February 24, 1994

Docket No. 50-341

Mr. Douglas R. Gipson
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Dear Mr. Gipson:

SUBJECT: RESPONSE TO GENERIC LETTER (GL) 88-20, AND GL 88-20 SUPPLEMENT 1, "INDIVIDUAL PLANT EXAMINATIONS (IPE) FOR SEVERE ACCIDENT VULNERABILITIES" - FERMI-2 (TAC NO. M74410)

The subject GL and supplement were issued on November 23, 1988, and August 29, 1989, respectively. We have received your responses dated September 1, 1992, and September 23, 1993, to the GL and its supplement and have determined that we will need the additional information identified in the enclosure in order to complete our review. These questions relate to the internal event analysis and the containment performance improvement program of the Fermi 2 plant-specific IPE submittal.

In order for our review to remain on schedule, we request that you respond to the enclosure within 60 days of receipt of this letter. If you have any questions, please contact me at (301) 504-1341.

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

Sincerely,

Original signed by

Timothy G. Colburn, Sr. Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Enclosure:
Request for Additional Information

cc w/enclosure:
See next page

OFFICE	LA:PDIII-1	PM:PDIII-1	LPM:PM:PDI-4	PD:PDIII-1
NAME	CJamerson	TColburn	RHerman	LMarsh
DATE	02/24/94	02/24/94	02/ /94	02/24/94

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION ON FERMI
INDIVIDUAL PLANT EXAMINATION (IPE) SUBMITTAL

1. Explain (a) how the end states (success or core damage) of the front-end event trees were peer reviewed given that the end states are not specified on the trees and (b) how component level failure models for systems were peer reviewed given that fault trees were not created.

2. Provide the rationale for excluding the following plant specific initiating events: loss of TBCCW [turbine building closed cooling water], loss of operating AC switchgear, and loss of operating HVAC [heating, ventilation, and air conditioning] systems.

3. Interfacing system loss-of-coolant accidents (LOCAs) outside containment cannot be mitigated without operator action and such sequences can dominate offsite releases. Explain how the interfacing systems LOCA frequency was estimated. In particular, explain how failure probabilities of piping and components exposed to above design pressure were calculated for inclusion in the frequency estimate.

4. The submittal states that small LOCAs are modeled in the transient event trees. It is not clear, however, how transient event trees can model small LOCAs. Given a small LOCA without containment heat removal, please clarify how the IPE treated: (a) trip of reactor core isolation cooling (RCIC) on high turbine exhaust pressure, (b) isolation of cooling to control rod drive (CRD) pumps resulting in loss of long-term makeup with CRD and (c) a loss of containment heat removal evolving into a small LOCA (due to isolation of cooling to the recirculation pump seals on high containment pressure).

5. The submittal lumps together large and medium LOCAs, where the smallest medium LOCA is defined as a 0.008 sq ft break. [IPE, Section 3.1.3.1] According to IPE's success criteria, only low pressure injection is needed to mitigate both of these LOCAs. [IPE, Table, 3.1-4] Other probabilistic risk assessments (PRAs), however, require for the smaller medium LOCAs high pressure injection and depressurization before low pressure injection. Please explain why similar requirements for the smaller medium LOCAs were not considered in the Fermi IPE.

6. The submittal states that long-term injection after a large LOCA can be provided with standby feedwater. [IPE, Table 3.1.4] It is not clear how standby feedwater can inject to the core following a large LOCA in a recirculation line. Both the updated final safety analysis report (UFSAR) and the System Description in the submittal indicate that standby feedwater injects into the downcomer via feedwater injection piping. Since the water is not injected into recirculation lines or directly into the core, it seems that the water injected into the downcomer would all run out the break and not reach the core. Please explain.

7. Please provide clarification and justification for the IPE treatment of the following inter-system dependencies: (a) control room cooling; (b) room

cooling for high pressure coolant injection (HPCI), RCIC, Core Spray, and low pressure coolant injection (LPCI), for initiators other than large LOCA; (c) room cooling for standby feedwater system and residual heat removal (RHR) complex state; (d) room cooling for electrical switchgear; (e) dependence of HPCI or RCIC on instrument air (the system descriptions indicate that the lube oil valves in these systems are air operated). Also explain, (f) why the Containment Vent System is not included in the dependency tables, yet the submittal states that venting requires safety-grade control air and an ESF [engineered safety feature] bus in both divisions.

8. It is not clear how recovery of offsite power was derived. The submittal provides data for non-recovery of power at a given time, then evidently integrates this data to calculate non-recovery by (cumulative) a given time. The non-recovery values of these integrated data are high compared to values used in other PRAs. For example, the IPE's non-recovery factor for both divisions of offsite power by 8 hours is 0.5, [IPE, Figure A.5-2] while other PRAs use typically about 0.1. Please explain.

9. According to "Sequence and Operator Action Insights" of the submittal (section 6.2.3), the results of a sensitivity study showed that guaranteed success of the operator action "Inhibiting ADS [automatic depressurization system] and Emergency Depressurization" reduces the overall core damage frequency (CDF) by about 20%. Please discuss how this important insight was used for identifying potential plant improvements.

10. Interfaces between the front-end and the back-end of IPE impact the CDF. The submittal assumes that adequate net positive suction head (NPSH) for emergency core cooling system (ECCS) pumps when pulling from the suppression pool will not be lost, even if containment cooling is lost prior to containment failure. The submittal states this assumption is based on available information on pump NPSH requirements and testing at Monticello and Browns Ferry.

    The UFSAR indicates that adequate NPSH is lost if the suppression pool heats up above 198°F. [UFSAR, Section 6.3.2.14] (a) Please provide further justification for the assumption that ECCS will not be lost due to inadequate NPSH if containment cooling is lost and the suppression pool is heated to 200°F or higher. (b) Also, please discuss the effect of venting containment on the ability to maintain adequate NPSH for ECCS pumps when pulling from the suppression pool. (c) The submittal indicates that after venting, makeup is required for suppression pool boiloff, yet the event trees do not address this requirement; please indicate how makeup following venting was modeled.

11. The IPE submittal notes that there were changes to the Human Reliability Analysis (HRA) since the original analysis in the PRA. Identify and discuss any significant changes.

12. Section 3.3.3.1, System Level Operator Actions, of the IPE submittal notes that additional unavailability data were obtained for some systems and that these data were used in lieu of the "fine screening" approach used in the

original level 1 PRA. Explain the process for analysis of the plant specific data and for integrating this new data source into the HRA of the IPE. Further, discuss insights gained from comparing this data to the original estimates.

13. For the quantification of human error for procedures on valve alignment, the IPE submittal states that the human error rates of Table 20-13 in THERP [technique for human error rate prediction] (NUREG/CR-1278) was reduced by 50% because I&C [instrumentation and control] technicians are required to follow plant procedures. Please justify this reduction.

14. Please explain how dependencies associated with system level (pre-initiator) human errors were addressed and treated in the IPE submittal to assure that important accident sequences were not eliminated. These dependencies could, for example, affect all the human events simultaneously, or could only affect certain human events such that only a series of human events are determined to fail simultaneously (e.g., complete dependence may be assumed for miscalibration of all reactor water level sensors).

15. Explain how dependencies associated with event level (post-initiator) human errors were addressed. These dependencies could, for example, affect all the human events simultaneously. On the other hand, dependencies could affect a certain set of human events so that only a specific series of human events are determined to fail simultaneously (e.g., complete dependence may be assumed for manual actuation of all injection systems). The discussion should particularly address the two points below:

    (a) Event level (post-initiator) human events can be modeled in the fault trees as basic events such as failure to manually actuate a system. The probability that the operator performs this function is dependent on the accident progression (e.g., what symptoms are occurring, what other activities were previously successfully and unsuccessfully performed). When a basic event (i.e., failure to manually actuate a system) is modeled in the fault tree and the sequences are quantified, it can appear, not only in different sequences, but also in different combinations of systems failures. In addition, the basic event can potentially be multiplied by other human events when the sequences are quantified, thus resulting in artificially low calculated human error contributions if dependencies are not taken into account. Please explain how the Fermi IPE treated such dependencies.

    (b) Event level (post-initiator) human events can also be modeled in the event trees as top events. The probability that the operator performs this function can be dependent on the accident progression. The quantification of the human events needs to consider the PSFs [performance shaping factors] associated with each different sequence and the dependencies between other human events. Please explain how the Fermi IPE treated such dependencies.

16. For the event level operator actions, please discuss how estimates of operator response times were obtained. For example, discuss whether actions were observed in the simulator or walked down in the plant.

17. Section 3.3.3, Human Failure Data, of the IPE submittal states that "human error rates for event level and recovery actions were developed by using a variation of the success likelihood index methodology, SLIM." Please discuss (a) the significant differences between the original SLIM methodology and the PLG [Pickard, Lowe and Garrick] modified version, and (b) the rationale for this modification.

18. Please provide Table 5.2-1 which gives the detailed guidelines that were followed in the preparation of the operator response forms, Table 5.2-3 which gives the descriptive scaling guides, and Table 5.2-4 which gives the action split fraction evaluation form.

19. Provide a complete but concise discussion using examples to explain the "screening technique" used to evaluate and quantify operator errors included in the containment event trees (CETs).

20. How many accident sequences were analyzed as a part of the combined front-end/back-end analyses? What fraction of the CDF did the analyzed sequences cover?

21. Please provide the fault trees for at least the important nodes of the CET; for instance, "containment Intact after Core Damage." Please provide the split fraction of the top event node for each of the six event trees, for the dominant accident sequences.

22. Please provide the references or origins for the summary of probabilities of containment nodes listed in Table 4.7-12 on page 4-380 of the submittal.

23. Please provide the values for the probabilities used for containment isolation failure (page 4-177 of the submittal).