

May 22, 1985

Docket No. 50-29  
LS05-85-05-027

Mr. James A. Kay  
Senior Engineer-Licensing  
Yankee Atomic Electric Company  
1671 Worcester Road  
Framingham, Massachusetts 01701

Dear Mr. Kay:

SUBJECT: CONFIRMATION OF ECCS CODES

Re: Yankee Nuclear Power Station

Recent evaluations of errors in Exxon Pressurized Water Reactor (PWR) Loss of Coolant Accident (LOCA) models and analysis methods raised concerns regarding the possibility of related errors at the Yankee plant.

The enclosed request for additional information identifies the information needed by the NRC staff to complete its evaluation regarding continued compliance with 10 CFR 50.46 for the Yankee plant. We request that you provide your response to the enclosed request for additional information by June 28, 1985.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

**Original signed by:**

John A. Zwolinski, Chief  
Operating Reactors Branch No. 5  
Division of Licensing

Enclosure:  
Request for Additional  
Information

cc: w/enclosure  
See next page

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Mr. James A. Kay  
Yankee Atomic Electric Company

Yankee Nuclear Power Station

cc  
Mr. James E. Tribble, President  
Yankee Atomic Electric Company  
1671 Worcester Road  
Framingham, Massachusetts 01701

Thomas Dignan, Esquire  
Pepper and Gray  
225 Franklin Street  
Boston, Massachusetts 02110

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U.S. Environmental Protection Agency  
Region I Office  
ATTN: Regional Radiation Representative  
U.S. Federal Building  
Boston, Massachusetts 02203

Resident Inspector  
Yankee Nuclear Power Station  
c/o U.S. NRC  
Post Office Box 28  
Monroe Bridge, Massachusetts 01350

Regional Administrator  
Nuclear Regulatory Commission, Region I  
631 Park Avenue  
King of Prussia, Pennsylvania 19406

Robert M. Hallisey, Director  
Radiation Control Program  
Massachusetts Department of Public Health  
150 Tremont Street, 7th Floor  
Boston, Massachusetts 02111

REQUEST FOR ADDITIONAL INFORMATION  
YANKEE ATOMIC ELECTRIC COMPANY  
YANKEE NUCLEAR POWER STATION (YANKEE)  
DOCKET NO. 50-29  
LOCA ANALYSES

In March, 1985, the staff became aware of several errors in the Exxon PWR LOCA models and analysis methods which impacted several licenses. These errors included:

1. A coding error in the TOODEE2 code.
2. The use of heat transfer augmentation factors for local rod peaking and mixing vanes, in some Exxon LOCA analyses, even though these factors had previously been found unacceptable.
3. The discovery of an input error in the St. Lucie 1 LOCA analysis.
4. The validity of the assumption that the Westinghouse-derived  $K(z)$  curve was applicable to the Exxon fuel.

Because the Yankee plant utilizes Exxon Fuel, the staff contacted Yankee Atomic Electric Company (YAEC) on March 22, 1985 and requested that they evaluate our concerns with the Exxon LOCA analyses and determine if these concerns were applicable to Yankee. Since YAEC performs its own LOCA analysis for Yankee using methods which had previously been reviewed and approved by the staff, the staff determined that the first three Exxon LOCA errors were not applicable.

The remaining Exxon LOCA analysis error concerned the validity of Exxon's assumption that the Westinghouse-derived  $K(z)$  curve was applicable to the Exxon fuel. The  $K(z)$  curve is utilized in the Westinghouse Standard Technical

Specifications, in conjunction with the maximum allowable peaking factor ( $F_Q$ ), to define allowable peaking factors, or linear heat generation rate (kW/f<sup>2</sup>) limits, as a function of core elevation. The K(z) curve was developed by Westinghouse, using its approved ECCS evaluation model, to assure that the requirements of 10 CFR 50.46 were satisfied for a range of power shapes. Exxon assumed that the Westinghouse K(z) curve was applicable to the Exxon fuel and, therefore, did not perform axial power shape sensitivity studies as required by Section I.A. of Appendix K.

On April 15, 1985, YAEK personnel contacted the staff and informed us of its evaluation of the K(z) curve issue for Yankee. YAEK personnel stated that the Yankee Technical Specifications are not based upon a Westinghouse-derived K(z) curve. Rather, Yankee specific analyses are performed to determine maximum linear heat generation rates, as a function of burnup, which are implemented into the Technical Specifications. No modifications to the maximum linear heat generation rates are made as function of core elevation.

In addition, YAEK personnel stated that the LOCA analyses are performed, using the NRC-approved ECCS evaluation model, for a chopped cosine axial power shape. No axial power shape sensitivity studies have been performed for Yankee which support the use of the maximum linear heat generation rate at all core elevations. It was mentioned that in topical report XN-75-41A, Supplement 3, an axial power shape study was performed. The staff has re-examined this report and is unable to conclude that it is applicable to Yankee as it (1) was based upon a 12-foot core height while Yankee has a 7.6 foot core, (2) assumed

decreasing linear heat generation rates as a function of core height and is thereby inconsistent with the Yankee Technical Specifications, and (3) was only analyzed to the end of bypass and not to the time of peak cladding temperature.

Based upon the above, the staff does not have sufficient information to conclude that the Yankee plant remains in conformance with 10 CFR 50.46. Specifically, it appears that an approved evaluation model may not have been used for the evaluation of ECCS performance which adequately addresses a "range of power distribution shapes and peaking factors representing power distributions that may occur over the core lifetime" as is required by Section I.A. of Appendix K to 10 CFR Part 50. Also, it appears that the Technical Specifications may not be adequate as the maximum linear heat generation rates are not modified as a function of core elevation, which is expected to be necessary due to degraded reflooding heat transfer as core elevation increases, and have not been verified by appropriate LOCA analyses in conformance with Appendix K.

Based upon the above, the staff needs the following information to determine that Yankee remains in conformance with 10 CFR 50.46.

1. Demonstrate, with reference to appropriate analyses, how the current Yankee LOCA analyses satisfy the requirements of Section I.A. of Appendix K to 10 CFR Part 50.



2. Demonstrate, with reference to appropriate analyses, that the current Yankee Technical Specifications assure conformance to 10 CFR 50.46 for all permissible power shapes.

If the demonstration required by questions 1 and 2 cannot be provided, then respond to the following:

3. Provide your plans and schedule for performing LOCA analyses which fully conform to the requirements of Appendix K to 10 CFR 50.46. These plans should discuss the verification and/or modification of your current plant Technical Specifications.
4. Justify how operation of Yankee, during the proposed time period for analysis given in response to question 3, provides reasonable assurance of compliance to the performance requirements of 10 CFR 50.46 in event of a LOCA. Provide a description of any administrative controls, if any, you intend to employ in order to assure compliance over this time period.