlations over a range of prototypic internal conditions including the effects of external parameters. They provide data on the transient heat transfer and the distribution of noncondensables. The effects of noncondensables on the containment heat transfer are observed and modelled in the computer code.

The large scale test is used to examine the important thermal-hydraulic phenomena that occur in the AP600 suitable to validate the WGOTHIC computer code. It is not meant to simulate specific AP600 accident scenarios.

Twelve tests are specified for the AP600 large scale phase 2 test matrix which is shown in Table 1. A discussion of the purposes of each test is provided below.

The passive containment cooling system water will have an initial temperature of approximately 80°F for all tests. The external water flow is specified as a target PCCS coverage percent. These coverages were chosen to envelope the amount of coverage expected on the AP600 plant. Actual coverages as determined from the water distribution tests are used as inputs to the AP600 calculations.

The fan speed will be adjusted such that an external air velocity of [ ]$^{(a,c)}$ ft/s is obtained for the tests as specified above. Two of the tests (214.1 and 215.1) are run under natural convection conditions (for the first part of the test). In the large scale baseline tests a wider range of velocities were specified and several external natural convection tests were run. It was not deemed necessary to run a range of velocities in this set of tests since the focus is on internal distributions and heat transfer.

All the above tests have short term heat sinks installed in the test facility. Long term heat sinks are modeled in tests 218.1, 219.1, 220.1, and 221.1. Reference Westinghouse response to RAI 480.09 for more details on the heat sinks.

Tests 202.3 and 203.3 are repeats of the constant pressure tests performed during the baseline test series. They are included to evaluate the effect of the addition of the steam generator model and the bottom insulation.

Tests 212.1 through 221.1 are steam flow rate specified transient tests. Useful information will be obtained by changing one parameter while all others are held constant. They will also be valuable tests for the Westinghouse-GOTHIC validation.

For tests 212.1 and 213.1 the steam flow rate will begin at [ ]^{a,c} lb_m/sec, the system will come to steady state. The steam flow rate will then be increased to [ ]^{a,c} lb_m/sec, and after it comes to steady state, the third steam flow rate will be initiated. These tests will be used to validate the code's ability to predict transient behavior. The difference between tests 212.2 and 213.1 will demonstrate the effects of varying passive containment cooling system water coverages.

For test numbers 214.1 and 215.1 the flow rate will be held constant; the tests will begin with the fan off. After steady state conditions are reached, the fan will be turned on. This will exercise the code's ability to model the transient between free and forced convection. Test 215.1 will require that a 180° circumferential section be blocked off such that the air can only enter around the remaining 180° azimuthal section. These tests are to address the effect of partial blockage of the air inlet region. The 180° azimuthal blockage will be centered around the steam generator.

Test 216.1 is a transient between two steady state conditions: [ ]^{a,c} PCCS coverage and [ ]^{a,c} PCCS coverage in quadrants. This test can be compared to tests 212.1 and 213.1 to evaluate the difference between PCCS coverage in stripes and in quadrants.

Tests 217.1 through 221.1 address the effect of long term heat sinks, helium addition, and blow downs.

The purpose of test numbers 217.1 and 218.1 is to evaluate the effect of long term heat sinks on noncondensable distribution. Test number 218.1 is similar to test number 217.1 with the only difference being long term heat sinks in test 218.1. After the system has come to steady state given a steam flow rate of [ ]^{a,c} lb_m/sec, the helium will be injected, and the system will come to a second steady state.

The purpose of test 219.1 is to evaluate how the noncondensables (specifically helium) distribute when the following scenario is followed: with the dome initially dry, reach steady state conditions, inject helium, come to steady state again, then start the PCCS flow. This test will show the effect of cooling a dry containment on noncondensable distribution. The steam flow rate is low ([ ]^{a,c} lb_m/sec) in order to keep the dry vessel pressure below the maximum rated vessel pressure of 100 psig.

Tests 220.1 and 221.1 address modeling heat transfer to heat sinks and to the containment shell and their effects on the flow field during the blow down phase of a transient.

Test 220.1 models a blow down of a small steam line break. The blow down is over within a minute and will be used to validate the code's ability to predict transient behavior. The blow down rate for test 220.1 is based on a steam line break (SLB at 102% power, full double ended rupture, main steam line valve failure). It was chosen because it is an AP600 limiting case as far as containment pressure and temperature are concerned. The steam line break flow was scaled by volume ($1/8^3$) for the large scale test. This results in the large scale test steam flow rate shown in Figure 1. The steam flow rate in the figure is a target test condition; a slightly lower peak flow rate will not affect the test purpose of validating the code. This test is not meant to simulate the prototype accident. It is meant to create in-vessel conditions similar to those in the plant which will be used to validate the WGOTHIC code.

Test 221.1 will model long term cooling post accident conditions. This is accomplished by starting with PCCS water on the outside, reaching a steady state after the initial steam blow down (Figure 2), injecting helium, reaching a second steady state, then shutting off the PCCS flow, and maintaining a low constant steam flow of approximately [ ]^{a,c} lb_m/sec. Noncondensable measurements will be taken to evaluate the effect of this scenario on helium mixing. The helium injection and the steam flow rate for test number 221.1 are based on a small loss of coolant accident (LOCA with In-Containment Refuelling Water Storage Tank Check Valve Failure).

The test is not meant to simulate the prototype accident. Although the prototype accident was used for guidance so that the conditions in the plant and in the large scale test would be similar. The steam blow down for the plant is scaled by volume ($1/8^3$) for the large scale test.

Helium Injection

The Helium concentrations for tests 217.1, 218.1 and 219.1 are based on 100% oxidation of the Zircaloy in the AP600 core. Note that Helium, instead of Hydrogen, is used in the test for safety reasons.

Test number 221.1 uses a different basis and will have less helium injected. The molar quantity of helium for test 221.1 is scaled by volume ($1/8^3$) from a small loss of coolant accident (Loss of Coolant Accident with In-Containment Refuelling Water Storage Tank Check Valve Failure) with 46% of the cladding of the active fuel oxidized.

The resulting flow rate and duration of helium injection for each test are given below:

Test #	flow rate (lb_m/sec)	time (min)	total He (lbm)
217.1	[		] (a,c)
218.1			
219.1			
221.1			

More details on how the range of test parameters relates to the scaling analysis will be given in Revision 1 of WCAP-13246. See also Reference 1.

The large scale test is used to examine the important thermal-hydraulic phenomena that occur in the AP600. The large scale test is suitable to validate the WGOTHIC computer code. The test is not meant to simulate specific AP600 accident scenarios.

References:

1. Letter, N. J. Liparulo to R. W. Borchardt (NRC), "AP600 Design and Design Certification Test Program Overview," Table 3, Revision 3, August 13, 1993.

TABLE 1 - AP600 LARGE SCALE PHASE 2 TEST MATRIX

Test No.	Pressure (psig)	External Air Velocity (ft/s)	Target PCCS (Coverage %)
202.3 203.3	[		] (a,c)

Test No.	Steam Flow (lb_m/s)	External Air Velocity (ft/s)	Target PCCS Coverage %	Long term Heat sinks	He	Noncondensable Measurements
212.1 213.1 214.1 215.1 216.1 217.1 218.1 219.1 220.1 221.1	[					(a,c)

Figure 1 Target Steam Flow Transient for Test 220.1

Figure 2 Steam Flow Transient for Test 221.1