

# CERTIFIED

ACRS-3148

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CERTIFIED BY:

Graham B. Wallis - 4/10/99

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
THERMAL HYDRAULIC PHENOMENA SUBCOMMITTEE MEETING MINUTES  
EPRI RETRAN-3D TRANSIENT ANALYSIS CODE  
MARCH 23, 1999  
ROCKVILLE, MARYLAND

INTRODUCTION:

The ACRS Subcommittee on Thermal Hydraulic Phenomena held a meeting on March 23, 1999 with representatives of the NRC staff, and the Electric Power Research Institute (EPRI). The purpose of this meeting was for the Subcommittee to continue its review of the EPRI RETRAN-3D thermal-hydraulic transient analysis code. The entire meeting was open to the public. Mr. P. Boehnert was the cognizant ACRS staff engineer and Designated Federal Official (DFO) for this meeting. There were no written comments or requests for time to make oral statements received from members of the public. The meeting was convened by the Subcommittee Chairman at 8:30 am, March 23, 1999, and adjourned at 3:30 PM that day.

ATTENDEES

ACRS Members/ACRS Consultants:

G. Wallis, Chairman  
T. Kress, Member  
M. Fontana, Member

R. Seale, Member  
V. Schrock, Consultant  
P. Boehnert, DFO

NRC Staff:

R. Caruso  
R. Landry  
U. Shoop  
T. Uises  
J. Staudenmeier

EPRI

L. Agee  
G. Swindlehurst (Duke Power)

There were approximately 10-15 other members of the public in attendance during this meeting. A listing of those attendees who registered is available in the ACRS office files. Public participation during this meeting was limited to the presentations by the above named industry representatives.

The presentation slides and handouts used during the meeting are attached to the Office Copy of these Minutes. The presentations to the Subcommittee are summarized below.

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### CHAIRMAN'S COMMENTS

G. Wallis, Subcommittee Chairman, convened the meeting. He indicated that the Subcommittee is eager to hear from the staff regarding the progress of its review of the RETRAN-3D code.

### NRR PRESENTATIONS - REVIEW OF RETRAN-3D TRANSIENT ANALYSIS CODE

#### Technical Presentations

Representatives of NRC-NRR provided the following presentations relative to the staff's review of RETRAN-3D:

- Introduction and Status
- Thermal-Hydraulics
- Kinetics
- Assessment
- User Experience
- Summary

Key Issues/Observations noted by the NRR staff representatives were:

- NRR has revamped its code review approach as follows: review is conducted totally in-house without contractor support, emphasis is placed on performing audit/confirmatory calculations by exercising the code under review, and, close and continuous interaction is to be maintained with the applicant and the ACRS. For this new approach, the code developer will bear the burden to demonstrate the correct implementation, adequacy, and range of applicability of the code models.
- Issues identified with the RETRAN-3D thermal-hydraulics include:
  - Some models do not include range of validity, applicability or assessment. Inadequate or no references are given in some cases.

- A large "user effect" is introduced by allowing mixing and matching of different models for the same problem.
- Different models are used for different plant assessments. This necessitates case-by-case justification and review.
- The five-equation model needs detailed review, given its usefulness in BWR and steam generator analyses. This model with non-condensable gases included cannot predict equilibrium conditions.
- Evaluation of the RETRAN-3D kinetics model found it to be well written and acceptably described. There are some minor questions on several models. Running sample problems did uncover concerns with the kinetics models that require additional investigation - particularly with the PWR rod drop model. Additional investigation of (BWR) stability is required.
- The staff believes that EPRI's assessment effort to date lacks the necessary rigor expected of an industry-standard code. The new models in the "-3D" version of the code have not been adequately assessed. NRR and EPRI are working to resolve this issue.
- NRC's user experience with RETRAN uncovered problems with documentation (lack of clarity in User Manual, lack of modeling guidelines), and "usability" (code failed for BWR rod drop problem, user skill is very important). NRR will audit the EPRI code training course.
- EPRI has been very cooperative in working to resolve the concerns identified by the staff.
- In closing comments, Mr. Caruso noted that the lessons learned from this code review will be fed into the staff's efforts to develop code review guidelines. He said that the staff has adequate manpower to support this review and enjoys good support from its management. Mr. Caruso welcomed any help the ACRS could provide.

#### Subcommittee Comments

1. The Subcommittee Members repeatedly noted a concern with the staff's lack of acceptability (success) criteria for guiding judgment as to when the code will be deemed adequate. Dr. Wallis expressed concern that the staff not put itself in a position where it is forced to accept a less-than-adequate code due to the pressures of schedule, in lieu of developing up front a set of acceptance criteria.

2. Dr. Kress raised the issue of how the uncertainty associated with the code will be assessed.
3. Dr. Wallis noted that a challenge facing use of best-estimate codes is the lack of experimental data for model validation.
4. Mr. Schrock expressed concern that the NRC staff does not have access to the kinetics data from the SPIRT test series to aid its review of RETRAN. He urged the staff to obtain these data and exercise the code against them.
5. Mr. Schrock urged the staff to investigate the gap conductance model used in the code.
6. Dr. Seale suggested that the ACRS and the staff work in close cooperation, as was done for the development of Regulatory Guide 1.174, to aid the staff's development of code review guidelines/acceptance criteria. The staff expressed strong support for utilizing this approach

#### COMMENTS FROM EPRI REPRESENTATIVES

Mr. G. Swindlehurst (Duke Power) and Dr. L. Agee (EPRI) provided comments. Mr. Swindlehurst, a member of the RETRAN Users Group, noted that the code is employed in a variety of uses by nuclear power plant licensees. He said that subsequent to the staff's generic review, an even-more-detailed review is conducted for plant-specific use. He noted that proper use of RETRAN demands an experienced user, and that there are strong controls in place for running these codes (QA programs, user qualification requirements, etc.). In response to Drs. Wallis and Seale, Mr. Swindlehurst said that his organization relies on the code vendor to address any problems found with the physical models.

Dr. Agee noted that EPRI has enjoyed a good professional relationship with the staff for this review. He indicated that what he called "inexperienced user feedback", as NRR is providing, is valuable for updating/editing the code user documentation. Dr. Wallis asked for the rationale employed to select the particular models used in the code. Dr. Agee indicated that the model choices are based on the code's ability to model plant transient data.

#### SUBCOMMITTEE CAUCUS

Dr. Wallis solicited comments from the Subcommittee. He also requested written reports from the ACRS Consultant, prior to the April ACRS Meeting. Comments provided included the following:

Mr. Schrock - Expressed doubt that the review can be successfully accomplished in accordance with the proposed schedule (draft SER in September 1999). He supports the cooperative review approach as discussed during this meeting. Recommended that NRC reexamine codes given prior review approval, as the current regulatory standards reflect 1970's-era knowledge. NRR/RES interchanges have greatly improved, but more needs to be done here.

Dr. Kress - The staff's review process is encouraging. The problems he sees are that with the move to use of "best-estimate" codes, no criteria exist as to what defines "best estimate" and what constitutes a "best-estimate" code. Also, the staff is not addressing the issue of uncertainties. He suggested that the staff develop a set of arbitrary acceptance parameters for the design basis accidents, perhaps by making use of existing test databases.

Dr. Seale - Applauds the staff's enthusiasm for the new review approach. He seconded Mr. Schrock's recommendation that NRR revisit the validity of past code approvals that were not made in light of our risk-informed regulatory paradigm. Requested that the staff provide the Subcommittee results of RETRAN steady-state plant calculations and information on associated normalizations that are required.

Dr. Fontana - Believe that the cooperative review approach holds great promise and should be encouraged.

Dr. Wallis - Requested that for the next meeting NRR provide information on its success criteria for code reviews as well as an approach for dealing with the issue of uncertainty. Believes that the staff needs to have review criteria in hand within the next two months to ensure successful review by September. He indicated that additional test data may be needed to ensure that the quality of the code's predictive capability is adequate.

The Chairman recommended that an informal information exchange be established to keep the Subcommittee closely informed on the progress of the RETRAN review. He also suggested that the staff provide monthly status reports to the Subcommittee, which would include identification of difficult review issues as well as resolution of previously identified concerns.

#### FOLLOW-UP ACTIONS

Dr. Wallis will report the results of this meeting to the ACRS during its April Meeting. He intends to propose that the Subcommittee function as a "Working Group" to oversee the staff's review, pursuant to the decision that the Committee conduct "participatory" reviews of selected issues at the Subcommittee level.

**BACKGROUND MATERIAL PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING**

Memoranda, dated March 12, 1999 from P. Boehnert ACRS to Thermal Hydraulic Phenomena Subcommittee including the following material:

- E-Mail transmittal from R. Landry, NRR, undated, titled, "RETRAN-3D - Requests for Additional Information"
  
- Memorandum to ACRS Members, from P. Boehnert, dated February 22, 1999, transmitting certified copy of Minutes of ACRS Thermal-Hydraulic Phenomena Subcommittee Meeting, December 16-17, 1999

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NOTE: Additional details of this meeting can be obtained from a transcript of this meeting available in the NRC Public Document Room, 2120 L Street, Washington, D.C. 20006, (202) 634-3274, or can be purchased from Ann Riley & Associates, LTD., 1250 I Street, Suite 300, Washington, D.C. 20005, (202) 842-0034.