Westinghouse Electric Corporation Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

NSD-NRC-96-4816
DCP/NRC0600
Docket No.: STN-52-003

September 10, 1996

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

ATTENTION: T. R. QUAY

SUBJECT: WGOTHIC APPLICATIONS TO AP600, WCAP-14407

Dear Mr. Quay:

Enclosed is Westinghouse report WCAP-14407, "WGOTHIC Applications to AP600." This document consists of fourteen sections and collects into one volume, the documentation that supports the modeling and assumptions made for the design basis evaluation model of the AP600 containment. Each section is briefly described below. A number of the report sections have been previously provided to the NRC for review and are noted below. This report was prepared at the request of the NRC staff for the purpose of compiling a comprehensive document on the application of the WGOTHIC computer code for the AP600. This report addresses all major open items on the WGOTHIC computer code. A completion of the NRC review of this document within 60 days is needed to support a timely finalization of the WGOTHIC review.

Section 1 is the Introduction section. This section provides a brief overview of the report and the conclusions drawn from each of the subsequent sections.

Section 2 is the Containment Phenomena Identification and Ranking Table (PIRT) section. This section contains the PIRT for the LOCA and MSLB design basis accidents. A description of the phases of the process used in the development of the tables and resulting PCS DBA evaluation model is included. A summary of how uncertainties are addressed is also provided in the tables. The PIRT has been previously presented and discussed in meetings with NRC staff.

Section 3 provides an overview and description of the WGOTHIC code. This section is essentially the same as that presented in WCAP-14382, "WGOTHIC Code Description and Validation," and is repeated for completeness.

Section 4 describes the WGOTHIC Evaluation Model. This section contains detailed geometric and modeling information for the WGOTHIC design basis containment evaluation model of the AP600. Portions of this section have been sent to the NRC for feedback on content and level of detail. Results of these discussions have been factored into the content of Section 4.

E P04 1/1

130021

Change distribution: NRC PDR 1 encl 1 INP

Section 5 is the Initial Conditions section. This section presents a series of sensitivity studies on the initial conditions assumed for the design basis evaluation model. This section provides justification for the assumptions made for initial conditions.

Section 6 is the Meteorological Effects on PCS Perfor[illegible]ction. This section presents the studies on wind induced turbulence, wind induced oscillations in the PCS annulus, and the recirculation of the PCS effluent back into the PCS inlet. This section is a summary of information that has been transmitted to the NRC in Westinghouse letters NTD-NRC-94-4166, June 1994 and NTD-NRC-95-4467, June 1995.

Section 7 is the Method for Calculating the PCS Film Coverage Input for the AP600 Containment DBA Evaluation Model section. This section supersedes the information originally provided to the NRC in letters NTD-NRC-94-4247, July 1994 and NTD-NRC-94-4286, August 1994. Section 7 is a compilation of information previously provided in Westinghouse letters NSD-NRC-96-4646, February 1996 and NSD-NRC-96-4728, May 1996. This section describes the methodology used to determine the PCS film flow rate and coverage fractions input to the AP600 WGOTHIC design basis evaluation model. The information has been revised to incorporate NRC review comments on the previously transmitted material. Changes incorpor[illegible]ed into this revision of the report are:

- Changes required to model 440 gpm PCS flow rate;
- A PCS containment coverage area sensitivity analysis;
- An evaluation of external flow oscillations on the LST;
- Observations of the film behavior on the LST vessel.

Section 8 is the AP600 PCS Sensitivity to Blowdown section. This section was originally transmitted to the NRC in letter NTD-NRC-95-4589, November 1995. This section presents the results of a containment integrity analysis of the blowdown phase using a single lumped volume and Standard Review Plan style assumptions.

Section 9 is the Mixing Within Containment section. A preliminary draft of this section was provided in NTD-NRC-96-4763 in July 1996. The following changes have been made relative to the preliminary draft.

- Text in Section 9.3 and Figure 9-13 have been edited to clarify the temporal partitioning used to evaluate mixing and stratification;
- Text in Section 9.5 has been edited to more clearly indicate that dead ended compartment heat sinks are eliminated after blowdown in the evaluation model;
- Expanded summary section;
- Updated references to other Applications Report sections.

NRC review comments on a draft of Section 9 were received on August 8, 1996. A number of these comments have been incorporated into Section 9, however, some comments have not been fully addressed due to time constraints. The remaining comments will be addressed in a revision to the Section.

Section 10 is the Nominal Inputs and Correlations Sensitivities section. This section documents the WGOTHIC design basis evaluation model sensitivities to the bounding assumptions made to address uncertainties. The sensitivities include the multipliers on the PCS heat and mass transfer coefficients and mass and energy release model assumptions as well as other key assumptions.

Section 11 provides a sensitivity study on timestep selection. This section was informally transmitted to the NRC for review and comment. Comments were received and incorporated into this section. This section documents the study of timestep size and how it affects the convergence of the WGOTHIC code.

Section 12 will address results of a sensitivity study on WGOTHIC Clime noding. This section is not included in this release of the WCAP. Supporting documentation and review of results could not be completed prior to the release of this report. This section will be provided by October 11, 1996.

Section 13 is the WGOTHIC Noding Studies in Support of the AP600 Evaluation Model section. This section contains results of distributed parameter modeling of the AP600 and was transmitted to the NRC in letter NTD-NRC-96-4634, January 1996. Comments from the NRC were received, letter from D. Jackson to N. Liparulo dated 1 March, 1996, and incorporated into this section. This section documents a detailed study of noding convergence for the WGOTHIC code and the WGOTHIC model of the AP600.

Section 14 is the Summary section. This section provides summary tables outlining the assumptions made in the WGOTHIC AP600 design basis evaluation model and cross references those assumptions back to supporting sections in the report.

The Westinghouse Electric Corporation copyright notice, proprietary information notice, application for withholding and affidavit are attached.

This submittal contains Westinghouse proprietary information consisting of trade secrets, commercial information or financial information which we consider privileged or confidential pursuant to 10CFR2.790. Therefore, it is requested that the Westinghouse proprietary information attached hereto be handled on a confidential basis and be withheld from public disclosures.

This material is for your internal use only and may be used for the purpose for which it is submitted. It should not be otherwise used, disclosed, duplicated, or disseminated, in whole or in part, to any other person or organization outside the Commission, the Office of Nuclear Reactor Regulation, the Office of Nuclear Regulatory Research and the necessary subcontractors that have signed a proprietary non-disclosure agreement with Westinghouse without the express written approval of Westinghouse.

Correspondence with respect to the application for withholding should reference AW-96-1006, and should be addressed to Brian A. McIntyre, Manager of Advanced Plant Safety and Licensing, Westinghouse Electric Corporation, P.O. Box 355, Pittsburgh, Pennsylvania, 15230-0355.

Please contact John C. Butler on (412) 374-5268 if you have any questions concerning this transmittal.

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

/nja

Enclosures
Attachment

cc: T. Kenyon, NRC (w/o Enclosures/Attachments)
D. Jackson, NRC (3E1)
E. Throm, NRC (1E1)
P. Boehnert, ACRS (1E1)
N. J. Liparulo, Westinghouse (w/o Enclosures/Attachments)