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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

SEP 2 6 1973

Docket Nos.: 50-416
and 50-417

Voss A. Moore, Assistant Director for Boiling Water Reactors, L

CURRENT POSITIONS AND REQUEST FOR ADDITIONAL INFORMATION FOR GRAND GULF NUCLEAR STATION, UNITS 1 & 2

Plant Name: Grand Gulf, Units 1 & 2
Licensing Stage: CP
Docket Nos.: 50-416/417
NSSS Supplier: General Electric
Architect Engineer: Bechtel
Responsible Branch & Project Manager: BWR #1; G. Owsley
Requested Completion Date: September 7, 1973
Applicant's Response Date: October 26, 1973
Review Status: Awaiting information

The Containment Systems Branch has reviewed the information provided in the Grand Gulf PSAR through Amendment 11. Our review has indicated that:

1. additional information is required in several review areas which are covered by the enclosed second round question list (Q-2); and,

2. in some cases we have been able to establish positions, listed below, on the information already submitted.

In addition, the applicant has informed us that in certain cases, information currently documented in the PSAR is either out of date or incomplete. Specifically, the containment pressure response and sub-compartment differential pressure responses are being reanalyzed because of recent design changes and changes in the Mark III analytical model. Analyses of the effects of pipe breaks inside containment but outside the drywell have not been completed. The project manager informed us that this information will be submitted on September 18 and 28, 1973.

Based on our review of the information submitted up to and including Amendment 11, the Containment Systems Branch has arrived at the following as interim positions:

1. The applicant's sensitivity studies on the containment's capability to tolerate bypass leakage indicate that the leakage must be less than that equivalent to an $A/\sqrt{K}$ of approximately 0.85 ft^2 for small primary system breaks.

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Although we consider such capability adequate, we believe that consideration of the large drywell to containment surface concrete boundary that additional measures may be necessary to ensure that possible bypass leakage would not exceed the allowable. Therefore, unless more conclusive information is provided, it may be necessary to require that the drywell be completely steel lined.

2. The Grand Gulf and other plants with Mark III containments should have the capability to operate recirculation mixing of hydrogen after 10 minutes following a loss-of-coolant accident. This assures a reasonable design basis to accommodate the metal-water reaction extent indicated in Regulatory Guide 1.7 without the need for development of an arbitrary model. The applicant has provided an analysis in Amendment 11 which acceptably demonstrates this capability for Grand Gulf.

3. The applicant has been requested to justify the post-blowdown drywell depressurization phase of the containment response. If this phenomenon cannot be adequately demonstrated, some positive means will need to be provided to reduce the drywell pressure and ensure the return of air from the containment to the drywell.

4. The applicant is currently proposing a drywell design differential pressure which is 15% greater than the applicant's peak calculated differential pressure. We believe that a minimum of a 30% margin should be applied and that the final margin will be a function of the conservatism of the pressure response analysis which is under review.

5. The applicant is currently proposing a 21% margin to establish the containment design pressure. We believe that a minimum of a 15% margin should be applied and that the final margin will be a function of the conservatism of the pressure response analysis which is under review.

The applicant should also be advised that the values of decay heat currently being used in the long-term containment analysis (ref.: PSAR pg. R6.2.8) are still under review by the staff. As soon as a Regulatory

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position regarding a standard decay heat surve is developed, its use in the containment analysis will be required.

Robert L. Tedesco, Assistant Director
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REQUEST FOR ADDITIONAL INFORMATION
GRAND GULF NUCLEAR STATION
DOCKET NOS. 50-416/417

1. As indicated by the applicant in the Grand Gulf meeting on August 10, 1973, the Mark III vent clearing model has been revised. The new model is described in the second Mark III test program progress report, NEDM 10976, and is shown to correlate with small scale Mark III test data. However, in the first progress report, NEDM 10848, the original vent clearing model was also shown to agree with small scale data. Considering the above:

   a. describe the differences between the vent clearing models

   b. discuss the effect that each variation in the model has on drywell differential pressure

   c. explain the significance of each vent clearing model being able to adequately predict vent clearing phenomenon as seen in the small scale Mark tests

   d. the control volume equations used to model the horizontal vents indicate that "turning" loss coefficients are applied to the vent velocity terms. Specify the values of these coefficients and describe how they are determined

   e. specify the value of the effective length, L*, used in the control volume equations.

2. Specify the values of the individual loss coefficients used in the vent flow model and describe how these coefficients will be experimentally verified on the full scale Mark III test facility. (Ref.: R6.2.3)

**3. Provide sensitivity curves, similar to your response to AEC Comment R6.2.3, of drywell differential pressure as a function of reactor vessel level swell time following a main steam line break.

4. Provide an updated response to AEC Comment R6.2.6 concerning the potential input of feedwater energy to the containment following a loss-of-coolant accident. Specify the total amount of feedwater energy which could be added to the containment and justify your statement that this additional energy would not result in higher long term containment pressures.

5. As requested by AEC Comment 6.2.9 (c), provide a detailed description of the modeling of the drywell depressurization which occurs at about 600 seconds post-LOCA (PSAR Figure 6.2-9). Specifically discuss, and provide analyses, the manner in which the spray effectiveness of the break flow is determined and provide a table of break flow and enthalpy as a function of time.

**6. Your response to AEC Comment 6.2.20, regarding Category II air lines within primary containment, should be supplemented as follows:

   a. specify the amount of service air which could be released to primary containment following failure of the Category II service air lines.

   b. discuss the principles of operation of the alarm system which would indicate to the operator that an instrument air line had broken within primary containment.

   c. specify the amount of instrument air which could be released to primary containment following failure of the Category II lines and before manual isolation of the system.

   d. discuss the effect that the volumes of air in (a) and (c) would have on containment peak pressure.

**7. Provide the design criteria which have been applied for postulated breaks in high energy, unguarded pipe lines located within primary containment but outside the drywell. Also, provide details of the analyses performed for each break, e.g., break sizes and location, blowdown rate, laps times for detection systems, containment pressure, etc., which demonstrates that the amount of blowdown fluid released to the containment is within acceptable limits.

**8. As requested in AEC Comment 6.2.29 (b), specify the number of hydrogen recirculation valves which will operate as automatic vacuum relief valves.

**9. Your response to AEC Comment 6.2.30 (d) does not consider positive drywell to containment differential pressures. Discuss the capability of the recirculation valves to open if a differential pressure, corresponding to the submergence of the first row of vents, existed across the valve disk.

10. Your response to AEC Comment 6.2.31 states that none of the pipes within the drywell are in enclosed subcompartments. However, from PSAR figures 5.5.10a and 5.1-4, it appears that the RHR head spray line may be located in a restricted volume within the drywell. Therefore, provide a drawing which illustrates the routing of the RHR head spray line and discuss the consequences of a rupture in the line between the reactor vessel and the inboard check valve.

11. Your response to AEC Comment 6.2.34, concerning post-accident suppression pool water levels, does not appear accurate in the following

respects and should be revised:

a. Figure R.6.2.34-1 indicates that the containment pool overflows into the drywell following drywell depressurization. If the vacuum breakers are operable this should not occur.

b. Figure R.6.2.34-1 shows the water level in the drywell above the top of the weir wall (at about 5 minutes) and the water level in the annulus at the top of the wall. This does not appear possible.

c. The final level of water in the containment and vent annulus is at the first row of vents. However, your response to AEC Comment 6.2.32 states that the vents should be submerged two feet following pool drawdown.

12. With respect to your analyses of subcompartments, describe the analytical methods that were used to determine the jet impingement forces.

**13. The PSAR (pg. R6.2.38-1) indicates that the containment external design differential pressure is 3 psi. Describe and provide details of the analyses of the types of transients which could result in negative pressures within primary containment. Justify the margins which are allowed between maximum calculated negative pressures and the design value and discuss the need for a containment vacuum breaker system.

14. Our review of the isolation valve arrangements described in PSAR Section 6.2.4 and Table 6.2.7 indicates that a number of primary containment penetrations do not explicity conform to General Design Criteria 55-57. Briefly GDC 55-57 require that two isolation valves

be provided, one inside and one outside the primary containment; that these valves close automatically; and that the valves fail, on loss of power, in the position of greater safety. Considering the above, provide a list of all primary containment penetrations which do not meet these criteria and in each case provide a discussion, analysis, etc., which demonstrates that exception to the GDC is justified. If in some cases this justification is already provided in the PSAR, then a specific page reference will be an acceptable response.

15. Provide the following information with respect to the Standby Gas Treatment System (SGTS) and secondary containment:

    a. elevation drawings which clearly indicate the boundaries of the secondary containment,

    b. a list of any high energy lines which are within secondary containment,

    c. the failure modes of valves in the SGTS, and

    d. justification for assuming that both trains of the SGTS are available for drawdown of the secondary containment pressure to -1/4" w.g., following an accident (Ref.: PSAR pg. 6.4-3).

16. Section 6.2.1.3.5 of the PSAR references Appendix A of NEDO 10329, "Loss-of-Coolant Accident and Emergency Core Cooling Models for General Electric Boiling Water Reactors", for the reactor vessel

level swell model used in the main steam line break analysis. However, since the containment design basis break is indicated to be the main steam line, the manner in which the topical report model is applied to containment analysis requires clarification as follows:

a. reference the specific parts of Appendix A which are applicable to the level swell associated with a main steam line blowdown analysis.

b. list any conservative assumptions which were incorporated in the model for containment analysis purposes.

c. provide results of the level swell times that are calculated by the model considering various reactor operating conditions such as full power, hot standby etc..

d. list the input parameters used in the above analyses.

17. Specify the pump heat rate input (Btu/sec) to the containment following a loss-of-coolant accident and justify its exclusion from the long-term containment response analysis described in PSAR Section 6.2.1.3.7.

18. Your response to AEC Comment 6.2.9 and discussions in the August 10, 1973, Grand Gulf meeting indicate that for containment mass and energy input rates, the primary system is modeled as a single volume at the average primary system enthalpy. Justify that this represents a conservative assumption for containment analysis purposes considering that the recirculation loop conditions display a significant (20 Btu/lbm) degree of subcooling. Provide a blowdown table (mass and energy rates versus time) and containment response profiles

for a recirculation line break assuming that the primary system is modeled as one volume, with the total mass inventory at operating pressure and at the average enthalpy of the recirculation loops.

19. Provide an analysis of containment and drywell pressure response to a main steam line or recirculation line break (whichever is the worst case) assuming that the reactor is at hot standby and the suppression pool is at an elevated temperature corresponding to the hot standby condition at the time of the break.

20. As indicated in response to AEC Comment 6.2.33, the vent flow model as described in GE Topical Report, NEDM-10320, "The General Electric Pressure Suppression Containment Analytical Model" was used to predict the critical flow threshold for the Mark III vent system. This method is based on the principle that only the vapor region determines the sonic characteristics of the two-phase mixture. Using this assumption, ideal gas relationships have been used to predict sonic flow. There are, however, experimental and analytical data within the literature that indicate the liquid phase does lower the sonic characteristics of the mixture below the value that would be calculated for only the vapor phase. We have discussed with General Electric specific references indicating this trend during a meeting at San Jose on September 20 and 21, 1973.

As a result, justify the applicability of the ideal gas-choked flow model in light of the contradictory data within the field, which includes the RELAP prediction comparisons of both the semiscale and Battelle blowdown experiments.

** Indicates information not specifically requested in the Standard Format.