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MEETING SUMMARY

MARK II OWNERS GROUPS AND NRC

DISCUSSION OF LONG TERM PROGRAM

MARCH 11 AND 12, 1981

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

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Task Action Plan A-8

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MEMORANDUM FOR: Karl Kniel, Chief
Generic Issues Branch
Division of Safety Technology

FROM: C. J. Anderson, A-8 Task Manager
Generic Issues Branch
Division of Safety Technology

APPLICANT: Members of the Mark II Owners Group

SUBJECT: MEETING WITH MARK II OWNERS TO DISCUSS THE LONG TERM PROGRAM (MARCH 11 AND 12, 1981)

Background

The Mark II owners recently completed development of their improved chugging load specification. The primary purpose of this meeting was for the Mark II owners to present this new load specification to the staff and our consultants. Several other Long Term Program subtasks were discussed at this meeting. These subtasks included the downcomer dynamic load specification, diaphragm uploads, mass and energy release calculations and froth loading.

An attendance list and a copy of the meeting handouts are enclosed.

Summary

A summary of the discussions is provided below:

1. Downcomer Lateral Loads
The dynamic lateral load specification has been under review by the staff for several years. The staff issued the last round of formal lateral load questions in September 1980. The owners responded to these questions in a letter report to Mr. Karl Kniel, NRC from Mr. Robert Buckholz, GE, dated January 16, 1981. The purpose of this meeting was to discuss the owners' response to the staff questions and to provide clarification regarding several new questions related to the dynamic lateral load specification. The lateral load topics discussed include lateral load data from the Karlstein test facility, variation of loads with system conditions, load definition for large downcomers, load observations in the recent 4TCO tests, explanation of the multi-vent lateral load methodology, load calculations and observations in the JAERI test facility, and description of plant specific load calculations.

The staff concluded that all but two items were addressed to their satisfaction and can be considered closed. The two open items include the "bounding" nature of the 30 Kip-3ms single vent load specification and the distribution of the multi-vent load. Two action items were identified to close out these two open items. The staff is conducting a statistical evaluation of the test data used in establishing the single vent load specification to confirm that the proposed load is conservative. We have requested additional test data and anticipate completion of this study in April 1981. In addition, we have requested that the Mark II owners provide the results of calculations to determine the fraction of the lateral load multivent multiplier due to angle variations and magnitude variations. In addition, we have requested that they establish the sensitivity of the multivent multiplier to the shape of the assumed load magnitude distribution. The owners indicated that these load distribution studies could be completed by April 1981.

2. Improved Chugging Load

The Mark II owners improved chugging load has been under development for several years. This development work has utilized a variety of testing programs and analytical model development to support a refinement to the lead plant steam chugging loads discussed in NUREG-0487. This program was redirected by the Mark II owners during the past 6 months to consider the result of the recent large scale Mark II test program (i.e., 4TCO and JAERI). This load development work is now complete. The chugging load consists of 10 separate chugging sources to be applied individually to each vent in an accoustical model of a Mark II plant. The chugging sources were derived from the largest chugging events observed in the 4TCO test facility considering a wide range of load frequencies. The chugging loads are to be applied so that gross pool chugs are assumed to occur at the same time; however, desynchronization of the individual chugging events from vent to vent is permitted within a narrow desynchronization time window. The desynchronization time window was selected from full scale multivent chugging data. Based on this data, a conservatively narrow window was selected for use in plant evaluations. The accoustic model (IWEGS-MARS) is documented in the May 1980 report NEDE-24822-P. This model was used in the development of the chugging vent sources, in the study of the JAERI test results to confirm the proposed load, and in Mark II evaluations for chugging loads.

The purpose of this meeting was for the Mark II owners to present and justify the development of the chugging source. Discussion topics included a description of the 4TCO chugging data base, a description of the source development methodology, development and justification of the desynchronization time window, comparison of calculated and observed JAERI multivent chugging wall loads and a description of the application of the chugging load to Mark II plants.

The staff and our consultants concluded that based on the presentations made at this meeting the proposed improved chugging load appeared to be reasonable and conservative. The proposed load did reflect previous staff concerns that adequate consideration be given by the Mark II owners to the small desynchronization window and the large chugging loads observed in the full scale multi-vent tests. This was the first presentation of the new chug source to the staff and our consultants. A draft copy of the report documenting the chugging load along with its bases will not be available for detailed review by the NRC until the end of April 1981. Several questions were raised by the staff and our consultants, however, to be addressed in the future by the Mark II owners. These questions include the following:

(a) Provide the results of asymmetric chugging load calculations using a larger time variance than that used for the symmetric load case. This information is needed to support the strength adjustment factor chosen for asymmetric chugging calculations.

(b) Describe the method used to separate true pool accoustic speeds in the 4TCO from effective speeds including fluid structure interactions (FSI) effects. In addition, describe how the true accoustic speeds are to be used in Mark II application analyses.

(c) Provide sufficient data (pressure histories and PSDs) from the 4TCO tests and the GKMIIM tests to confirm that chugging fluid structure interactions are a secondary consideration in the establishment of plant chugging loads.

3. Pool Swell Loads

Several topics came up in the area of pool swell loads that needed clarification by the Mark II owners. These topics include:

(a) Method of application of the NUREG-0487 diaphragm floor uplift load.

(b) The critical flow model used in mass and energy release calculations.

(c) Observations of froth at high wetwell elevations during the JAERI full scale multi-vent tests.

Each of these topics were briefly discussed at this meeting.

Consideration of a spectrum of breaks rather than the largest break in the NUREG-0487 diaphragm floor uplift load will result in higher design uplift loads. Estimates of the potential increase in these loads of several psi above the current load specification indicates that this will not present a problem for the lead Mark II plants since significant increases in the current uplift loads can be accommodated. The Mark II owners agreed to investigate these concerns and modify this load if necessary. They agreed to discuss their plans to address this item with the staff by the end of March 1981.

The Mark II owners discussed the common method used by General Electric to calculate mass and energy release for Mark II plants. They stated that the method is the same as that used for Mark III calculations and described in Appendix B to NEDE-20533. They also stated that it is the same as the approved method used for Mark I containment evaluations with the exception that the Mark II's use the Moody slip flow model (SLIP) whereas Mark I's use the Moody Homogeneous Equilibrium Model (HEM). The owners stated that these methods were used in both the pool swell calculations and in the asymmetrical vessel loads calculations.

The Containment Systems Branch is currently reviewing the mass and energy release methods used by the Mark II owners to confirm that they are conservative. Based on the owners' presentation, no significant problem is anticipated with this review.

The Mark II owners recently presented the results of scale tests conducted by SRI to study the influence of bracing elevation on Mark II pool swell. This presentation was made to address the presence of significant froth activity in the JAERI tests at elevations above the maximum bulk pool swell region. The SRI tests indicated that for downcomer bracing at less than one vent diameter above the initial pool surface and for submerged bracing there was little if any effect due to the bracing presence. However, SRI tests conducted with bracing at an elevation of 3 vent diameters above the initial pool surface showed significant froth activity. The Mark II owners have concluded that the JAERI forth activity is most likely associated with the location of the bracing at about 1.5 vent diameters above the pool surface. Considering the low froth activity observed in the full scale 4T tests and the results of the SRI tests, the staff agrees with the conclusions of the Mark II owners. As a result, we find no need for a specific froth load for Mark II applications. However, we will require that plants conduct a review of safety related equipment and structures in the wetwell above the maximum bulk pool swell region to assure that froth activity can be accommodated. Where possible, this equipment

should be either removed from the wetwell or moved to high wetwell elevations. Fragile objects should be protected from potential froth activity if they cannot be removed from the wetwell.

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Enclosures:
As Stated

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