July 7, 1993

Docket No. 50-261

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Mr. C. R. Dietz, Vice President
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON INDIVIDUAL PLANT EXAMINATION SUBMITTAL FOR ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 - GENERIC LETTER 88-20 (TAC NO. M74460)

The Individual Plant Examination (IPE) results for the H. B. Robinson Steam Electric Plant, Unit No. 2, was submitted on August 31, 1992, in response to Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities - 10 CFR 50.54(f)," dated November 23, 1988. We have determined that additional information is needed to complete our review. Please respond in writing to the questions contained in the enclosure within 60 days.

The reporting and/or recordkeeping requirements of this letter affect fewer than 10 respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

ORIGINAL SIGNED BY:

Brenda Mozafari, Project Manager
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Office of Nuclear Reactor Regulation

Enclosure:
Human Reliability Analysis

cc: w/enclosure:
See next page

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-261

GENERAL

The questions contained in this request for additional information are based on the staff's review of the H. B. Robinson Steam Electric Plant, Unit No. 2 (HBR2), Individual Plant Examination (IPE) submittal dated August 31, 1992. We understand that Carolina Power & Light Company (CP&L) plans to submit supplemental information regarding their IPE submittal. If the supplemental document is submitted prior to the receipt of this request for additional information and it resolves any questions contained in this document, then CP&L's response may refer to their supplemental submittal.

Section 1.4 of the IPE submittal lists a number of items for which CP&L has indicated that changes to procedures and/or an evaluation of improvements would be performed by the end of 1992. Address these items discussing the results of the evaluations, and identify changes that have been made or will be implemented. Include in your discussion the impact of these changes on the results of the IPE, including core damage frequency (CDF) and the dominant contributors, if available.

HUMAN RELIABILITY ANALYSIS (HRA)

HF-1. Discuss the formal approach, including the process used to obtain, document, and incorporate plant-specific data obtained from interviews with operations, training, and maintenance personnel, as well as from walkdowns and simulator data. Provide an example of this documentation for one of the more complex human interactions (HI).

HF-2. In order for the staff to understanding more fully the process you have used in the HRA, provide a concise discussion on how the technique for human error rate prediction (THERP) and the Electrical Power Research Institute (EPRI) methodology have been applied to quantify human error. In other words, identify and justify the types of factors, namely performance shaping factors, used to adjust the magnitude of base human error probabilities (HEPs).

HF-3. A failure probability of 0.1 was assigned for each of the four operator actions identified for use in the containment event tree, e.g., OPER-ILI, operator failure to isolate, the residual heat removal (RHR) suction valves given an interfacing-systems loss-of-coolant accident (ISLOCA) and a refueling water storage tank (RWST) pipe failure. Provide additional discussion regarding the selection of this probability value for each of the operator actions, including the method and the basis for the HEP values used and any factors used in modifying the base HEPs.

HF-4. No discussion was provided on the actions for recovery of emergency diesel generators or offsite power under the human reliability section. If recovery credit was taken, discuss the consideration given for these actions, including how the HEP values for these actions were derived during each of the different time phases.

HF-5. In the HRA, numerous pre- and post-initiator HIs have been identified indicating that the human action area has been examined for vulnerabilities. However, no explicit indication was given in the IPE submittal to indicate that the HIs have been quantitatively investigated on a ranked basis for their contributions to total CDF to determine which are the most significant. Identify the top 10 actions and their contributions to CDF (separately for both pre- and post-initiator HIs). In addition, discuss the significance (quantitatively, if available) of the HIs considered in the containment event tree and their individual contributions to CDF.

FRONT-END QUESTIONS

FE-1. In the letter transmitting the IPE for HBR2, CP&L indicated that there are no remaining significant vulnerabilities to severe accidents for HBR2. A concise discussion of the criteria used to define vulnerabilities, as required by NUREG 1335, has not been provided in the IPE. Provide a concise discussion of the criteria used to define "vulnerability," in accordance with the NUREG reporting guidelines, list any vulnerabilities so identified, and the fundamental causes of each. If explicit quantitative criteria has not been developed, discuss the process used to evaluate the need for plant improvements during and upon completion of the IPE, and the level at which plant improvements were implemented.

FE-2. In the section describing internal flooding initiating events, one of the criteria indicates that an area could be eliminated from further consideration if it did not contain equipment for trains of different systems that could serve as backups to each other with respect to core cooling. However, based upon this criteria, it appears that sequences of events (which might be of significance) may have been eliminated where multiple trains of different systems that are important to shutdown or mitigation of an accident, but not strictly backups to each other, are failed by a single flood. While it may be accepted that faults related to mechanical and human error are more important causes for loss of individual trains of systems than are flood-related failures, as indicated in your IPE submittal, it is not obvious that the same rationale would apply for multiple independent train failures. Discuss the significance of areas that have been eliminated from further consideration based on this criterion.

FE-3. The section of the IPE submittal dealing with internal floods indicates that industry flood data and generic component failure rates were used to develop flood probabilities and frequencies.

Describe the development of the frequencies of the different type of flood initiators and identify the sources of data used for each. Discuss the insights derived and provide a breakdown of the contribution to CDF of the types of flood initiators (i.e., pipe breaks, maintenance, etc.).

FE-4. Provide a description of the basis used to eliminate other buildings from further consideration in the internal flood analysis.

FE-5. Describe how plugging of drains was considered in the analysis of the area floods.

FE-6. While the description of the analyses for loss of heating, ventilation, air conditioning (HVAC) considers the impact of temperature rise on the pumps in the areas considered, it does not address its impact on instrumentation and controls in these areas, nor its impact on valves. Provide a discussion of your consideration of these items in the criteria used for eliminating loss of HVAC as a possible cause for failure of the systems to be used for shut down or accident mitigation.

FE-7. Your description of the auxiliary feedwater (AFW) pump room indicated that the ambient temperature reaches 200 degrees F in 10 minutes and that a temperature of 212 degrees F was used as a conservative approach for the remainder of the calculation. It is not clear from this description that the temperature in the room would not continue to rise and reach a point that would compromise the operation of the AFW pumps, given the loss of both fans, nor is it clear that the operations staff has sufficient time to take corrective action to mitigate the impact of the loss of both fans. Discuss how these issues were addressed in the analysis and describe the impact they may have on CDF.

FE-8. Explain why loss of HVAC to the E1/E2 bus room is not included as an initiating event, since the loss of HVAC (both fans) would be considered over the operating year (8760 hrs.) and the plant may trip or be required to shut down due to the subsequent malfunction of equipment in the room. Discuss how the operators would have sufficient time to take mitigating action for the case of loss of both fans for which credit has been given in the assessment. Address these issues from the perspective of an initiating event and the impact on CDF. Include any new information obtained from any tests performed for this room, as suggested in the discussion of this room in the IPE submittal.

FE-9. In many of the scenarios for loss of HVAC, CP&L has postulated that the operators <u>could</u> provide alternate means of cooling to the room in question. In effect, credit is taken for operator action that could be significant for the plant's ability to respond to an accident. NUREG-1335 indicates that all recovery actions will have written procedures. Verify that procedures, training, and equipment are readily available for all actions of this type.

FE-10. The IPE submittal presents the contribution to CDF from the initiating events, but does not present other methods of identifying the contributors that may provide insights or identify concerns in your search for vulnerabilities. Discuss any insights gained and provide the contribution to CDF identified for the following:

1. Loss of offsite power (LOOP), station blackout (SBO), Reactor coolant pump seal LOCA

2. Top 10 systems contained in the cutsets for the sequences leading to core damage (including support systems)

3. Common cause failure

4. Maintenance

FE-11. Descriptions of the LOOP and SBO events are not provided in the submittal. Provide a discussion of these events, including the success criteria, timing, and effect on the battery life.

FE-12. Discuss the insights gained from the IPE with respect to the quantitative importance of dedicated shutdown diesel and feed and bleed.

FE-13. Section 2.3.3, "Sequence Quantification," indicates that the "accident solutions" were truncated with the limit set low enough (1E-7) to ensure that truncated cutsets would not impact the overall result. Clarify the application of this truncation limit, and discuss its application, if any, to cutsets and/or sequences. Address the appearance of values equal to E-8 in the sequences, and the impact of requantification after the elimination of cutsets based on an initial quantification with HEPs initially set equal to 1.0. (i.e., has anything been lost due to this approach).

FE-14. Table 1 indicates that generic data was used for the LOOP initiating event frequency. Discuss your use of generic data vs. plant-specific data for this event, considering the years of operating history available for HBR2.

FE-15. Provide the definition of core damage that was used in the HBR2 IPE.

FE-16. The decay heat removal (DHR) evaluation in section 3.4.3 indicates that the DHR contribution to CDF has been considered with all other insights in section 3.4.2. However, section 3.4.2 does not address DHR as an entity, nor does it provide insights into the relative contribution to CDF of DHR totally or for its separate constituent systems. In addition, Generic Letter 88-20, Appendix 5, indicates that support systems are important to the DHR function and suggests that they be considered in the search for DHR-related vulnerabilities. Therefore, provide a discussion of insights derived and provide the contribution of DHR and its constituent systems to CDF and the relative impact of loss of support systems on the frontline systems that perform the DHR function.

FE-17. In the discussion of the "medium break LOCA event tree" in section 3.1.2, it is indicated that procedural guidance for low pressure recirculation is not provided and that, therefore, all LOCAs will require high pressure recirculation. You also indicated that consideration for when to allow low pressure recirculation is underway and may be added in the future, thus reducing conservatism in the analysis for successful recirculation. Discuss any evaluations made for this condition and address how any implemented or expected changes affect the CDF. Address the contribution of medium LOCA to CDF, if available.

BACK-END QUESTIONS

BE-1. Briefly describe the peer review performed on the IPE to help assure the analytic techniques used in the back-end analysis were correctly applied. Identify specific areas reviewed, the review team members and their positions within the organization. Characterize the peer review findings and any significant comments.

BE-2. (a) Explain the apparent discrepancy between the level of detail in the calculation of the containment loads associated with the various severe accident phenomena. For example, the material access authorization program (MAAP) code was used for analyzing the direct containment heating issue in detail, but most other phenomena were not treated in the same manner.

(b) Provide the basis for the data from Reference 3 which was used to determine that the containment failure mode capacities are largely insensitive to containment temperature.

(c) Describe the consideration given to the effect of prolonged high temperatures on penetration elastomer seal materials.

BE-3. (a) Provide a concise discussion of how your IPE process treated equipment survivability during a severe accident scenario.

(b) Identify any essential equipment which would fail as a result of severe environmental effects.

BE-4. Describe briefly how plant-specific insights (including candidates for back-end improvements) were obtained from the back-end analysis. Likewise, discuss how the back-end insights are used to enhance plant safety, or develop accident management procedures.

BE-5. (a) Explain why on page 4-146 event DBC4W (equal to "not" event DEBTHICK) is included as an input to DBC4. As shown in the figure, DBC4W "cancels out" the event DEBTHICK input to DBC4X.

(b) According to Figure 4-30 on page 4-148, no event is included in the late hydrogen burn fault tree to account for the status of ex-vessel debris coolability (since this affects ex-vessel hydrogen generation). Justify the exclusion of such events.

(c) According to Figure 4-31 on page 4-166, the possibility of basemat attack is not considered for the case where containment cooling never fails. Explain the rationale used. Is the debris assumed to be always coolable?

(d) Justify the exclusion of scrubbing due to an overlying pool of water from the fault tree on page 4-171. It is understood that pool scrubbing is present in virtually all cases at HBR2, but if it is implicitly credited, then the few cases without pool scrubbing, where it does not apply, should be treated appropriately (i.e., high pressure sequences without RWST injection).

BE-6. (a) Discuss the basis for assuming an average of 5.5 hours for recovering containment cooling after vessel breach. How does your assumption affect ex-vessel hydrogen production?

(b) On p. 4-218, it is stated that a value of 0.5 is assigned for the probability of restoring AC power. Discuss the sensitivity of this value and its impact on recovery of AC power leading to hydrogen burn/containment failure.

BE-7. (a) On p. 4-253, you assumed that the release categories for coolable debris with unscrubbed releases can be used in place of both "non-coolable" scrubbed and unscrubbed cases. Provide your rationale for using the coolable, unscrubbed case for the non-coolable, unscrubbed case.

(b) The release categories for the different plant damage state (PDS) runs appear inconsistent between Table 4-52 (p. 4-256) and Table 4-53 (p. 4-257). For example, in Table 4-53 release category RC-1 is represented by run # CA-6B-02. However, in Table 4-52, CA-6B-02 refers to release category RC-1B. Please clarify.

BE-8. (a) Provide a table containing the conditional probability of each release category for each PDS (i.e., a complete "containment matrix"), if available.

(b) Identify all functional sequences that meet the important severe accident sequence reporting criteria listed in

Appendix 2 of Generic Letter 88-20. For example, PDS 120 has a frequency of 4.0E-6/yr., and its representative sequence is an ISLOCA sequence. Since the reporting criteria for bypass sequences is 1.0E-07/yr., the functional sequences (from this PDS) that exceed 1.0E-7/yr. should be reported.

(c) In addition, you state that release category RC-2B at a frequency of 4.7E-6/yr. has no reportable sequences when compared to the WASH-1400 PWR-2 category. Appendix 2 of Generic Letter 88-20 states that the basis for reportability is the PWR-4 Category, for which RC-2B exceeds the requirements. Identify those sequences which would fail under this reporting criteria.

BE-9. (a) Discuss how the hydrogen release points and vent were used in your assessment of hydrogen pocketing and detonation.

(b) Discuss the plant-specific effects on containment integrity and equipment survivability due to local detonations. The discussion should consider the likelihood of local detonation and potential for missile generation as a result of local detonations.

BE-10. NUREG-1335 recognizes the importance of considering uncertainties in the accident progression and core exit thermocouple (CET) quantification. Discuss your consideration of uncertainties in the level 2 analysis with respect to the recommendations in the Gabor Kenton & Associates report, "Recommended Sensitivity Analyses for an Individual Plant Examination Using MAAP-3.0B," prepared for EPRI and referenced in your IPE submittal.