88-91

JAN 1 2 1974

Docket Nos. 50-416
and 50-417

Note to Raymond Fraley, Executive Secretary
Advisory Committee on Reactor Safeguards

ANSWERS TO CERTAIN INQUIRIES ON THE GRAND GULF NUCLEAR GENERATING STATION

The ACRS Subcommittee on the Grand Gulf Nuclear Station requested at its December 21-22, 1973 meeting that the Regulatory staff provide written answers to certain inquiries. The enclosed answers are being furnished for use by the Subcommittee prior to its January 17-18, 1974 meeting to form the basis for further discussions with the Regulatory staff.

For your information, the Regulatory staff will be represented at the January 17-18, 1974 meeting by technical specialists in the areas of site seismicity, containment systems, reactor systems, and structural analyses.

Original signed by

for

Walter R. Butler, Chief
Light Water Reactors Projects Branch 1-2
Directorate of Licensing

Enclosure:
As stated

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ENCLOSURE

RESPONSES TO INQUIRIES

1. INQUIRY:

What is the basis for the time vs. quantity relationship of hydrogen generation which the staff assumes in establishing design criteria for Grand Gulf and for other plants? (pg. 28 of the transcript). Related questions posed by the Subcommittee (in the discussion on pp. 15-28) should be addressed in the response, particularly Dr. Bender's question on pg. 16:

"Recognizing that the hydrogen release mechanism is arbitrary, is it reasonable to press so hard for getting the initiation of the fans and mixing in a period like 10 minutes?"

RESPONSE:

The response to this question is provided in Section 6.2.5 of the SER.

2. INQUIRY:

What mechanism or phenomena for failure might lead to ECCS degradation beyond that considered in the interim acceptance criteria? Has the staff considered what such phenomena, mechanisms, and failures might be? (Tr. pg. 28; related discussion starts on pg. 15 and also on pp. 61-63).

RESPONSE:

The present Interim Acceptance Criteria and the recently issued Rule governing "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water-Cooled-Nuclear Power Reactors" requires that the ECC systems be designed to accommodate the effects of a single active failure. With this assumption, both sets of criteria set forth a minimal degree of acceptance performance standards. Obviously, any additional failure or degradation beyond those already assumed would cause the calculated clad temperature to increase and could exceed the allowable value (2200°F or 2300°F); that is, if a pump were to produce less flow than assumed in the analysis the effect would be to cause an increase in clad temperature and it might be characterized as a degradation of performance in the ECCS. However, this does not suggest that the core would not be adequately cooled. Quite to the contrary, it has been testified at length during the recent rulemaking hearing on ECCS that clad temperatures considerably higher than 2300°F could occur and a coolable core geometry maintained. However, the extent of permissible ECCS degradation can not be quantified at this time. Thus, it is believed the clad temperature, may approach clad melting, and in some cases, perhaps some clad melting may occur and can still be tolerated.

The specific failure modes that can cause various degrees of degradation or consequences in arriving at the present single failure assumption used to satisfy the criteria are discussed above. Additional single failures beyond this to cause any single degradation have been considered as discussed in response to interrogatory 5.

In summary, the ECCS is designed to accommodate any single active failure and those consequences or degradations in systems resulting from it. However, present systems have not been designed to accept two unrelated single failures and still satisfy the criteria discussed above.

3. INQUIRY:

What is the basis for the staff's conclusion that reliability of the hydrogen mixing system is acceptable? This includes both its reliability to function when called upon and reliability not to fail and to permit inadvertent steam bypass (Tr. pg. 39).

RESPONSE:

The response to this question is provided in Sections 6.2.1.6 and 6.2.5 of the SER.

4. INQUIRY:

What is the staff's opinion of the applicant's description of the capability of the safety related features and systems to withstand a hydrogen burning event? (TR. pg. 60; related discussion starts on pg. 48).

RESPONSE:

General Design Criterion 41 requires that systems to control hydrogen, oxygen and other substances which may be released into the reactor containment be provided as necessary to control their concentrations following postulated accidents. We have reviewed the systems for the control of combustible gas concentrations proposed for the Grand Gulf facility using the guidelines of Regulatory Guide 1.7. We have concluded the systems are acceptable as indicated in our Safety Evaluation Report, Section 6.2.5 provided that the system be automatically actuated. The acceptability of the system is based on limiting the hydrogen concentration within the containment to below 4 v/o which is conservatively considered to be the lower flammability limit of hydrogen in air. As has been our practice, our review is based on the system's capability to limit concentrations to this level and thereby preclude burning; we have not evaluated the capability of the containment to withstand the effects of burning of flammable hydrogen mixtures.

5. INQUIRY:

What is the effectiveness of the ECCS consisting of 1 LPCI and of 2 LPCI's, in providing adequate cooling in the event of a LOCA? (Tr. pg. 63) Can the staff evaluate the applicant's statements on this subject (Tr. pg. 61-63).

RESPONSE:

The staff has not made independent calculations of the peak clad temperature or metal-water reaction with core cooling by only one or two LPCI pumps. Although the staff could estimate the flooding time with one or two LPCI pumps and calculate the temperature up to the time of flooding, the accuracy of the peak clad temperature estimates for the transient following flooding would be uncertain because of the uncertainty in the quantity of residual water remaining in the lower plenum and the effectiveness of the heat transfer at low flooding rates has not been specifically evaluated for a BWR.

6. INQUIRY:

Is there a means for ascertaining during the life of the plant whether core spray nozzles are blocked? (Tr. pg. 64).

RESPONSE:

Blockage of individual or a few core spray nozzles cannot be detected unless the water level in the vessel is lowered below the level of the core spray sparger and the system spray observed while the core spray system is operated. While this is done prior to initial startup, it is not performed during plant operation since all fuel would have to be removed from the vessel. Blockage of a large number of nozzles would be detected by the full flow core spray system test performed during refueling outages.

7. INQUIRY:

What is an acceptable method for determining the representative set of stresses for a single direction, when considering more than one mode shape? (Tr. pg. 74; related discussion starting on pg. 66).

RESPONSE:

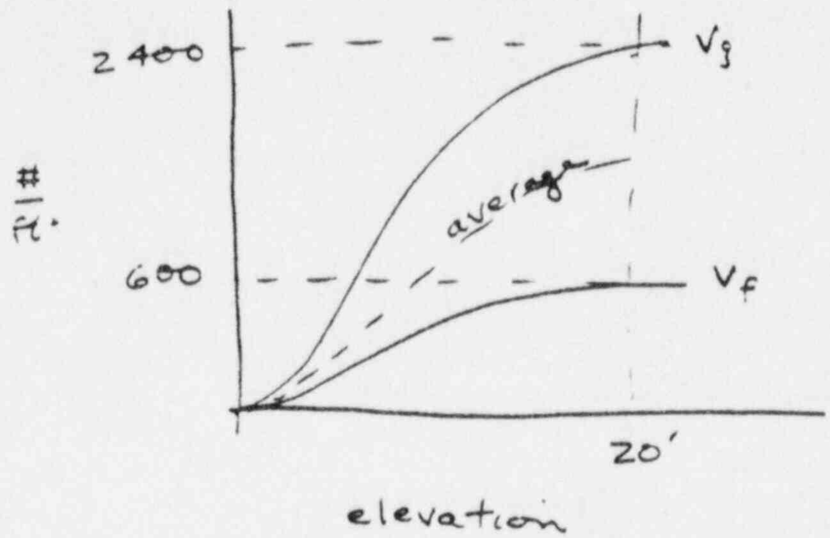
The acceptable procedure for determining the representative stresses for a single direction is to take the square root of the sum of the stresses obtained from each mode. For closely spaced modes, absolute sum of the stresses for the closely spaced modes is first obtained and then the square root of the sum of the squares approach is used to obtain the resultant stresses from all modes.

GRAND GULF 1/16/74 SAN JOSE

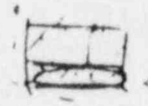
#1. Structures a[illegible]e pool surface:

assume - 1. all air carried over first

GE: PSAR pressure profile - constant pressure



$F_f = \overline{\rho_i} A \frac{V_f^2}{g}$



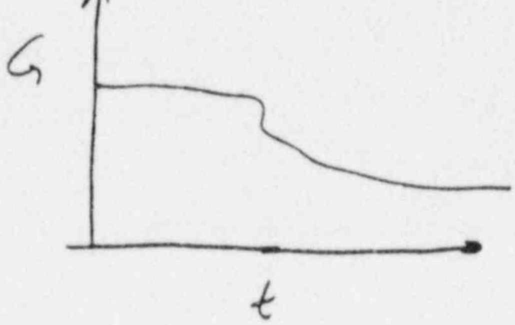
$F_g = \overline{\rho_i} A \frac{V_g^2}{g}$

$\overline{\rho} = (1-\alpha)\rho_f + \alpha \rho_g$

average = ~1400 #/ft²

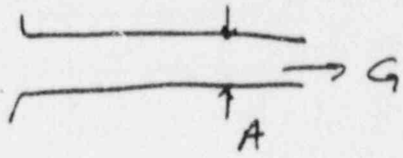
- Velocity of pool surface should be constant for a constant air charging rate. Therefore assuming no compressibility effects, inertia or air break through, velocity should be constant. therefore, since $\overline{\rho}$ is decreasing with time (elevation), forces should also be decreasing with time (elev.)

#5 Recirc. Blowdown

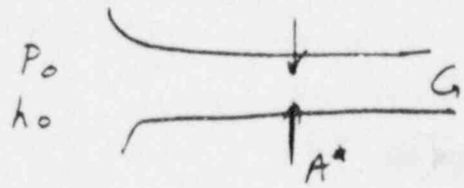


Analysis

$\dot{m} = G(t)\, A$



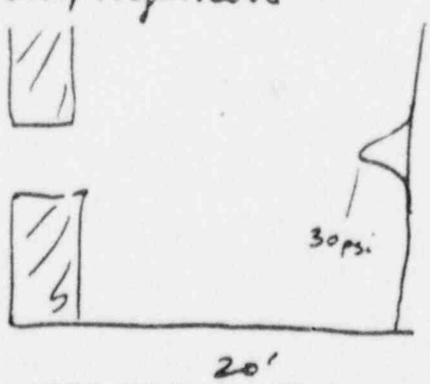
Program



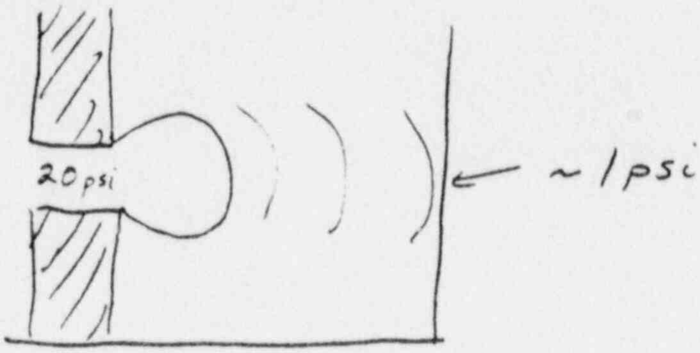
$G(P_o, h_o)$ $\dot{m} = G(p_o, h_o)\, A^*(t) = G(t)$.

\# 1 a). jet impingement load from water clearing
b). bubble ~~[illegible]~~ causing pool acceleration
c) steam condensation
d).

jet impingement.



bubble pressure



same as relief valve analysis

steam condensation ~ zero load

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