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

JUN 03 1991

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Project Directorate I-3
Division of Reactor Projects I/II, NRR

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SUBJECT: QUESTIONS ON SEABROOK INDIVIDUAL PLANT EXAMINATION (IPE) SUBMITTAL

Based on our ongoing review of the Seabrook IPE submittal and its associated documentation, we have enclosed a list of questions for additional information.

The list of questions are related to the internal event analysis in the IPE, and the containment performance improvement (CPI) program. The questions are mainly based on the efforts of a review team which consists of Ed Chow, the team leader, William Milstead, Dale Rasmuson, all from RES and Steven Long from NRR. In addition, Jose Lantaron from RES also contributed to preparing some of the questions. We request that the licensee provide written responses to the list of questions within 45 days in conformance with our review schedule.

If you have any questions, please contact Ed Chow on x23984.

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Enclosure: As stated

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QUESTIONS ON SEABROOK IPE SUBMITTAL

1. The success criterion of emergency feedwater (EFW) state that the EFW system supplies sufficient water to cool the reactor coolant system (RCS) allowing the operation of the residue heat removal (RHR) system within nine hours. Can Seabrook cool down on atmospheric relief valves (ARVs) and EFW in nine hours?

2. "Once air gets to the common supply headers, it is assumed that its path is unobstructed to the equipment it serves due to the very small failure rate attributable to piping and to valves transferring closed." (p.E-71) Please discuss concisely why the failure rate would be very small. Your discussion should include the consideration of a failure of an air line to a valve controller, such as the main feedwater isolation valves (which would close on loss of air and initiate a loss of feedwater transient).

3. Several emergency air handling (EAH) dampers are normally open, but fail closed on loss of instrument air. (p.E-68) "Failure of the EAH system to operate for 24 hours is conservatively assumed to cause long-term failure of the charging, safety injection (SI), RHR, and containment building spray (CBS) pumps." (p.E-65) "The steam dump valves (SDVs) ... are assumed unavailable if instrument air (IA) is not available." (p.E-69) "The loss of instrument air (IA) leads to an initiating event - loss of main feedwater - which has been included implicitly in the data analysis for initiating events." (p.69) "The system [IA] is assumed to be operating normally prior to the occurrence of any of the initiating events." (p.E-70) Please provide a brief explanation of the reasons for assuming that modeling loss of instrument air as only a loss of main feedwater is a conservative approach.

4. There seems to be a considerable number of recovery actions (or potential actions not actually credited) involving the IA system (eg, providing fire water to cool instrument air compressors during loss of secondary component cooling (SCC) [not credited], and providing a path for the startup feedwater pump to fed the steam generators after loss of IA. In light of these discussions of IA interactions, why wasn't IA included on the vertical axis of the dependency matrices?

5. Failure of elastomer seals, resulting in Types B and C containment leakage, has been assigned a low probability of occurrence, thereby increasing the conditional probabilities of intact containment and Type A containment leakage. Discuss the results of sensitivity analyses performed for less optimistic assumptions regarding the survivability of elastomer seals, such as purge valve seats, equipment and personnel hatch seals, and electrical penetration seals and potting as well as other non-metallic sealing surfaces such as the sight glasses in personnel access hatch covers. Particular attention should be directed to the equipment hatch seals, both of which are physically located in the containment building environment. Discuss the impact of the seal failures on the containment failure probabilities.

6. Discuss the containment design features that promote the mixing and dispersion of H2 in the containment volumes, which reduce the potential for and effects of

"pocketing" in the compartments below the operating deck and in the near vicinity of the reactor vessel (i.e., reactor cavity, incore instrument tunnel and instrument room). Describe the sensitivity of Early Large Containment Failure/Bypass and Late Containment failure probabilities (conditional and absolute) to variations in the assumed limits for H2 combustion and detonation in the post accident containment environment.

7. The descriptions of steamline breaks (p.34) and steam generator tube ruptures (SGTR) (p.34) both contain statements that a reactor coolant pump (RCP) seal loss of coolant accident (LOCA) is assumed if a total loss of primary component cooling (PCC) occurs. Similar statements do not occur in the small LOCA description (p.29-30). Why was the failure of PCC explicitly considered and discussed for these steam generator related events?

8. The probability values for event OG1, Loss of Offsite Power, are not provided in the IPE submittal. (PLG-0726 is referenced.) Please provide a graph or table showing the frequency vs duration of LOSP.

9. According to the IPE submittal, for the back-end analysis you refer to Appendix H of the Seabrook Station Probabilistic Safety Assessment (SSPSA) from 1983. In this appendix (H.2.2) there is a part titled "Phenomenological Models and Assumptions" which states that the codes used for these analysis were MARCH, COCOCLASS9, MODMESH and CORCON-Mod 1. These codes are from 1980, 1974 and 1983. The assumptions and models considered in this appendix may be different from the present knowledge about the severe accident. To what extent have you considered recent developments and investigated the impact of any new changes in your assumptions and models?

10. In the containment event tree (CET), your submittal considers the top event DP (Depressurization). Your submittal states that a single power operated relief valve (PORV) is sufficient to accomplish the depressurization. Please discuss the supporting studies or calculations that have been made.

    With respect to the top event VH (Early Hydrogen burning), please discuss the modeling assumptions with the hydrogen generation.

11. Regarding the top event CD (Debris dispersion) in the IPE, you consider that this event is true if more than 50% of the core material is relocated to the lower containment floor. Please explain in more detail the basis for your assumptions.

12. With respect to the top Event CY (No hydrogen Burn at Vessel Failure), the impact of simultaneous direct containment heating (DCH) and hydrogen burn has been evaluated, and the results of the evaluation indicate that a containment failure is unlikely. Discuss the assumptions that were made about the hydrogen concentration available for the burning.

13. Please provide a concise discussion of the method used for estimating the Seabrook release categories related to the early release. The discussion should include source terms for various radionuclides, for examples, Te, Ru, and Cs.

14. Your IPE submittal states "The major contributors to unusually poor containment performance, i.e., large early release are ..." Please provide rationale for your definition of "unusually poor containment performance". How do you define "large early release"?

15. The report PLG-0550 states that benchmarking between MAAP and RELAP calculations (1984) provides an assurance that the timing of RCS depressurization is predictable and well understood. Were insights associated with the timing of RCS depressurization integrated into operator training and procedure upgrading?

16. Table 2-1 for defining the plant damage state (PDS) in the PLG-0550 report uses 300 psia as the primary pressure at the time of vessel penetration. How was this pressure estimated?

17. In the report PLG-0550, some blackout sequences have been analyzed with MAAP code. Which assumptions have been considered related to core blockage, in-vessel and ex-vessel hydrogen generation, and hydrogen burning?

18. The report PLG-0550 analyzed the phenomena DCH and SGTR, but only for TMLB' scenarios. Do you expect differences in terms of containment failure probabilities and release categories for other high pressure sequences? If so, please explain.

19. Your IPE states that containment bypass sequences have small contribution to the source term. Please discuss the effort that was involved in identifying all the potential contributors to the bypass scenarios.

20. On page 102 of the Seabrook IPE submittal it states the following:
Plant procedures used in the human action analysis include the Westinghouse Emergency Response Guidelines (ERG), generic Westinghouse operating procedures and, wherever possible, the prospective Seabrook operating and emergency procedures.

    Please discuss the differences between the procedures used in the human action analysis in the SSPSA and the current Seabrook procedures. If a difference exists, please discuss the impact you feel it will have on the SSPSA results if the current procedures are included.

21. On page 23 it states that "a number of walkdowns have been performed ...." How many walkdowns have been performed? Which walkdowns were performed for the follow-on studies done by Seabrook?

    Did the human factors analysts and human reliability analysis (HRA) practitioners participate in the plant walkdowns? If so, please provide additional information about what was done and what insights were gained from these activities.

22. On page 104 the IPE submittal discusses an anchoring activity for human error probabilities. Please discuss how this was done and the results of this activity.

23. On page 10.3-14 of SSPSA it states the following (about the simulator): While it was very easy to determine that SI was initiated, the cause of the SI was not always readily apparent since the annunciators indicating the source of the SI signal alarmed and then cleared immediately (the failure of these alarms to lock in may be peculiar to the simulator in its present operability state).

    What is the current condition at the plant regarding these alarms? Do they clear immediately or do they lock in until an operator clears them? Does the simulator represent the current, as-built plant?

    Please discuss the use of the simulator in the evaluation of human actions and the HRA. Were any insights into improving plant safety obtained from these simulator tests? If so, what were they?

24. Section 5 of the IPE submittal is very brief and lacks details about the utilities participation in the IPE process. The original SSPSA was done about 1984. The submittal states on page 234 that PLG did the original SSPSA and subsequent ones and that the utility has done more in house as the utility PSA team has grown. For the 1990 update of the Seabrook Station Probabilistic Safety Study (SSPSS), please provide answers to the following questions: Who did it? What percent of involvement came from utility personnel? What percent of the total effort was the review?

25. Section 3.3.3 summarizes the human error probabilities used in the original PSA and the IPE analysis. The human actions are grouped into three types - pre-initiating event interactions, initiating event interactions, and post-initiating event-related interactions. For the first group the discussion states that "these actions were, in general, quantified using the handbook methods . . . as documented in the SSPSA." At the meeting on April 24, 1991, a copy of Chapter 10 of the original SSPSA was provided which contains the information about the human reliability analysis, especially those used as top events in the event trees.

    Please concisely discuss the process used to estimate the HEPs for the human actions documented in Chapter 10, and note any significant deviations from the handbook method.

    Discuss any substantial differences in your IPE findings between the approach using the 1980 draft handbook and the approach using the final handbook published in 1983. Please provide an example of estimating the HEPs for a typical top event and a concise discussion of the data used in the process.

26. Recovery is handled by an event tree which is shown in Figure 3.1-12 of the IPE submittal. Recovery is limited to station blackout and makeup of the refueling water storage tank (RWST). In the April 24, 1991 meeting, the utility said it would provide more details about the offsite recovery model. Please provide additional information on the process used to treat recovery.

27. On page 2 of the IPE submittal it states "... subsequent studies have been performed using the same contractor team with significant utility personnel involvement." Please clarify in more detail what you mean by "significant."

28. On page 101 of the submittal it states "These actions were, in general, quantified using the handbook methods (NUREG/CR-1278, Reference 27), as documented in the SSPSA. Please provide a more detailed overview of these methods and the process used to perform the quantification.

29. Please discuss the personnel who performed the human factors evaluations and the human reliability analysis for the SSPSA and follow-on studies.