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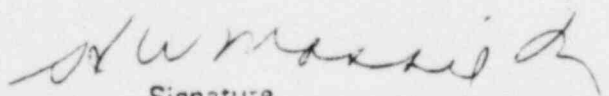
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NRC Research and Technical
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July 18, 1980

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SUBJECT: FLECHT-SEASET PROGRAM
Informal Monthly Progress Report for June, 1980
CONTRACT: NRC 04-77-127, EPRI NO. RP959-1

Gentlemen:

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

Sincerely,

WESTINGHOUSE ELECTRIC CORPORATION

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

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Attachment

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cc: Mr. Andrew L. M. Hon (NRC)
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CONTRACT NRC-04-77-127
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FLECHT-SEASET PROGRAM
INFORMAL MONTHLY PROGRESS REPORT
JUNE, 1980

PROJECT MANAGEMENT - H. W. MASSIE, JR.

The first flow blockage tests under the FLECHT-SEASET program were initiated in the 21 Rod Bundle test facility.

Procurement and some construction effort is proceeding on the 161 Rod Bundle test facility. Design and procurement is proceeding on the System Effects Natural Circulation/Reflood test facility; also instrumentation work on the small steam generator is proceeding.

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

Unblocked Bundle Task (Task 3.2.1)

Nine test runs have been analyzed by FLEMB, the mass and energy balance program. Also qualitative comparisons of the data are being prepared. COMPARE program is being modified to accept FFLOW outputs.

An initial effort to define the froth level above the quench front was initiated using the heater rod T/C slope as an indication of the froth level; this idea was suggested by Y. Murao of JAERI.

The modification of the skewed power correlation is essentially complete and is being compared with selected runs of the 15 X 15 cosine and skewed power FLECHT tests and 17 X 17 FLECHT-SEASET tests. It is hoped that this will finalize the development of the skewed power correlation, if the results of the comparison are satisfactory.

Work has been initiated to compare the Yeh void fraction correlation with FLECHT-SEASET data. This work will be used to further justify the applicability of the void fraction correlation to a 17 X 17 type rod array.

Analysis of the unblocked bundle rod distortion was continued. More restrictive data samples were chosen in attempts to reduce the rod-to-rod data scatter; this was not successful. The statistical analysis appears inconclusive. The work will be written up; additional analysis of the repeat tests will be made to aid in indicating when the distortion became significant. Efforts were continued on preparation of the evaluation work.

21 Rod Bundle Task (Task 3.2.2)

The 21 Rod Bundle task plan report was published.

Hydraulic characteristics, steam cooling, and forced reflood testing of the second 21 rod bundle was completed in June. The second bundle has the center 9 rods blocked in a coplanar manner with short concentric blockage sleeves.

Data reduction and analysis are in progress. It has been generally observed that the maximum rod temperatures in the blockage configuration are approximately 50°F less than the unblocked configuration. It is expected that the gravity reflood tests will be completed by the second week in July.

The data package summary for the first 21 rod bundle was issued to EPRI, NRC, and their respective consultants. This data package summary provided data in microfiche output for 7 hydraulic characteristics tests, 4 steam cooling tests, and 17 reflood tests; and included a summary of actual test conditions and results, a description of facility improvements, and a bad channel list.

The FFLQWS Code was updated with the friction factor and grid pressure loss coefficients determined in the first bundle. These coefficients are required to calculate the void fraction in the bundle.

The PMG requested that W perform COBRA calculations regarding the impact of the filler distortion on Bundle No. 1; utilizing the actual cross sectional areas of the bundle after the bundle has been epoxied. Westinghouse attempted several methods to epoxy the bundle, but they were unsuccessful. Hence, ORNL was requested to epoxy the bundle. In parallel, Westinghouse has performed COBRA sensitivity studies to determine the effect of filler distortion on the bundle heat transfer.

Bulge directions for Bundles No. 4 and 5 have been determined and will be discussed at the next PMG meeting.

A letter was prepared for the NRC to discuss the German's FEBA flow blockage program and its compatibility with the FLECHT-SEASET 21 Rod Bundle Task.

161 Blocked Bundle (Task 3.2.3)

No major work was performed this month. Some follow and support of the design effort was made.

Steam Generator Separate Effects Task (Task 3.2.6)

No activity this month. Westinghouse is awaiting comments from NRC and EPRI on the draft steam generator evaluation report.

Reflood and Natural Circulation Systems Effects Task (Task 3.2.7)

Westinghouse visited the EG&G Semiscale personnel to discuss the proposed upper plenum air/water tests, the natural circulation and reflux condensation tests and methods to measure liquid film thickness and steam velocities during counter current flow in the hot legs. Several agreements and action items were established for the upper plenum air/water tests. Westinghouse will provide a test section with internals; and EG&G will be responsible for the loop design, test section support, instrumentation, test performance, and reporting the results to the PMG.

Westinghouse agreed to review EG&G instrumentation needs to determine if some equipment can be provided by Westinghouse in order to minimize cost and schedules. Westinghouse has started effort on a general assembly drawing of the upper plenum test section which will include all physical interfaces and instrumentation penetrations. EG&G is preparing cost estimates and schedules based on the discussions held and agreements made during the Westinghouse visit.

Several meetings were held with suppliers regarding improvements in the temperature measurement resolution of the PDP 11/20 computer and the data logger acquisition systems. During reflux condensation tests, resolution of 0.3°F is desirable to minimize error in measuring temperature differences (ΔT) between the primary and secondary side on the order of 5°F .

Work was performed on the development of a technique to measure liquid film mass rates during steam/water counter current flow in the hot leg, and during condensate flow in the cold legs for the reflux condensation tests.

Calculational models were programmed to predict the steam generator temperature distribution under two-phase secondary side flow conditions steady state forced convection flow and transient free convection with no secondary recirculation. These programs will predict the bundle temperatures and local heat fluxes during shakedown tests with single phase liquid primary side flow. Using these programs, a shakedown test matrix was developed that would calibrate the steam generator bundle thermocouples under known conditions.

The PMG action items identified for resolution by the end of June are near completion for the system effects tests. The most difficult item is the method for introducing non-condensibles and measuring the distribution of the non-condensable gas in the test loop.

Previous test data from the FLECHT-SET Phase B tests and calculations of two-phase natural convection reflux boiling were reviewed to establish requirements for data accuracy and data logger performance.

In response to agreements made at the April PMG meeting, a writeup of the methodology to reduce the tube bundle thermocouple uncertainty was completed. A writeup of the expected performance of a D/P probe on the primary side of the small steam generator was also completed.

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

21 Rod Bundle (Task 3.2.2)

Testing was started on Bundle No. 2 on June 9, 1980. These tests had blockage sleeves on 9 of 21 heater rods. To date all of the hydraulic steam cooling and forced reflood tests have been completed. The facility will now be modified for gravity reflood, and the test series should be completed by July 9, 1980. The mass balance program was completed for Bundle No. 2 and will be used for forced and gravity reflood tests only. Assembly of Bundle No. 3 is underway and is expected to be completed on schedule.

161 Rod Blocked Bundle (Task 3.2.3)

About 80 percent of the facility hardware has been placed on order; about 40 percent of the total facility hardware has been received at the test site. Loop construction will be initiated in July, 1980.

System Effects Task (Task 3.2.7)

About 70 percent of the facility hardware has been placed on order; about 35 percent of the facility hardware has been received at the test site. Drawings for the loop piping were completed and sent to prospective vendors for quotations.

Several proposed methods for tracing non-condensable gas injection and sampling techniques are being investigated.