

INTERIM REPORT

Accession No. _____

Contract Program or Project Title:

Analysis of Hypothetical Accidents Resulting in Core Meltdown

Subject of this Document:

Analysis of Hypothetical Accidents Resulting in Core Meltdown

Type of Document:

Monthly Progress Report for April, 1980

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Responsible NRC Individual and NRC Office or Division:

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Office of Nuclear Regulatory Research

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

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Prepared for
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

INTERIM REPORT

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PROGRAM: Reactor Safety Study Follow-on Program Subtask FIN#: A4067

CONTRACTOR: Battelle's Columbus Laboratories

BUDGET PERIOD: (mm/yy-mm/yy) 10/79-9/80

PAS PROGRAM MANAGER: J. Curry

BUDGET AMOUNT: (Thousands) 95.1*

CONTRACTOR PROGRAM MANAGER: R. S. Denning

PHONE: FTS-976-7501

PRINCIPAL INVESTIGATOR(S): P. Cybulskis

PHONE: FTS-976-7509

PROGRAM OBJECTIVES:

Investigate the effects of LWR plant design variations on the risks associated with reactor meltdown accidents. Specifically, determine the effects of plant design variations on the probability and nature of the radionuclide source term released during key meltdown accident sequences.

ACTIVITIES DURING April, 1980

Results of the B&W PWR design were summarized and presented at the meeting with NRC on April 25, in Bethesda. In view of recent changes in accident event trees and sequence probabilities by Sandia, these results are being reevaluated.

Grand Gulf analyses are being reviewed; further definition of important accident sequences is expected from Sandia.

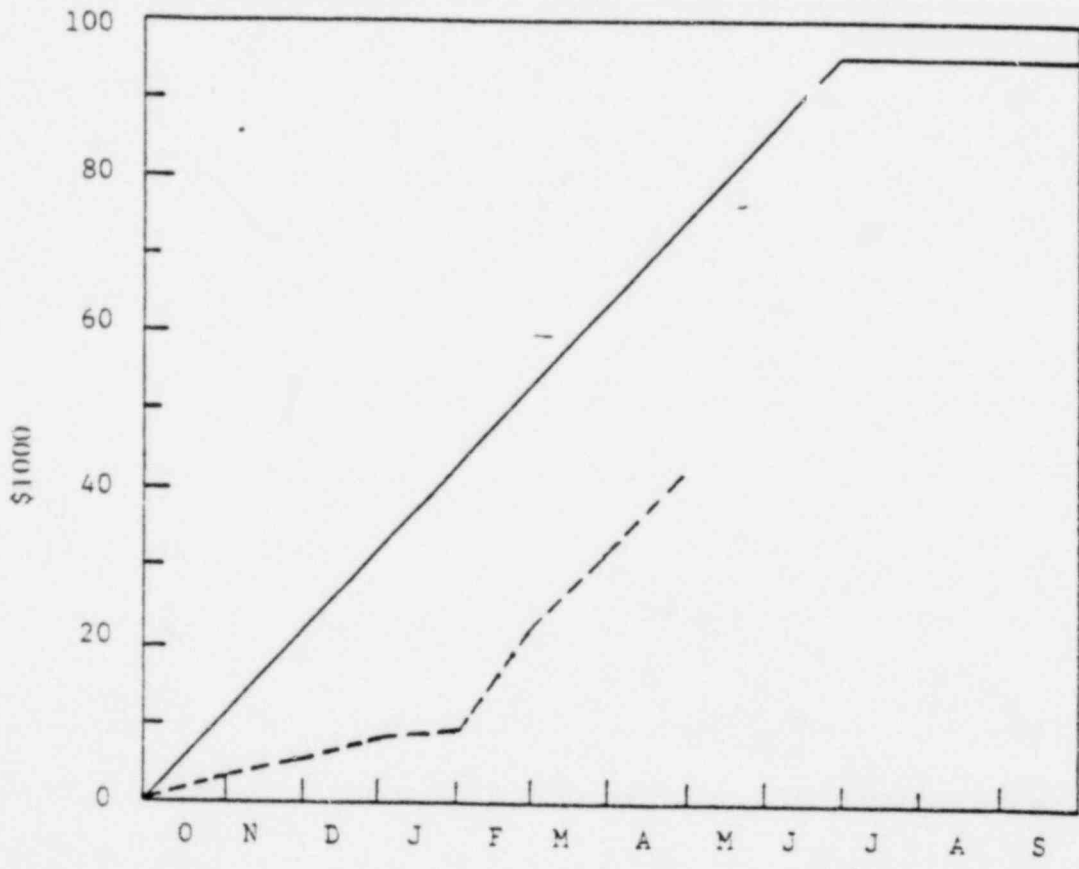
MAJOR MILESTONES:

| MILESTONE DESCRIPTION | SCHEDULED/ACTUAL START | SCHEDULED COMPLETION | ACTUAL/PROJECTED COMPLETION |
|---|------------------------|----------------------|-----------------------------|
| 1. Complete Analyses of B&W Design | 4/78 | 3/80 | 5/80 |
| 2. Complete Analyses of GE Mark III Plant | 9/78 | 4/80 | 5/80 |
| 3. Complete Analyses of CE Design | 8/78 | 5/80 | |
| 4. Evaluation & Documentation | | 7/80 | |

MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:

* Includes \$18,099 carryover from FY'79.

PROGRAM: REACTOR SAFETY STUDY FOLLOW-ON PROGRAM



RESOURCES EXPENDED:

| | APRIL, 1980 | CUMULATIVE |
|------------|-------------|--------------|
| DOLLARS | 10.8 | 42.0 K (44%) |
| MAN-MONTHS | 1.2 | 5.1 |

PROGRAM: Analysis of Thermal-Hydraulic Behavior

FIN#: A4067

CONTRACTOR: Battelle's Columbus Laboratories

BUDGET PERIOD: (mm/yy-mm/yy) 10/79-9/80

PAS PROGRAM MANAGER: J. Curry

BUDGET AMOUNT: (Thousands) 81.9*

CONTRACTOR PROGRAM MANAGER: R. S. Denning

PHONE: FTS-976-7501

PRINCIPAL INVESTIGATOR(S): P. Cybulskis

PHONE: FTS-976-7509

PROGRAM OBJECTIVES:

1. Test each of the modules in the MARCH code.
2. Standardize programming and units.
3. Document the MARCH code.
4. Verify against available data and compare with similar codes.

ACTIVITIES DURING April, 1980

As part of the USA/FRG information exchange, discussions relating to code comparison studies were held on April 11-12 in Knoxville and April 17-18 in Columbus.

A workshop on the development and use of the MARCH code was presented to NRC as well as industrial representatives on April 24 in Bethesda.

MARCH documentation activities were continued.

Additional requests for the MARCH code have been received through PAS.

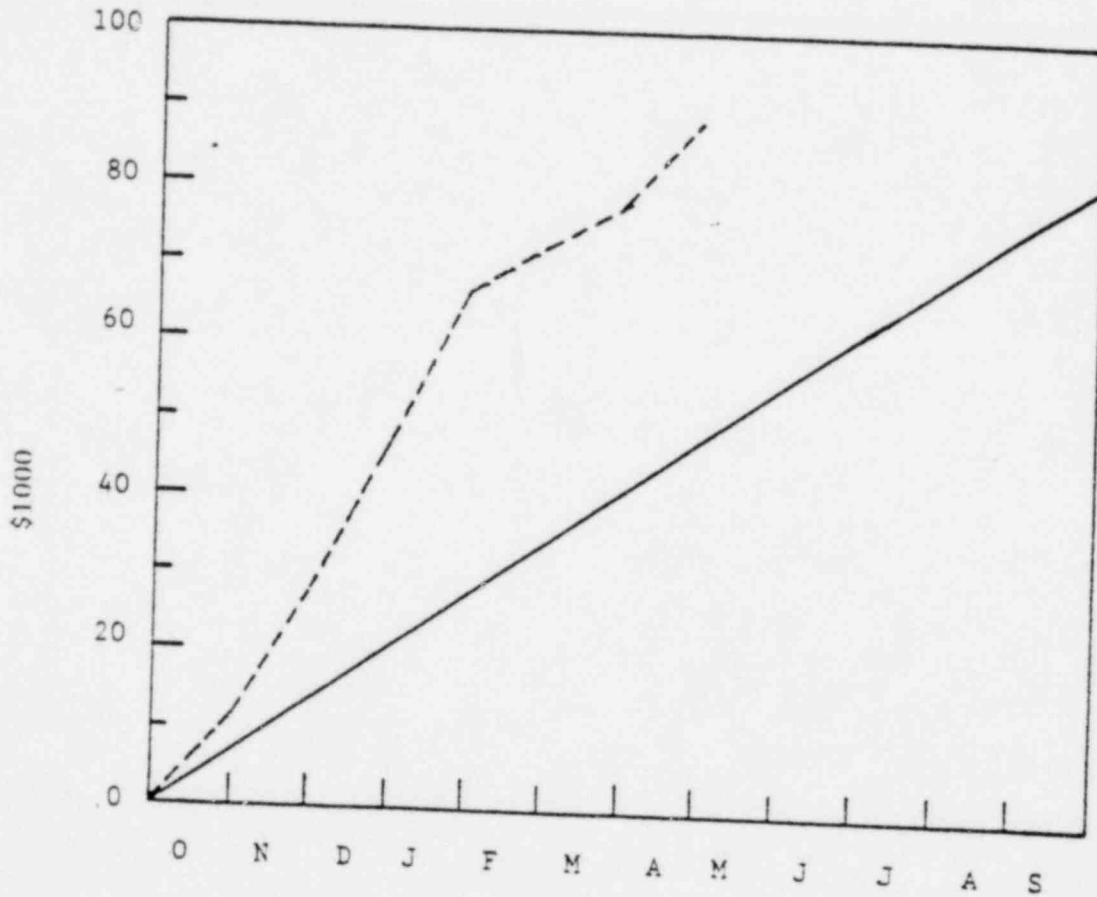
MAJOR MILESTONES:

| MILESTONE DESCRIPTION | SCHEDULED/ACTUAL START | SCHEDULED COMPLETION | ACTUAL/PROJECTED COMPLETION |
|---|------------------------|----------------------|-----------------------------|
| 1. Separate model inter-comparisons with KESS | 5/1/80 | 6/1/80 | |
| 2. Draft report on inter-comparisons | 6/1/80 | 7/1/80 | |
| 3. Complete draft of MARCH documentation. | 5/79 | 7/1/80 | |
| 4. Receive comments on MARCH documentation | | 8/1/80 | |
| 5. Complete documentation & release MARCH | | 9/1/80 | |

Request for additional funds and revised schedules for completion of this task have been submitted to NRC, early guidance from NRC is required to maintain projected schedules.

* Includes carryover of \$31,918 from FY'79.

PROGRAM: ANALYSIS OF THERMAL-HYDRAULIC BEHAVIOR



RESOURCES EXPENDED:

| | APRIL, 1980 | CUMULATIVE |
|------------|-------------|---------------|
| DOLLARS | 10.5 K | 88.8 K (108%) |
| MAN-MONTHS | 1.5 | 11.9 |

PROGRAM: Probabilistic Uncertainty Analysis Subtask FIN#: A4067
 CONTRACTOR: Battelle's Columbus Laboratories BUDGET PERIOD: (mm/yy-mm/yy)10/70-9/80
 PAS PROGRAM MANAGER: J. A. Murphy BUDGET AMOUNT: (Thousands)155.4*
 CONTRACTOR PROGRAM MANAGER: R. S. Denning PHONE: FTS-976-7510
 PRINCIPAL INVESTIGATOR(S): P. Baybutt PHONE: FTS-976-7499

PROGRAM OBJECTIVES:

- Perform probabilistic uncertainty analyses for PWR and BWR accident sequences.
- Evaluate the uncertainty analysis methodology and develop decision criteria.
- Assess the feasibility of developing response surfaces for the MARCH and CORRAL codes.

ACTIVITIES DURING April, 1980

Continued difficulties were experienced in attempts to run MARCH for accident sequence S₂D-B. Several modifications were made to the code. Problems have occurred in correctly modeling the containment spray system for a four compartment nodalization of the containment. Since the funds required to make the necessary modifications to the code are not available, we will forego the analysis of this sequence. The remaining effort will be directed at the interpretation and documentation of results. A number of reports on the uncertainty analyses are in progress.

MAJOR MILESTONES:

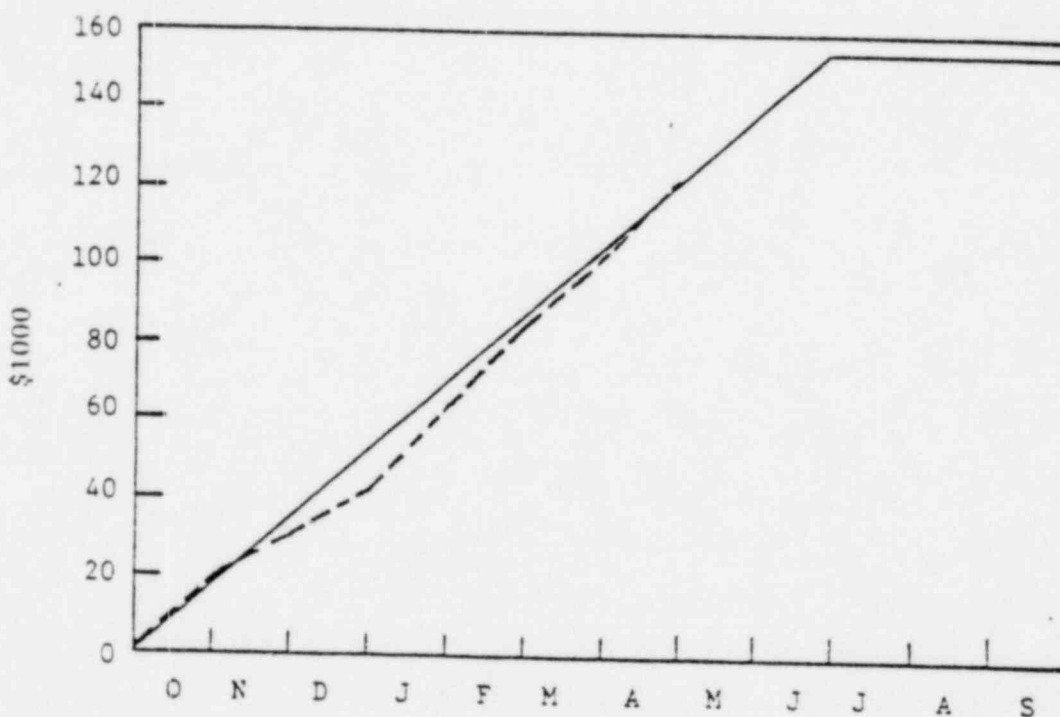
| MILESTONE DESCRIPTION | SCHEDULED/ACTUAL START | SCHEDULED COMPLETION | ACTUAL/PROJECTED COMPLETION |
|--|------------------------|----------------------|-----------------------------|
| 1. Methodology/Application Topical Reports | ----- | 10/31/79 | 10/21/79 |
| 2. Task Completion | ----- | 5/31/80 | 6/30/80 |
| 3. | | | |

MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:

* Carryover from FY'79.

EXPENDITURES

PROGRAM: PROBABILISTIC UNCERTAINTY ANALYSIS PROGRAM



RESOURCES EXPENDED:

| | APRIL, 1980 | CUMULATIVE |
|------------|-------------|---------------|
| DOLLARS | 18.6 K | 121.1 K (78%) |
| MAN-MONTHS | 2.1 | 15.6 |

PROGRAM: ANALYSIS OF RADIONUCLIDE TRANSPORT SUBTASK FIN#: A4067
 CONTRACTOR: Battelle's Columbus Laboratories BUDGET PERIOD: (mm/yy-mm/yy) 10.79-9/80
 PAS PROGRAM MANAGER: J. A. Murphy 'BUDGET AMOUNT: (Thousands) 100 K
 CONTRACTOR PROGRAM MANAGER: R. S. Denning PHONE: FTS-976-7510
 PRINCIPAL INVESTIGATOR(S): P. Baybutt PHONE: FTS-976-7499

PROGRAM OBJECTIVES:

- To revise the CORRAL code.
- To verify the revised code.
- To provide for the coupling of CORRAL with other codes.

ACTIVITIES DURING April, 1980

A writeup identifying and summarizing deficiencies in the aerosol modeling of the present version of the CORRAL code was prepared. This will be combined with a similar writeup prepared last month for other radionuclide transport models. A report on this work will be submitted to NRC shortly.

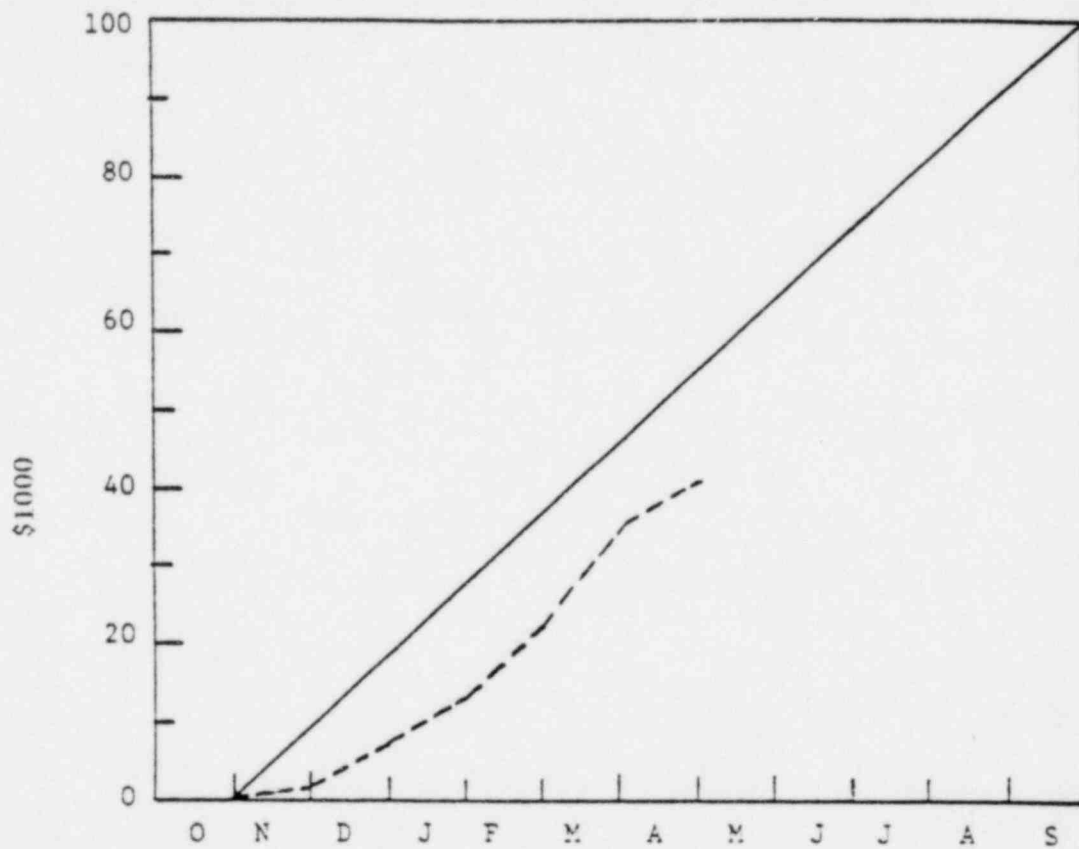
Work continued during the month on the development of an improved interface between MARCH and CORRAL. MARCH output contains a large number (approximately 10^3) of data points while CORRAL accepts as input a polygonal curve based on no more than 20 data points. A least-squares procedure was developed for fitting such polygonal curves to MARCH output using Powell's algorithm for minimizing a non-differentiable function of many variables. Preliminary tests indicate that this approach offers promise for the resolution of the interface problem.

MAJOR MILESTONES:

| MILESTONE DESCRIPTION | SCHEDULED/ACTUAL START | SCHEDULED COMPLETION | ACTUAL/PROJECTED COMPLETION |
|---|------------------------|----------------------|-----------------------------|
| 1. Specification of model improvements | 10/1/79 | 2/29/80 | 2/29/80 |
| 2. Specification of new model requirements | 12/1/79 | 6/30/80 | |
| 3. Identification of interface requirements | 2/1/79 | 9/30/80 | |

MANAGEMENT AND TECHNICAL ISSUES/POTENTIAL SCHEDULE OR FUNDING PROBLEMS:

PROGRAM: ANALYSIS OF RADIONUCLIDE TRANSPORT



RESOURCES EXPENDED:

| | APRIL, 1980 | CUMULATIVE |
|------------|-------------|--------------|
| DOLLARS | 6.5 K | 41.2 K (41%) |
| MAN-MONTHS | 0.6 | 2.9 |