Department of Energy
Washington, D.C. 20545

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Docket No. 50-537
HQ:S:83:254

MAY 27 1983

Dr. J. Nelson Grace, Director
CRBR Program Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Grace:

MEETING SUMMARY FOR PROBABILISTIC RISK ASSESSMENT (PRA) INTERACTION MEETING

On May 24, 1983, the Clinch River Breeder Reactor Plant project met with the Nuclear Regulatory Commission (NRC) and their consultants to review the status of the PRA work to date. During the course of this meeting, the following agreements were reached.

(1) The project agrees and commits that the PRA model will be exercised to study the effects of design changes for questions determined to be important to risk. This will also include studies of questions asked by the Advisory Committee on Reactor Safeguards (ACRS) in their April 19, 1983, letter and questions asked by the NRC on emergency electrical power for decay heat removal. This study will be reported separately.

(2) The ACRS letter dated April 19, 1983, further identified several features in the present design that the ACRS recommended be studied in the PRA. Each item is included in the PRA plan and will be addressed by the project.

(3) The project has reviewed the May 6, 1983, Technology for Energy Corporation (TEC) Report that documented the review of the Phase I PRA and identified approaches to resolve each comment. The project agrees with the approach recommended by TEC in this May 6, 1983, report and has instructed TEC to revise their PRA program plan to reflect the proposed resolution of the comments on Phase I.

(4) The schedule in the enclosure shows that all risk analysis related reports will be completed and documented by December 1984, as identified in the Preliminary Safety Analysis Report (PSAR). Some of the application tasks now extend into 1985 to allow for the additional effort associated with the transition from Phase I to Phase II.

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However, these application tasks are directed toward operations activities rather than the design so the schedule change will not adversely impact the utility of feedback from these tasks. Interim dates in Table 3 of the PSAR supporting the December 1984 submittal of the final report will be updated in the PSAR by June 1983.

(5) The project commits to having documented procedure outlines for every operator action for which credit is taken in the PRA. These procedure outlines will be referenced in the PRA and will be made available for NRC review.

(6) The project will review its plans and approaches for each task with the staff prior to initiating the following tasks: Core Phenomenology, Containment Phenomenology, Uncertainty Analyses, and External Events including Seismic Assessments.

(7) Feedback to both the design and operations will be provided throughout the PRA process, whenever specific tasks afford applicable insights.

Enclosed is a document titled "Description of Additional Tasks Needed To Integrate Plan I and Plan II Efforts," which was used as the basis for discussions. The list of attendees is also provided.

The project continues to believe that the PRA is an important tool for assuring and enhancing plant safety and reaffirms its commitment to conduct and complete a substantive PRA by December 1984. The PRA process is entirely consistent with the project's emphasis on system engineering. If there are any questions, please call P. J. Gross of the Project Office (FTS 626-6005).

Sincerely,

John R. Longenecker

John R. Longenecker
Acting Director, Office of
Breeder Demonstration Projects
Office of Nuclear Energy

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ENCLOSURE I

CLINCH RIVER BREEDER REACTOR PROJECT PRA

DESCRIPTION OF ADDITIONAL TASKS NEEDED TO INTEGRATE PHASE I AND PHASE II EFFORTS

INTRODUCTION

In order to integrate the Phase I activities efficiently with the activities initially planned for Phase II and to complete the iterative step begun in Phase I, certain additional tasks have been identified as necessary. These tasks and their impact on the original Phase II scope and schedule are described here in a preliminary fashion. The details and schedule of the technical tasks will be finalized by developing a comprehensive project plan. This preliminary description of the necessary activities is intended to provide early input to assist the Project Office in planning and scheduling and to identify activities that should now be begun in order to make the transition from Phase I to Phase II as efficiently as possible. Included here are a breakdown of the new tasks and a revised, integrated schedule for all tasks remaining to be completed for Phase II.

TASK DESCRIPTIONS

Seven technical tasks have been identified to accomplish the goals relative to the Phase I reiteration. These tasks are described below. Detailed task outlines will be developed as part of the project plan after interaction with the Project Office and NRC.

1. Accident Sequence Delineation

This task entails the redefinition of event sequences to develop a more traceable sequence structure and to provide a more straightforward set of sequences for quantification. The task is comprised of the following four subtasks:

- Interface with Phase I Contractors

  In order to optimize the transfer of information and insights into plant sequence modeling gained during Phase I, a working session will be held with the Phase I contractors. Resolution of the comments on the Phase I sequence development will serve as the basis for initiating interaction.

- Event Tree Construction

  New event trees will be developed to afford a more systematic and straightforward set of sequences for qualitative and quantitative solution. The approach will be to develop event trees with top events reflecting the various functions that must be accomplished in successfully establishing shutdown core cooling. This will avoid problems in consistency and complexity that can arise in attempting to substitute system-level events directly into the event trees.

- Success Criteria Finalization

  A number of comments on the Phase I effort relate to the definition of success criteria. This subtask reflects the need to develop a comprehensive set of success criteria consistent with current understanding of the plant behavior.

- Supporting Logic

  The simpler event trees will require the explicit development of supporting logic to relate the event-tree top events to the system-level fault trees. In this logic, the effects of system-level failures, specific initiating events, and top-level human errors will be integrated. This will provide a logical, systematic description of the relationship of the event-tree and the system-level fault trees.

2. Fault Tree Iteration and Update

- Interface with Phase I Contractors

  Working sessions will be held with the Phase I contractors to obtain additional information on system failure understanding and development above that documented in the Phase I final report.

- Systems Analysis Assumptions and Success Criteria

  The additional information obtained from the Phase I contractors will be integrated with updated system information, and the systems analysis will be thoroughly documented. This includes construction of simplified flow diagrams, detailed listing of assumptions, and a complete and concise description of system design and operation. Following review by the Project Office, this will form the basis for revision to and update of the existing fault trees.

- Fault Tree Revision

  The fault trees developed in Phase I will be revised to incorporate plant changes, comments developed in the review, and more clearly defined success criteria. Included in this will be the development of a new naming scheme for the basic events to relate them more directly to the component names and to provide information useful in beginning the common-cause analysis.

- Data Application

  Consistent with changes in success criteria and the extraction of repair as an integral part of the unavailability calculations, new primary event probabilities will be generated for a number of the events in the fault trees, as well as new events generated in the fault-tree revisions.

- Internal Review

  In order to assure the technical quality of the revised systems analyses, an internal cross-disciplinary review will be conducted.

- External Review

  Prior to beginning the sequence-quantification effort, the fault trees and supporting documentation will be provided for review by the Project Office. This will prevent carrying errors or omissions through the full analysis and will help to force out surprises early.

- Modularization

  The final step prior to quantification is to combine groups of independent basic events into single modules in order to reduce the overall complexity of the fault trees and to optimize the number of sequence-level cutsets generated. This task requires careful consolidation up to the point at which the necessary level of detail must be retained for efficient understanding and reviews, and it will be carefully documented.

3. <u>Quantification</u>

This task provides for the solution of the combined event-tree/fault-tree models to obtain a detailed qualitative and quantitative evaluation of the event sequences.

- Fault-Tree Solution

  The fault trees will be solved individually to allow the identification and elimination of coding errors, missing data or events, or possible logic errors.

- Sequence Solution I

  When the fault-tree models are correct, the event sequences will be solved to obtain and quantify sequence-level minimal cutsets.

- Sequence Solution II

  Due to the size and complexity of the models constructed, as well as limitations in the ability of fault trees to represent dynamic system behavior, it is to be expected that some changes to the models will be required to generate the most meaningful sequence solutions. Therefore, as part of the iterative process, a second sequence solution is explicitly included in planning.

4. Human Reliability

The fault trees and event tree update will include development of the human reliability aspects of the accident sequences. Two types of human errors will be identified: latent and dynamic. The latent errors are those that occur prior to the accident (e.g., during maintenance). These will be added appropriately to the fault trees. The dynamic human errors will be identified as part of both the event tree and fault tree update and quantified on a sequence-specific basis.

5. Iteration of Results and Review

The development of updated accident sequences, including sequence cutsets, will be the principal products of Tasks 1 through 4. The results will require a review by appropriate parties (Project Office, Westinghouse, etc.). Although several reviews are scheduled during the other tasks (to ensure efficient task development and no late surprises), this is the first review of accident sequence results which will be finalized for the risk analysis. It is expected (based on past experience) that some new issues will be raised after the accident sequences are generated and assembled. In addition, a thorough review will ensure realistic treatment and help in the process of identifying potential recovery events for specific sequences. The results will be iterated one last time after the review process is complete.

6. Core Phenomenology

The phenomenological analyses of the core-melt process will be completed. Three subtasks can be identified, completion of which will result in a suitable probabilistic treatment that is fully interfaced with the other parts of the analysis.

- Core Response Event Tree Expansion

  The core response event trees require expansion to include: (1) type of radiological release and (2) events which are less likely but which could play a major role. The expansion of these event trees will be based, for the most part, on available analysis with some hand calculations to provide justification of assumptions. A key part of this analysis will be the presentation and documentation of the broad group of sources used and the resultant assumptions.

- Core Response Event Tree Quantification

  The event trees in the previous subtask will be quantified. The quantification will be based on engineering judgment using the assumption base and input of other appropriate parties. For important branch points, the sensitivity of the quantification will be discussed. The less likely sequences will be maintained in the analysis to ensure correct probabilistic treatment of rare events that could have large consequences.

- Interface Core Phenomenology with Systems Analysis and Containment Phenomenology

  One of the key tasks in the iteration is the interface between the different analyses to ensure a proper treatment of each phase of the study. This will include a feedback process from the systems analysis and the containment studies that could result in changes to the core melt phenomenology. These changes could be (1) a shift of emphasis based on probabilistic importance, (2) a change in format to ensure efficient transfer of accident sequences, or (3) a change in analysis based on identified dependencies between phenomena and systems.

7. Containment Phenomenology

The analysis of containment phenomena also includes three subtasks.

- Containment Event Tree Development

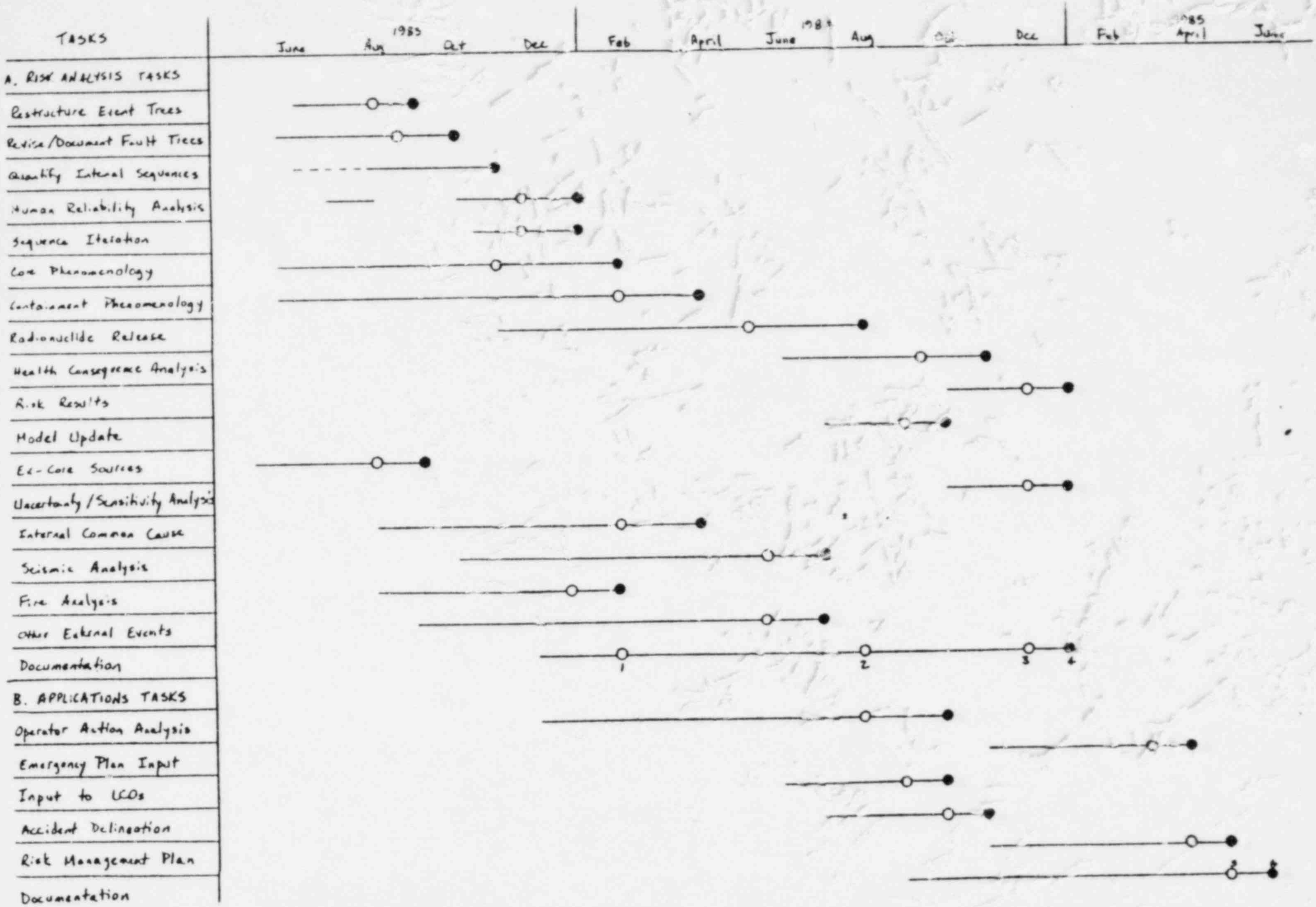
  The containment phenomenology will be addressed in an event-tree format. All phenomena significant with respect to the sequence projection or the radiological release will be factored in. The dependencies between phenomenology will be treated directly in the tree. The analysis will be based on available information, although some simple computer solutions may be required to track combinations of phenomena and to trace key parameters.

- Containment Event Tree Quantification

  Similar to the core-response trees, the containment trees will be quantified using engineering judgment, the results of calculations, and input of other experts.

- Interface Containment Phenomenology with Containment Systems

  As in Task 6, one of the key iteration steps is the development of the interface between tasks to ensure efficient transitions. In addition to the phenomenological interfaces, this task will require explicit development of the containment systems interface to ensure the dependencies associated with the different combinations of containment systems are accounted for in the phenomenology.



TASKS
1983
June
Aug
Oct
Dec
Feb
April
June
1984
Aug
Oct
Dec
Feb
1985
April
June
A. RISK ANALYSIS TASKS
Restructure Event Trees
Revise/Document Fault Trees
Quantify Internal Sequences
Human Reliability Analysis
Sequence Iteration
Core Phenomenology
Containment Phenomenology
Radionuclide Release
Health Consequence Analysis
Risk Results
Model Update
Ex-Core Sources
Uncertainty/Sensitivity Analysis
Internal Common Cause
Seismic Analysis
Fire Analysis
Other External Events
Documentation
1
2
3
4
B. APPLICATIONS TASKS
Operator Action Analysis
Emergency Plan Input
Input to LCOs
Accident Delineation
Risk Management Plan
Documentation

NOTES ON SCHEDULE

A. The open circles indicate the availability of draft or interim results for particular tasks. The solid circles indicate completion of the task.

B. The first seven tasks under the heading, "Risk Analysis Tasks", are associated with the integration of the Phase I work into the planned scope for Phase II.

C. The Common Cause Failure Analysis has been broken down into four elements: (1) internal common cause, including temperature, missiles, flooding, humidity, common manufacturers, etc.; (2) seismic analysis; (3) fire analysis, both sodium and other sources; and (4) other external events, including flooding, weather, aircraft impact, off-site explosions, etc.

D. The notes on the documentation task refer to the following reports:

1. Draft report on internal (excluding common cause) systems/ sequence analysis.
2. Draft report on common-cause failure analysis, including seismic and other external events.
3. Draft report of remaining risk-analysis tasks.
4. Final report of risk analyses.
5. Draft report of applications tasks.
6. Final report of applications tasks.
7. With regard to review of technical products, working documents describing the tasks and their results will be available on the dates indicated by the circles for each task. Formal reporting will be provided as indicated in Section D above.

ENCLOSURE II

Meeting Attendees

PRA Interaction Meeting

May 24, 1983

Steve Frye	CRBRP/PO
Pete Gross	CRBRP/PO
Rich Stark	NRC
Alfred H. Spano	NRC
Jerry Swift	NRC/CRBRPO
Stuart R. Lewis	TEC
Jim Carter	TEC
Stu Asselin	TEC
L. Wainer	ACRS
R. J. Barrett	NRC/RSB
Chet Poslusny	NRC/CRBRPO
J. Nelson Grace	NRC/CRBRPO
T. L. King	NRC/CRBRPO
D. W. Giles	W/CRBRP
E. G. Rodrick	Burns & Roe
Dominick Fortunato	Burns & Roe
Ed Rumble	SAI
Stephen Additon	Westinghouse
Bryce Johnson	SAI