

UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

January 25, 2001



Mr. Gary L. Vine
Senior Washington Representative
Electric Power Research Institute
2000 L Street, NW., Suite 205
Washington, DC 20036

SUBJECT: SAFETY EVALUATION REPORT ON EPRI TOPICAL REPORT NP-7450(P),
REVISION 4, "RETRAN-3D - A PROGRAM FOR TRANSIENT THERMAL-
HYDRAULIC ANALYSIS OF COMPLEX FLUID FLOW SYSTEMS" (TAC NO.
MA4311)

Dear Mr. Vine:

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the Electric Power Research Institute (EPRI) Topical Report NP-7450(P), Revision 4, "RETRAN-3D - A Program for Transient Thermal-Hydraulic Analysis of Complex Fluid Flow Systems," for analysis of Standard Format Chapter 15 accidents and transients. The report describes modifications to the approved RETRAN-02 analysis code which include the addition of three-dimensional kinetics capability and other changes to the thermal-hydraulic modeling capability.

The staff previously reviewed and accepted earlier versions of this analysis methodology, subject to several conditions and limitations on their use. The review of the new version has found the proposed changes to be acceptable, subject to the conditions and limitations on its use described in the enclosed safety evaluation, that you accepted in your December 13, 2000, letter. Please note that even with this generic approval of the new version, the responsibility for assessment of the code and the new modeling changes continues to rest with the individual user, and approval of all future applications of this code will require the formal submittal of detailed assessment documentation by the code user.

The staff finds that the subject topical report is acceptable for referencing in licensing applications to the extent specified and under the limitations delineated in the report and in the associated NRC safety evaluation. The safety evaluation, which is enclosed, defines the basis for acceptance of the topical report.

The staff will not repeat its review of the matters described in the subject report, when the report appears as a reference in license applications, except to ensure that the material presented applies to the specific plant involved. In accordance with the procedures established in NUREG-0390, the NRC requests that EPRI publish an accepted version of the report within 3 months of receipt of this letter. The accepted version shall incorporate (1) this letter and the enclosed safety evaluation between the title page and the abstract, (2) all requests for additional information from the staff and all associated responses, and (3) an "-A" (designating "accepted") following the report identification symbol.

If the NRC's criteria or regulations change so that its conclusions about the acceptability of the report are invalidated, EPRI or the applicant referencing the report, or both, will be expected to revise and resubmit its respective documentation, or submit justification for the continued effective applicability of the report without revision of the respective documentation.

Pursuant to 10 CFR 2.790, we have determined that the enclosed safety evaluation does not contain proprietary information. However, we will delay placing the safety evaluation in the public document room for a period of ten (10) working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.790.

If you have any further questions regarding this review, please contact Leonard Olshan at (301) 415-1419.

Sincerely,
/RA by Stephen Dembek for/
Stuart A. Richards, Director
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 669

Enclosure: Safety Evaluation

cc w/encl: See next page

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8.0 CONCLUSIONS

Development of RETRAN-3D is a significant advancement in analysis tools versus RETRAN-02. The RETRAN-3D code, however, due to its flexibility is a very complex tool to use. The degree to which the user can affect calculational results necessitates stringent controls over the training of the user and close examination of the modeling, assumptions and options used.

RETRAN-3D was submitted for staff review to be a code applicable to all Standard Review and Format Chapter 15 events except the loss-of-coolant accidents. As such it would be expected that broad and extensive assessment of the code would be provided addressing all models and correlations, a broad spectrum of separate effects tests, and a wide range of integral systems tests and actual plant data. This would also be expected to include a wide range of plant types and configurations. The lack of sufficient code assessment makes it incumbent upon the individual licensee or applicant to provide appropriate assessment for each use and application of the code. In addition, the user will have to provide verification that the code is used within the proper range of each and every correlation and model selected.

As a condition on the code used in a "RETRAN-02 mode," it will be necessary to provide adequate demonstration that the code is actually used in that mode where possible and that the only divergences are due to mandatory use of modified numerics and models. It will be essential that demonstration be provided that margins similar to those that would be obtained with RETRAN-02 have been obtained.

The addition of 3-dimensional neutron kinetics is a significant advancement in the code's capability. The performance of the kinetics models has been demonstrated to be consistent with that of other similar methodologies. The models have been compared with other methodologies by the staff and assessed by comparison with existing prompt critical experimental data. The staff concludes that use of the RETRAN-3D kinetics models is acceptable for transients such as the PWR rod ejection and BWR rod drop. In the case of the main steam line break in the PWR, the results are comparable to those obtained with lower order kinetics models since the transient is driven by the thermal-hydraulic conditions. Approval is not given for use of the code for the BWR instability calculation.

The staff believes that establishment of a RETRAN-3D peer review process by the RETRAN-3D Maintenance Group is a positive step in alleviation of staff concerns about user experience and consistency and uniformity in application of the code.

The staff review of RETRAN-02 resulted in a list of 39 limitations and conditions of use. The review of RETRAN-3D results in a reduction of that list, but does not eliminate all of the conditions. Many of the conditions still apply to RETRAN-3D and are, therefore, still in force. The forty-five conditions and limitations discussed above have been agreed to by EPRI and the RETRAN-3D Maintenance Group in a letter dated December 13, 2000.

The Chexal-Lellouche drift flux model appears to be an improvement over the previous RETRAN drift flux models based on the limited assessment provided. A licensee wishing to use the correlation will have to assure its use is in conformance with the conditions noted in Condition 16 above. Use outside the noted range of acceptance, or where CCFL is important, will necessitate that an applicant provide assessment over the full range of conditions

encountered during the application of interest. Since the correlation is purely empirical in nature the assessment must be provided for full scale in all variables of interest. An assessment of the uncertainties must also be provided.

Final acceptance of RETRAN-3D for licensing basis calculations depends upon successful adherence to the conditions and limitations on use discussed in this report. The RETRAN-3D documentation is expected to be republished with noted errors corrected and this safety evaluation included. The staff will audit the use of the RETRAN-3D code to verify that the conditions and limitations on use are followed.

9.0 REFERENCES