Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381

AUG 2 8 1995

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

Gentlemen:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

WATTS BAR NUCLEAR PLANT (WBN) - EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL CHANGES

The purpose of this letter is to notify you of recent changes to WBN's ECCS evaluation model, and to provide a schedule for performing a small-break loss-of-coolant (SBLOCA) reanalysis as requested in your letter dated July 24, 1995. This letter is intended to satisfy both the 30-day and annual reporting requirements of 10 CFR 50.46.

Recent changes in parts of the ECCS model that are used to analyze a large-break loss-of-coolant accident (LBLOCA), reported to TVA by Westinghouse in a letter dated August 14, 1995, exceed the threshold defined in 10 CFR 50.46 for a "significant" change of more than 50°F in calculated peak cladding temperature (PCT). Therefore, TVA is reporting these significant changes within the 30-day time limit specified in 10 CFR 50.46. There have been no additional changes in the parts of the ECCS model that are used to analyze a SBLOCA since the last annual report of May 8, 1995.

On August 7, 1995, Westinghouse withdrew its Power Shape Sensitivity Model (PSSM) from NRC review. PSSM had been submitted to the NRC via WCAP-12909, "Westinghouse ECCS Evaluation Model: Revised Large Break LOCA Power Distribution Methodology," in May 1991, as a statistical methodology to evaluate and assure that the cosine distribution for reactor core power remains the limiting

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distribution. Prior to withdrawal, WCAP-12909 was still under review and had not been approved by the NRC. Based on Westinghouse discussions with the NRC, it was believed that PSSM would not be approved without significant modifications. The penalties associated with these modifications out-weighed the benefits derived from PSSM.

In order to minimize the potential PCT penalties for all licensees that use the Westinghouse LBLOCA evaluation model, Westinghouse developed an alternate axial power shape methodology, ESHAPE (Explicit SHape Analysis for PCT Effects) to replace PSSM. The ESHAPE methodology is based on explicit analysis of a set of skewed axial power shapes. The explicit use of skewed power shapes has previously been approved by the NRC as part of the Westinghouse LBLOCA evaluation model.

To offset the PCT penalty imposed on many licensees by adoption of ESHAPE methodology, Westinghouse revised the LBLOCA evaluation model to include steam flow through the hot leg nozzle gap (between the core barrel and the reactor vessel) in the calculations. This hot leg gap model allows steam flow to the break in the latter phases of the LBLOCA transient with a resulting PCT benefit to offset the skewed power shape effects which occur in the same time period.

These recent changes to WBN's ECCS evaluation model are described in detail in Enclosure 1. The PCT margin allocations resulting from these ECCS evaluation changes are summarized in Enclosure 2.

In previous reports of ECCS evaluation model changes, TVA identified cumulative changes that affected WBN's LBLOCA analysis and exceeded the threshold defined in 10 CFR 50.46(a)(3)(i) for a "significant" change of more that 50°F in calculated PCT. As a result, TVA committed in a letter dated July 28, 1993, to perform a LBLOCA reanalysis no later than the end of WBN's second refueling outage. TVA has reviewed the schedule for this commitment in consideration of the additional ECCS model changes described in Enclosure 1. The review determined that there is no need to accelerate the schedule for LBLOCA reanalysis.

Your letter dated July 24, 1995, requested that TVA provide a proposed schedule for providing a SBLOCA reanalysis or taking other action as may be needed to show compliance with 10 CFR 50.46 requirements. TVA will perform a SBLOCA reanalysis no later than the end of WBN Unit 1's third refueling outage.

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If you should have any questions, contact John Vorees at (615) 365-8819.

Sincerely,

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ENCLOSURE 1

Background:

Large-break loss-of-coolant accident (LBLOCA) analyses have been traditionally performed using a symmetric, chopped cosine, core axial power distribution. Under certain conditions, calculations have shown that there is a potential for top-skewed power distributions to result in peak cladding temperatures (PCTs) greater than those calculated with chopped cosine axial power distributions. In 1991 Westinghouse developed a statistical methodology to evaluate and assure that the cosine distribution remains the limiting distribution. This methodology, Power Shape Sensitivity Model (PSSM), was submitted to the NRC for review and approval via WCAP-12909, "Westinghouse ECCS Evaluation Model: Revised Large Break LOCA Power Distribution Methodology," dated May 1991.

In March 1993 and in November 1994, the NRC requested Westinghouse to provide information on the statistical approach and the treatment of uncertainty in PSSM. After the NRC's second request for information and subsequent discussion with the NRC, it became clear to Westinghouse that PSSM would not be approved by the NRC without significant modifications. These modifications would likely include adding a +100°F PCT penalty to all LBLOCA analyses to account for model uncertainty and a revision to the PSSM database. As a result, Westinghouse determined that the potential penalties associated with these modifications out-weighed the benefits derived from PSSM. Although Westinghouse believed that PSSM was conservative without additional modifications, Westinghouse decided not to continue to pursue licensing of PSSM.

In March 1995, Westinghouse met with the NRC to discuss the LBLOCA axial power shape methodology issue. The intent of the meeting was two-fold: 1) to present the basis for safe continued operation of those plants currently using PSSM as part of their licensing basis, and 2) to present an alternative axial power shape methodology, ESHAPE (Explicit SHape Analysis for PCT Effects), which was based on explicit analysis with a set of skewed axial power shapes. The use of skewed power shapes in the computer code BASH had already been approved by the NRC as part of Westinghouse's LBLOCA evaluation model.

At the NRC meeting Westinghouse demonstrated to the NRC's satisfaction, using a previously licensed approach to determine bounding axial power shapes, that past plant operation which was based on PSSM met 10 CFR 50.46 criteria (i.e. PCT $\leq$2200°F). The NRC also concurred with Westinghouse that the alternative approach was similar to the approach defined in Westinghouse's approved LBLOCA evaluation model and therefore may not warrant consideration as an evaluation model change subject to NRC review and approval. Given the NRC's recognition of this alternative approach and the preliminary results which demonstrated that most plants would not be subject to a PCT penalty, Westinghouse decided to continue development of the alternate methodology to replace PSSM.

To offset the effects of PCT penalty imposed on many licensees by adoption of ESHAPE methodology, Westinghouse revised the LBLOCA evaluation model to include steam flow through the hot leg nozzle gap (between the core barrel and the reactor vessel) in the calculations. This hot leg gap model allows steam flow to the break in the latter phases of the LBLOCA transient with a resulting PCT benefit to offset the skewed power shape effects which occur in the same time period.

Technical Evaluation:

The alternate methodology to replace PSSM, ESHAPE, is based on an explicit analysis of the LBLOCA transient with a set of skewed axial power shapes to supplement the standard analysis done with the chopped cosine. Development of this methodology was completed in June 1995. Results of multiple plant calculations have shown that the limiting core axial power distribution is related to the time of PCT and that plants with long PCT times (>100 seconds) are potentially limited by power shapes that are skewed to the top of the core. Based on on-going discussions and meetings with the NRC, Westinghouse considers the ESHAPE methodology to be an updated application of the methodology described in WCAP-10266-P-A, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," submitted and approved in December 1987. Submittal of ESHAPE for explicit NRC review and approval is, therefore, not anticipated.

Investigation of the hot leg nozzle gap evaluation model feature had recently been undertaken as part of a Westinghouse Owners Group program on hot leg switchover elimination. As an off-shoot to this program, Westinghouse prepared and submitted WCAP-14404, "Methodology for Incorporating Hot Leg Nozzle Gaps into BASH," dated June 1995, to the NRC for review and approval. Westinghouse informed the NRC that use of the hot leg nozzle gap flow is considered to be a permanent evaluation model change and will be incorporated in a forward-fit basis for future LBLOCA evaluations. Although use of the hot leg nozzle gap flow has not yet been approved by the NRC, personnel from TVA, Westinghouse, and the NRC, at a meeting on August 10, 1995, agreed to its use pending NRC approval of WCAP-14404. In addition, Westinghouse is maintaining substantial conservatism in this methodology by modeling only single phase flow through the gap. As documented in WCAP-14404, Westinghouse has determined that single phase flow through the gap is conservative compared to two-phase flow through the gap, which is a more realistic assumption.

The PCT margin allocations resulting from the above ECCS evaluation changes are summarized in Enclosure 2.

Enclosure 2

SUMMARY OF PEAK CLADDING TEMPERATURE (PCT) MARGIN ALLOCATIONS RESULTING FROM CHANGES TO THE EMERGENCY CORE COOLING SYSTEM (ECCS) EVALUATION MODEL

Large-Break Loss-of-Coolant Accident:		PCT (°F)
A.	ANALYSIS OF RECORD (8/87) (Based on BASH evaluation model with F_Q=2.40, $F_{\Delta H}$=1.58, SGTP=10% and VANTAGE 5H fuel)	2126
B.	PRIOR MODEL ASSESSMENTS (Refer to letters dated July 22, 1991, July 13, 1992, March 17, 1993, November 10, 1993, April 23, 1994, and May 8, 1995.)	+88*
C.	CURRENT MODEL ASSESSMENTS (8/95) (Permanent assessment of PCT margin)	
	1. Skewed power shape penalty	+176
	2. Hot leg nozzle gap benefit	-240
LICENSING BASIS PCT + MARGIN ALLOCATIONS		2150

Small-Break Loss-of-Coolant Accident (SBLOCA):		
A.	ANALYSIS OF RECORD (6/94) (Based on NOTRUMP evaluation model with F_Q=2.40, $F_{\Delta H}$=1.58, SGTP=10%, and VANTAGE 5H fuel)	1452
B.	PRIOR MODEL ASSESSMENTS	0
C.	CURRENT MODEL ASSESSMENTS (5/95) (Permanent assessment of PCT margin)	
	1. Decreased minimum ECCS flow	+23
	2. Boiling heat transfer correlation errors	-6
	3. Steam line isolation logic error	+18
	4. Axial nodalization, RIP model revision, and SBLOCTA error corrections	+4
LICENSING BASIS PCT + MARGIN ALLOCATIONS		1491

* A temporary PCT margin assessment of -20°F was previously reported in TVA's letter dated May 8, 1995, but is not included here. This margin assessment adjusted the assumption on steam generator tube plugging (SGTP) from 10% to 5% to gain a PCT benefit. This PCT benefit is no longer needed to show compliance with the PCT limit of ≤2200°F. SGTP is considered to be 10% in accordance with the analysis of record.