



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 12 1986

MEMORANDUM FOR: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

FROM: Thomas M. Novak, Acting Director
Division of PWR Licensing-A

SUBJECT: REVIEW OF EPZ SENSITIVITY STUDY FOR SEABROOK

On July 21, 1986, Public Service of New Hampshire (PSNH) submitted a sensitivity study on the emergency planning zone (EPZ). The study provides a comparison of dose versus distance curves for the Seabrook plant and site with similar generic curves from NUREG-0396 which were used in developing the EPZ regulation in 10 CFR 50.47. The study concludes that a 1-mile evacuation radius at Seabrook provides for a similar or greater degree of public protection than was shown by NUREG-0396 for a 10-mile evacuation radius around the plants considered by WASH-1400.

The study is largely based on the Seabrook Probabilistic Safety Assessment that PSNH submitted about 3 years ago. The source terms used in the Emergency Planning Sensitivity study were drawn from the source terms used in the WASH-1400 calculations, with some modifications under specific scenarios. Also, some of the probabilistic models have been changed from the Safety Assessment. Thus, the report is intended to examine differences made by the Seabrook design and site, plus the improvements in accident sequence modeling capabilities, without credit for source term reductions that may result from recent studies. The EPZ study attributes reductions in the offsite dose predictions to the higher strength of the Seabrook containment, a more refined failure modes analysis for the containment, and a more realistic treatment of the initiation and progression of interfacing systems LOCA sequences. Along with the Emergency Planning Sensitivity Study, PSNH has also submitted a report titled "Seabrook Station Risk Management and Emergency Planning Study," which provides results of Seabrook specific calculations with new source terms based upon the recent IDCOR work.

The conclusions of the EPZ Sensitivity Study are based upon comparison of the results of the study to three acceptance criteria that were drawn from NRC documents. One of the criteria is a comparison of the individual risk of early fatality in the population within 1-mile of the plant, assuming no

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immediate protective action, to the NRC proposed safety goal. A second criterion is the comparison of early fatalities at the Seabrook site, assuming a 1-mile evacuation, to the early fatalities results of WASH-1400, which assumed a 25 mile evacuation. The third criterion is the comparison of the risks of exposure to 1, 5, 50, and 200 rem whole body doses at various distances from the Seabrook site to the corresponding NUREG-0396 results at 10 miles, assuming no immediate protective actions. It should be noted that a presentation on this general subject was made to NRC a few months ago by the AIF Subcommittee on Emergency Planning on behalf of the nuclear industry. The AIF proposal is currently under review in DSRO and IE; furthermore, it has been combined with the NRC initiated changes in EPZ related rules and regulatory practice.

In order to review the EPZ Sensitivity Study, it will be necessary to identify the baseline against which comparisons are made, to identify the appropriate criteria for making the comparisons, and to review the basic assumptions and the more significant aspects of the probabilistic calculations. We have met with representatives of IE, and they have agreed to provide guidance on the baselines and comparison criteria. They will be responsible for determining whether the study accurately portrays the principal conclusions of and technical material contained in NUREG-0396.

When the Seabrook Station Probabilistic Safety Assessment was submitted three years ago, the staff engaged in a review that was discontinued in January 1985. This occurred due to funding restrictions on the part of the utility. The current review is intended to focus on those aspects of the PRA that contribute most to the differences in the results for public risks and doses. In this regard, it is noted that the core melt frequency of the updated Seabrook study is somewhat higher than the frequency estimated by WASH-1400 because of a more complete assessment of dependent events and component failure rates by the Seabrook study. However, the percentage of core melt scenarios of principal concern to emergency planners (i.e., early gross containment failure and containment bypass scenarios) is more than 300 times less at Seabrook, primarily due to credit granted based on the strength of the containment. Therefore, our review should carefully evaluate the assumptions and analyses regarding the behavior of the containment and the probability of the containment bypass sequences.

Several areas that have already been identified for review are:

- early containment failure frequencies and the sensitivity to assumptions of loading (e.g., hydrogen detonation) and containment behavior (e.g., local versus global response),
- treatment of source term for bursting type containment failure,
- severe accident sequences involving containment bypass due to human factors and hardware problems (for example, malfunction of air operated valves due to high ambient pressure inside containment),

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- interfacing LOCA sequences which result in core melt and simultaneous breach of containment with consideration of procedures used for successful isolation of containment,
- depth of treatment of severe accident sequences resulting from external events (for example, earthquakes),
- consideration of conditional probabilities.

We expect to expand and refine the above list early in the technical review process.

The Division of PWR Licensing-A will coordinate the review. DSRO has essential expertise in the appropriate issues and techniques, and it has familiarity with the Seabrook Probabilistic Safety Assessment and the previous review by the Lawrence Livermore Laboratory. We would expect that the recently formed Oversight Committee on Source Term Related Technology would be working to define its role in this effort.

A technical assistance contract with Brookhaven National Laboratory will be used to support the staff effort. We have met with personnel from Brookhaven National Laboratory, and they have proposed a three-month effort to review the Seabrook submittal. BNL has identified six tasks necessary to assist NRC in evaluating the technical validity of the applicant's conclusions regarding the Emergency Planning Sensitivity Study for Seabrook. Enclosure 1 contains a description of those tasks proposed by BNL. By copy of this memo we are requesting DSRO review of the proposed BNL tasks.

A meeting was held on Wednesday, August 6, with PSNH personnel to brief the NRC staff on the basic content and conclusions of their EPZ study. BNL personnel were present for this presentation.

We have informed the ACRS of the PSNH EPZ study and our review of it. By a letter to the Commission dated April 19, 1983, the ACRS requested that they be kept informed of the staff's review of the Probabilistic Safety Assessment, and this has been done to date. At this time, the ACRS has provided a letter approving only 5% power operation for Seabrook.

Preliminary discussions have been held with ACRS staff for the purpose of scheduling a subcommittee meeting on the EPZ study some time in September.

The applicant has requested that the technical merits of the EPZ study be reviewed with respect to its adequacy to support a change to the emergency response process. The exact nature of the change has not yet been specified. PSNH has further requested that the review be completed on an expedited basis. A number of internal staff meetings were held within DPL-A with members of DSRO and I&E to discuss a plan for review of the Seabrook submittal. A draft of this memo was provided to DSRO and I&E for comment. We have accepted the comments provided by I&E. With regard to DSRO comments (Enclosure 2), we

ENCLOSURE 1

TASKS PROPOSED FOR REVIEW OF EMERGENCY PLANNING SENSITIVITY STUDY FOR SEABROOK

Task 1: System Evaluation

BNL will review those portions of the Seabrook Emergency Planning Sensitivity Study related to system failure to determine the appropriateness of the calculated accident sequence probabilities. In particular, the probability for interfacing system LOCA will be carefully assessed to determine the potential for containment bypass. BNL will also review the probability of equipment malfunctions, personnel errors or design errors resulting in containment bypass at the time of a severe accident.

Task 2: Containment Event Tree Review

BNL will review the conditional probabilities of early containment failure given in the Seabrook submittals. In particular, the vulnerability of the Seabrook containment to uncertainties in containment loads will be carefully assessed. This task will be highly coupled to Task 3, which will assess the performance of the Seabrook containment under severe accident conditions.

Task 3: Evaluation of Containment Behavior

The purpose of this task is to evaluate the technical validity of the applicant's conclusions regarding the behavior of the Seabrook containment under severe accident conditions. BNL will review and evaluate the relevant containment structural analyses performed by the applicant and its consultants. In addition, a plant site tour and engineering audit at the applicant's (or consultants') office will be conducted to better understand the containment analyses and design, and to identify any unique design features and/or analytical assumptions that merit further investigation.

Based on the above review, BNL will develop an axisymmetric finite element model and perform analyses utilizing BNL's NFAP computer code to confirm the applicant's prediction of the overall capacity of the containment. Special attention will be given to the post-cracking behavior of the concrete which controls the shear failure mode of the containment. To expedite the performance of this task, BNL will utilize, to the maximum extent practical, the input parameters obtained from the applicant's analytical models. In addition, simplified hand calculations will be performed to assess the applicant's conclusions regarding the behavior of selected containment penetration assemblies. Finally, BNL will perform a qualitative assessment of the applicant's seismic fragility analysis of the containment structures and components.

BNL will also support meetings with NRC management and the ACRS to describe the interim status of this review, as well as the final results.

Task 4: Review of Source Terms

The appropriateness of the new source terms based on RSS methodology used in the Seabrook submittal will be reviewed.

Task 5: Site Consequence Modeling

The site consequence modeling will be reviewed to determine the appropriateness of the consequence calculations presented in the Seabrook submittal. In addition, any consequence calculations found necessary as a result of the work to be performed under Tasks 1-4 will be performed.

Task 6: Final Report

A final report due by October 31, 1986 will be prepared based on the results of Tasks 1-5. The final report will address BNL's recommendations on procedures, testing or design modifications to reduce the probability of containment bypass in conjunction with a severe accident.

Task 7: Follow-on Effort

Follow-on effort in terms of resolution of issues will be provided under this task.

December 31, 1985

Docket Nos. 50-317
and 50-318

Mr. Steven Aftergood
Committee to Bridge the Gap
1637 Butler Avenue #203
Los Angeles, California 90025

Dear Mr. Aftergood:

Thank you for your letter of December 2, 1985 which requests that the Committee to Bridge the Gap be placed on a service list, and be kept informed, regarding the November 18, 1985 application by Baltimore Gas and Electric Company (BG&E) for reduction of the Emergency Planning Zone (EPZ) at Calvert Cliffs Units 1 and 2. A preliminary review of BG&E's November 18, 1985 application indicates a number of difficult technical and procedural issues that preclude early NRC action on the application. Since no public hearings are currently underway concerning the November 18, 1985 application, there is no service list associated with this matter. Should the opportunity for public hearing be offered, and should you make a request at that time, you will be placed on a service list. Until such time, the Calvert Cliffs Project Manager, Mr. D. H. Jaffe (301 492-8140) will keep you informed of developments concerning the November 18, 1985 application as indicated in your recent telephone conversation with Mr. Jaffe.

If we can be of further assistance, please call us.

Sincerely,

/S/

Ashok C. Thadani, Director
PWR Project Directorate #8
Division of PWR Licensing-B

cc: See next page

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COMMITTEE TO BRIDGE THE GAP

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LOS ANGELES, CALIFORNIA 90025
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December 2, 1985

Attn: Docketing & Service Branch
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Calvert Cliffs Nuclear Power Plant Units 1 and 2;
Docket Nos. 50-317 and 50-318

Dear Sir:

The Committee to Bridge the Gap is a public interest organization which has been involved in the Commission's ongoing assessment of the nuclear accident source term research. We are particularly concerned by Baltimore Gas and Electric's attempt to use this research as the basis for its November 18, 1985, request for reduction of its emergency planning zone.

We therefore request (a) that we be added to the service list for the above-cited dockets; and (b) that we be promptly informed of any opportunity to intervene or otherwise challenge BG&E's request.

Thank you.

Sincerely,


Steven Aftergood
Executive Director

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