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NUCLEAR ENERGY

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January 7, 1980

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

Attention: Mr. D. G. Eisenhut, Acting Director
Division of Operating Reactors

Gentlemen:

SUBJECT: MARK I CONTAINMENT PROGRAM
IMPLEMENTATION OF THE MARK I LONG-TERM PROGRAM

Reference: Letter, D. G. Eisenhut to all Mark I Utilities, dated October 31, 1979, "Acceptance Criteria for the Mark I Containment Long-Term Program"

The NRC staff review of the Mark I Containment Program Load Definition Report (LDR) has resulted in NRC acceptance criteria for implementation of the Mark I Long-Term Program (LTP). These criteria were transmitted to all Mark I Utilities via the reference letter. During a December 20, 1979 meeting with NRC staff management, the Mark I Owners explained that initial structural analyses using the load definitions in the Mark I LDR in accordance with the NRC acceptance criteria are resulting in some unrealistic calculated structural responses. Current plant unique structural analysis techniques consist of using idealized predictions of hydrodynamic loads as input to conservative analytical models which then predict structural response. This method results in structural response predictions much greater than responses measured in full scale testing.

Certain of these analytically derived structural responses are of such a nature that the feasibility of practical structural modifications is questionable. Therefore, the Mark I Owners have approved continuing Mark I Program efforts to address this issue.

In response to a verbal NRC staff request made subsequent to the December 20, 1979 meeting, this correspondence is provided on behalf of the Mark I Owners Group to further describe the activities underway to develop more realistic load definition, load application and structural analysis techniques. The objective of these activities is to provide a basis for early decisions regarding plant modifications which conform to the NRC acceptance criteria for LTP implementation.

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Most of these current Mark I Progra activities relate to the load application and structural analysis techniques. Therefore these efforts may not require revision to the LDR or the NRC acceptance criteria. These current activities involve three primary areas. The following is a description of these three main areas of emphasis and the planned activities in each area.

1. Safety/Relief Valve (SRV) Shell Stresses

   The typical SRV load definition wave form presented in the LDR is an idealized pressure load which does not account for the actual pressure decay or frequency variation with time that was observed in in-plant SRV tests. Activities underway are aimed at providing a wave form with pressure decay and frequency variation closer to the in-plant observations. Empirical factors to reduce current calculated structural responses to levels in closer agreement with actual in-plant test structural responses are also under development. These reduction factors would be based on comparing actual measured test structural responses to test structural responses calculated using current analytical techniques. Plant unique in-plant tests are being considered, if necessary, to confirm these empirical reduction factors derived on a generic basis from Monticello test data.

2. SRV Column Loads

   This SRV load definition in the LDR is based on bounding the peak torus pressures observed at in-plant tests. The method used is appropriate for peak local pressure determination but results in an overly conservative method for calculating the total load applied to the entire torus bay and thus the support columns. Current activities in this area are directed at determining a revised bounding factor to be used in evaluating the total load applied to the torus bay and support columns. This new factor would be based on a comparison of test results and analytical predictions as in item 1 above. The current bounding factor will be retained for use in evaluating local shell stresses. The additional in-plant tests mentioned in item 1 above are also being considered for confirmation of the revised torus support columns load application.

3. Condensation Oscillation (CO) Load for the Design Basis Accident (DBA)

   The LDR CO load definition for the DBA is comprised of varying pressure amplitudes over the 0-50 Hz range. The work underway in this area has demonstrated that most of the load frequencies are randomly phased. This approach will provide justification for taking credit for the random time phasing of most of the loading frequencies observed in the Full Scale Test Facility testing.

Some of the initial efforts involved in the above activities are expected to be completed in the next several weeks. Representatives of the Mark I Owners Group will be available to meet with the NRC staff in early February 1980 to discuss the status and details of the work in progress. Final completion of the engineering aspects of the above work is tentatively scheduled for April 1980.

Preliminary evaluations indicate that several items, in addition to the three identified above, may also require similar Mark I Program efforts. Evaluation of submerged structures is currently underway. Specific additional submerged structures activities, if any, are to be identified in the near future and completed by about June 1980. Torus attached piping cannot be evaluated until dynamic analysis of the torus is completed. However, scoping evaluations have indicated that additional activities may be forthcoming in this area. For some plants, additional efforts to provide a more realistic response to DBA CO and chugging may also be required.

Full scale CO and in-plant SRV tests resulted in typical maximum measured free shell stresses of 4Ksi or less. Even increasing these test results to account for suitable design loading conditions still provides a large margin of safety when applying the Short-Term Program (STP) criteria. Measured test responses other than free shell stresses show similar margins. Such full scale test results verify the conclusions of the STP and are the basis for the continuing Mark I Program activities described above.

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