

INTERIM REPORT

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under Accident Conditions  
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NRC Research and Technical  
Assistance Report

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MONTHLY HIGHLIGHTS

for

September 1980\*

PROGRAM: Evaluation of LWR Residual Heat Removal  
under Accident Conditions  
Technical Assistance, Reactor Projects  
Fin A-3315

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Commission.

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## MONTHLY HIGHLIGHTS

### TASK I. PROBABILISTIC ANALYSIS (A. J. Buslik)

Work continued on the preparation of the final report on the problem of assessing the risk reduction resulting if cold shutdown could be reached by the use of safety grade equipment. A report from SAI on a subcontract related to this work was received at the end of the month.

### TASK II. NATURAL CIRCULATION (K. R. Perkins and E. G. Cazzoli)

A draft report on the "PWR Natural Circulation Boron Mixing Tests" has been completed and transmitted to the NRC/DSI for review. The report compares RETRAN, LOFTRAN and BITRAN predictions of the proposed tests and describes the BITRAN code developed at BNL.

### TASK III. DEGRADED CORE ACCIDENT EVALUATION (W. T. Pratt)

#### MARCH Code - Operation and Maintenance (J. Zahra)

The updates to MARCH requested from BCL during August have not yet been received. The time step modifications to MARCH cause a great deal of data to be read into the files used as input to the plotting program. It was therefore necessary to write additional programs to modify the data to allow plots to be made.

#### Accident Sequences (W. T. Pratt)

Scoping studies for transients and small LOCA (equivalent diameter 2 inches) in the Zion/Indian Point Reactor Plants have been completed. A draft report is being prepared.

#### MARCH Code - Evaluation and Testing (J. W. Yang)

A logic error was found in the subroutine HOTDROP. In the subroutine, a parameter G040 is used to control the heat flux from the debris to water (QWTR). It was found that when the debris is quenched, the logic of the subroutine controlled by the parameter G040 sets QWTR to zero. This implies that no heat transfer take place between the debris and water. With the decay heat and metal-water reaction as heat sources but no heat loss, the debris temperature increases rapidly. A test case involving the TMLB' accident shows that the debris is reheated to 2500°F and is starting to melt the concrete at about 460 minutes. A preliminary fix to the logic was made by setting QWTR equal to the decay heat after the debris has been quenched.

#### Core Debris/Water Interactions (J. W. Yang)

A draft of the report entitled "Cooling of Ex-vessel Debris and its Impact on Containment Pressure" was transmitted to NRC. The study of debris/concrete interaction and its effect on debris cooling has been started.

### MARCH Code Modeling - Condensation Heat Transfer (R. D. Gasser)

A mechanistic condensation model has been devised for use in the MARCH code. The model will supplant the UCHIDA correlation which is presently used for calculation of the heat transfer and condensation rates at the containment boundaries. The UCHIDA correlation is considered to be inadequate, in that it correlates condensation as a function only of the air-to-steam ratio. This assumption has neither analytical nor experimental justification.

### Hydrogen Modeling (S. S. Tsai)

A model for the interaction of Fe and steam has been added to the Boil subroutine of the MARCH code. The model calculates both solid-phase and gas-phase diffusion and determines which is the dominant mechanism in the reaction. Preliminary results indicate that about 25% of the Fe in the core region will have reacted at the point of core slumping. The interaction of Fe and steam as the core falls into the bottom head is at present done parametrically.

### Hydrogen Control in LWRs (A. Berlad, M. Sibulkin and C. H. Yang)

The draft version of a report entitled, "Containment Building Safety Related to Accidental Hydrogen Release," has been completed and sent to NRC.

Distribution

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