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Author(s), Affiliation and Address: H.W. MASSIE, JR. Project Engineer
Westinghouse Electric Corporation
P.O. Box 355, Pittsburgh, PA. 15230

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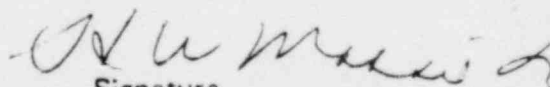
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L.H. SULLIVAN
Reactor Safety Research

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PRELIMINARY

NRC Research and Technical
Assistance Report

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Westinghouse
Electric Corporation

Water Reactor
Divisions

Nuclear Technology Division

Box 355
Pittsburgh Pennsylvania 15230

July 18, 1980

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Dr. K. H. Sun
EPRI PMG Member, FLECHT-SEASET Program
Safety and Analysis Department
Nuclear Power Division
Electric Power Research Institute
P.O. Box 10412
Palo Alto, California 94303

Dr. L. Harold Sullivan
NRC PMG Member, FLECHT-SEASET Program
Separate Effects Research Branch
Division of Reactor Safety Research
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: FLECHT-SEASET PROGRAM
Informal Monthly Progress Report for May, 1980
CONTRACT: NRC 04-77-127, EPRI NO. RP95^a-1

Gentlemen:

Attached is an informal progress letter for the month of May, 1980, for FLECHT-SEASET.

Sincerely,

WESTINGHOUSE ELECTRIC CORPORATION

H. W. Massie, Jr.
FLECHT-SEASET Project Engineer
Strategic Projects

jb

Attachment

Dr. K. H. Sun, 12L, 12A
Dr. Harold Sullivan, 1L, 1A

cc: Mr. Andrew L. M. Hon (NRC)
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NRC Research and Technical
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FLECHT-SEASET PROGRAM
CONTRACT NRC-04-77-127
PROGRESS LETTER

Mr. S. Levine, Director
Office of Nuclear Regulatory Research
Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. T. E. Murley, Director
Division of Reactor Safety Research
Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. R. L. Tedesco
Nuclear Regulatory Commission-DSS
Washington, D. C. 20555

Mr. R. F. Fraley, Executive Secretary
ACRS
Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. P. Litteneker
Idaho Operations Office
P. O. Box 2108
Idaho Falls, Idaho 83401

Mr. J. O. Zane, Manager
Semiscale Program
INEL
550 Second Street
Idaho Falls, Idaho 83401

Mr. G. Sozzi
General Electric Company
175 Curtner Avenue
San Jose, California 95125

Dr. J. H. Holderness
Combustion Engineering, Inc.
Nuclear Power Department
Post Office Box 500
Windsor, Connecticut 06095

Dr. B. Bingham
Babcock & Wilcox Company
Post Office Box 1206
Lynchburg, Virginia 24505

Dr. L. S. Tong, Assistant Director for
Water Reactor Safety Research
Division of Reactor Safety Research
Nuclear Regulatory Commission
Washington, D. C. 20555

Dr. P. A. Lottes
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

Dr. J. A. Dearien, Manager
Code Verification & Applications Program
EG&G Idaho, Inc.
Post Office Box 1625
Idaho Falls, Idaho 83401

Dr. Peter Griffith
Department of Mechanical Engineering
MIT
Cambridge, Massachusetts 02139

Dr. D. C. Groeneveld
Chalk River Nuclear Laboratories
Chalk River
Ontario, Canada K0J1J0

Dr. D. A. Powers
Division of System Safety
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Professor W. Y. Chon
Department of Engineering Science
Aerospace Engineering & Nuclear Engineering
State University of New York
Buffalo, New York 14214

Mr. Wayne Hodges
Nuclear Regulatory Commission-DSS
Washington, D. C. 20555

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Division of Contracts
Nuclear Regulatory Commission
Washington, D. C. 20555

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Dr. James F. Jackson
Associate Division Leader for Reactor Safety
Energy Division (Mail Stop 555)
Los Alamos Scientific Laboratory
Post Office Box 1663
Los Alamos, New Mexico 87545

Mr. R. Jensen
Intermountain Technology
Post Office Box 1604
Idaho Falls, Idaho 83401

Mr. W. Kirchner
Post Office Box 1663
Mail Stop 557
Los Alamos Scientific Laboratory
Los Alamos, New Mexico 87545

Dr. P. North, Manager
Code Development & Analysis Program
EG&G Idaho, Inc.
Post Office Box 1625
Idaho Falls, Idaho 83401

Mr. James White, Manager
PWR BDHT Program
Oak Ridge National Laboratory
Post Office Box Y
Oak Ridge, Tennessee 37830

Mr. W. Farmer
Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. W. Kayser
Exxon Nuclear
2101 Horn Rapids Road
Richland, Washington 99352

Mr. G. E. Wilson (TSB)
EG&G Idaho, Inc.
550 Second Street
Idaho Falls, Idaho 83401

Mr. E. H. Davidson
Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. Joel S. Gilbert (Group Q-9)
Los Alamos Scientific Laboratory
Post Office Box 1663
Mail Stop 553
Los Alamos, New Mexico 87545

Professor R. A. Seban
Department of Mechanical Engineering
University of California
Berkeley, California 94720

Professor I. Catton
Department of Chemical, Nuclear, and Thermal
Engineering
University of California
Los Angeles, California 90024

Mr. G. F. Brockett
Intermountain Technologies, Inc.
Post Office Box 1604
Idaho Falls, Idaho 83401

Dr. G. E. Dix
Nuclear Energy Division, M/C 583
General Electric Company
175 Curtner Avenue
San Jose, California 95125

Mr. K. V. Moore
Energy Incorporated
Post Office Box 736
Idaho Falls, Idaho 83401

Dr. Z. Rosztoczy
Nuclear Regulatory Commission-DSS
Washington, D. C. 20555

Mr. T. Charlton
EG&G Idaho, Inc.
Post Office Box 1625
Idaho Falls, Idaho 83401

Dr. S. Fabic
Nuclear Regulatory Commission-RSR
Washington, D. C. 20555

Dr. D. A. Prelewicz
NUS Corporation
4 Research Place
Rockville, Maryland 20850

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FLECHT-SEASET PROGRAM
INFORMAL MONTHLY PROGRESS REPORT
MAY, 1980

PROJECT MANAGEMENT - H. W. MASSIE, JR.

Testing was completed on the first bundle, the unblocked reference configuration, of the 21 Rod Bundle test facility. The second bundle, which includes flow blockage sleeves on 9 of 21 heater rods, was fabricated and inserted into the test facility. Testing will be initiated in June.

TESTING PLANNING AND ANALYSIS - L. E. HOCHREITER/R. P. VIJUK

Unblocked Bundle Task (Task 3.2.1)

Preliminary results of the statistical analysis to examine bundle distortion effects were obtained; the results seemed to indicate that the present statistical method fails to quantify the effects of bundle distortion. Work is being continued to improve the method and/or to find other ways to study the geometry distortion effects.

Work is being continued to analyze the unblocked reflood data; the efforts include modifying the Heat II Code, estimating the appropriate drop size and drop velocity movies, and improving the rod-to-rod radiation model.

A scheme of mass and energy balance in the bundle has been developed and incorporated into FLEMB. The code has been used to analyze several test runs, 31504, 31302, 31701, 34106, 31805, and 31203. The results showed an improvement in calculating the quality at the quench front.

The skewed power correlation has been modified to include an adiabatic period for low initial cladding temperature. The correlation was compared with old FLECHT data, 15 X 15 skewed power and cosine power test data; some disagreements exist. The correlation is currently being modified to correct these disagreements.

21 Rod Bundle Task (Task 3.2.2)

The 21 Rod Bundle task plan was released to Technical Publications for printing. It is expected to be forwarded to EPRI, NRC, and their respective consultants by mid-June.

Reflood testing of the first 21 rod bundle was completed May 13, 1980. All tests which were run prior to the turbine meter calibration shift were found to have an acceptable mass balance using the corrected calibration. The steam cooling tests were rerun after the reflood tests were completed. In the initial steam cooling tests, the test facility apparently had water present, therefore to insure a completely dry facility, the tests were preheated at

30 psia and run at 20 psia. Four of the five steam cooling tests conducted were deemed acceptable.

After the first bundle was pulled from the housing, it was learned that the filler rods had broken at a joint and separated approximately 2 inches at the mid-plane. The outer row of heater rods had distorted slightly due to the bowing of the fillers; however, it is believed that the geometry of the inner 9 rods had remained intact. The heat transfer data for 3 repeat tests were compared, and it was found that the data compared well. Additional comparisons of the 3 repeat tests and other reflood tests are presently underway. EPRI and NRC agreed to continue with bundle #2 testing in parallel with data analysis of bundles No. 1 and No. 2. The PMG agreed to hold testing of bundle No. 3 until data comparisons and analyses could be made on bundles No. 1 and No. 2.

The heater rod instrumentation layout for bundle No. 5, which includes long concentric blockage sleeves distributed in a non-coplanar fashion, was completed. The bundle build specifications, which include heater rod, steam probe, and blockage sleeve thermocouple placement for the third bundle (short sleeves on all rods distributed coplanar) were completed.

161 Blocked Bundle Task (Task 3.2.3)

A proposed method for determining the azimuthal burst direction of alpha phase zircaloy clad was developed. The sleeve geometry for the 90 percent flow blockage case in a coplanar distribution has been defined.

Steam Generator Separate Effects Task (Task 3.2.6)

To satisfy an April PMG meeting action item, the reference steam generator run (Run No. 22701) temperatures were corrected using a T/C calibration characteristic developed in the System Effects Task and the local fluxes were recomputed. The calculation showed that the uncorrected T/C data yields local heat fluxes that are nearly identical to the heat fluxes calculated using the corrected T/C measurements. The largest variance was 6 percent at one particular time; in general the difference was less than 1 percent.

The steam generator separate effects test data was reviewed to determine the data logger readout error for comparison with the estimated DAS error in the error analysis in the data report. The test data suggests that the actual DAS readout error is much smaller than the error assumed in the data report.

The draft steam generator evaluation report was completed and issued to EPRI and NRC.

Reflood and Natural Circulation Systems Effects Tests (Task 3.2.7)

RAMA is fabricating a single-ended prototype heater rod for delivery by the end of June. This rod will be shipped to ORNL for low temperature recovery annealing and then to Forest Hills for testing. Testing of this rod is scheduled for the end of July.

Westinghouse personnel visited RAMA to discuss quality assurance and fabrication schedules. It was agreed that the West Coast quality control engineer will audit RAMA periodically during the rod manufacturing period.

Azimuthal and axial location of thermocouples on the two bundle instrumentated thimbles were specified. Radiation heat transfer studies were made with the Moxy Code and Yeh's radiation model to determine the effect of increasing the thimble walls from 24 to 34 mils in order to provide more support for the wall thermocouples. The results showed that the increase in thimble wall thickness does not significantly affect the temperature transient and quench behavior of the adjacent rods nor the thimbles. Consequently, the thimble wall will be increased to 34 mils.

Plans are being made to perform upper plenum (U.P.) air/water tests to determine the upper core plate and ground plate flooding characteristics. These tests are planned to be conducted in the semiscale air/water test facility at EG&G Idaho. U.P. drawings and test requirements were mailed to EG&G, and a visit to discuss testing details will be made shortly. Because of conflicts regarding the loop construction and the EG&G air/water loop startup and operating schedules, fabrication of a U.P. plexiglass housing is being considered.

Work continued to reduce the T/C errors associated with the steam generator tube bundle T/C's. Potential modifications to the DAS to reduce the T/C error include increasing the scan time, reducing the T/C range and using data averaging to decrease the random error.

A preliminary data reduction plan for the system effects tests was defined. This plan defines the changes to the software developed for the separate effects steam generator test. (SGTEMP and SGFLUX programs.)

The instrument locations to be instrumented with the calibrated T/C's were identified in the small steam generator bundle. Also, additional T/C calibrations were specified.

The FLECHT Phase B test data for downcomer to containment tank pressure drop were studied to confirm the calculated downcomer to containment tank pressure drop in the Systems Effect Task.

FACILITIES ENGINEERING/TEST OPERATIONS - L. R. KATZ/C. E. FUCHS

21 Rod Bundle (Task 3.2.2)

All matrix tests were completed for Bundle No. 1, the unblocked bundle configuration. The bundle showed significantly less distortion as compared to the Unblocked Bundle; however, some distortion between the 62 inch and 83 inch elevation grids existed. The pin connections for the fillers sheared off, and there was a two-inch gap between the fillers. There was also slight movement of the fillers inward into the bundle. The separation of the fillers caused the failure of the steam probes below the 74 inch elevation. Work has started on casting the bundle section in epoxy and taking cross sections to determine the amount of bundle distortion.

Bundle No. 2 has been installed into the test section, and testing should resume on June 9, 1980.

161 Rod Bundle (Task 3.2.3)

About two-thirds of the facility hardware has now been placed on order. Construction of the facility support structures was completed.

System Effects Task (Task 3.2.7)

The small steam generator was successfully hydrottested. The lower plenum and top cap for both steam generators were shipped to the vendor for modifications, addition of new inlet nozzles to the lower plenum and a new circulation nozzle in the top cap.

Ungrounded T/C's were ordered for the small steam generator fluid and steam probe instrumentation. These will allow for more accurate ΔT measurements. Installation of the tube wall T/C's in the small steam generator was initiated.