INTERIM REPORT

Accession No. _____

Contract Program or Project Title: SSC Code Development, Verification and Application

Subject of this Document: Monthly Highlights for November

Type of Document: Monthly Highlights

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Date of Document: December 9, 1980

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U.S. Department of Energy

Prepared for
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
Under Interagency Agreement DE-AC02-76CH00016
NRC FIN A-3015

INTERIM REPORT

SSC Project Highlights

for

November 1980

PROGRAM: SSC Code Development, Validation and Application

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This is the monthly highlights letter of (1) the SSC Code Development and (2) SSC Code Validation Programs, Fast Reactor Safety Assessment, for the month of November, 1980. These programs are covered under the budget activity number 60-10-20-01. Only major accomplishments are noted in this letter.

A. CODE DEVELOPMENT (J. G. Guppy)

I. SSC-L Code (G. J. Van Tuyle)

1. Low-Heat Flux Sodium Boiling (M. Khatib-Rahbar, S. Carter)

Severe flow reversals were observed during the high power, high void fraction simulation of ORNL experiments with a high degree of flow oscillation and instability. These effects are being further evaluated and studied.

2. In-vessel Energy Calculations (W. C. Horak, S. F. Carter)

The new numerical method for the solution of temperature distributions in fuel elements was incorporated into SSC. The method was tested on a 5 channel, 5 second null transient, where it yielded excellent results. Further testing is proceeding.

Methodology and preliminary code restructuring were completed for the implicit solution scheme for the core thermal calculations.

3. Steam Generator Modeling (G. J. Van Tuyle, T. C. Nepsee)

The revisions to the steam generator input processor are currently being tested. An input file compatible with the new input processor is nearly complete.

4. LMFBR Accident Progression Analysis (K. Jamali, M. Khatib-Rahbar)

The lumped-base fault-tree of the SHRS is completed and awaiting minor changes in the UPICO code for obtaining the significant initiator-dependent sequences for the forced circulation short term heat removal. A short summary report is being prepared to be sent to Prof. W. Kerr (U. of Michigan) for comments.

5. User Support (J. G. Guppy, R. J. Kennett, N. Tanaka-PNC, G. J. Van Tuyle)

An input data deck for Monju analysis was prepared and is being checked with the SSC-L (CY-31) code to reproduce the specified plant steady-state conditions.

The Gesellschaft fuer Reaktorsicherheit (GRS) had recently requested assistance in resolving some problems they were encountering with SSC-L (reference letter of 9/10/80). The major problems experienced by GRS have been solved and a response letter written.

II. SSC-P Code (M. Khatib-Rahbar)

1. Pipe Break Studies (M. Khatib-Rahbar, E. G. Cazzoli)

Primary system pipe break studies are being conducted for both pool-type (Phenix) and loop-type (CRBRP) LMFBR plants. Impact of break area, pump trip and reactor scram time delay is also being investigated.

2. SSC-P User's Manual (E. G. Cazzoli)

A description of the code library, including input/output data and flow charts compatible with the SSC-L, CYCLE-31 program library has been compiled. The work on the SSC-P data dictionary is being deferred until the code is updated to SSC-L, CYCLE-33, which is currently underway.

III. SSC-S Code (B. Chan)

1. Shutdown Heat Removal System Modeling (B. Chan)

The coding of the direct heat removal system has been started. This DHRS has a separate NaK circuit which removes decay heat from the reactor upper plenum region and cools it by a NaK/air heat exchanger. The model is designed to operate under natural circulation conditions.

B. CODE VALIDATION (R. Pyare)

1. Inter-Code Comparison of SSC-W and RETRAN (L. G. Epel, R. Pyare, R. J. Kennett)

The loss of offsite power transient for TMI-1 has been run on the BNL CDC-6600 for 85 seconds of simulation time using RETRAN and for 180 seconds using SSC-W. In order to make a valid comparison of the results of the two codes, the descriptions of the physical system were made as consistent between the two codes as the respective input formats would allow. Specifically, it was necessary in SSC-W to

- use the RETRAN Doppler feedback coefficient so that post-scram fission powers would agree
- adjust the decay power to match the RETRAN values
- change the pump frictional torque parameters to simulate a constant torque as is done in RETRAN

With these alterations in place, the comparisons between the two simulations were very good as far as they were carried out. On the primary side the flows match extremely well, the core outlet and steam generator inlet temperatures agree very well and the core inlet and steam generator outlet temperatures compare fairly well. Further, the computer resources needed to perform the simulation using SSC-W were much less than those needed using RETRAN. After 80 seconds of simulation, the advantage in running time of SSC-W over RETRAN was almost a factor of 5. In addition, SSC-W does not require as much core memory as does RETRAN, thus further reducing the relative computer cost.

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