January 28, 1997

Mr. Percy M. Beard, Jr.
Senior Vice President, Nuclear Operations
Florida Power Corporation
ATTN: Manager, Nuclear Licensing (SA2A)
Crystal River Energy Complex
15760 W Power Line Street
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SUBJECT: CRYSTAL RIVER NUCLEAR GENERATING PLANT UNIT 3 - REQUEST FOR ADDITIONAL INFORMATION ON THE RESOLUTION OF UNRESOLVED SAFETY ISSUE (USI) A-46 (GENERIC LETTER 87-02) (TAC NO. M69440)

Dear Mr. Beard:

By letter dated January 2, 1996, you submitted a plant-specific summary report documenting the results of a seismic evaluation performed to address USI A-46 at CR3. Our review of the summary report is in progress. We have determined that additional information is necessary to complete our review of your submittals. Attached is a list of items in the request for additional information (RAI). Since your A-46 program is credited for other issues, such as seismic analysis relating to Individual Plant Examination of External Events (which is being evaluated by the Office of Nuclear Regulatory Research) and our review effort involves several disciplines and other program offices, there may be additional RAI questions from these ongoing reviews.

We request your response within 60 days of the date of this letter. If you have any questions, please write or call me at (301) 415-1471.

Sincerely,

Original Signed by

L. Raghavan, Project Manager
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: As stated

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REQUEST FOR ADDITIONAL INFORMATION

Resolution of USI A-46 (Generic Letter 87-02)
Crystal River Unit 3

1. In the Safety Evaluation (SE) (Reference 1), the staff has taken several exceptions and identified specific issues related to your A-46 implementation procedures (References 2 and 3). Since you performed the equipment verification (called walkdown) before receiving the SE, your walkdown report* (Reference 4) does not completely address the staff concerns. Moreover, since the walkdown report basically contains a *summary* of the data, it is not clear from the report whether and how many of the staff concerns have been addressed through the walkdown. Therefore, please provide the necessary information to show that the open issues identified in the SE (Reference 1) have been addressed during the walkdown.

2. On Page 14, third paragraph, the walkdown summary report (Reference 4) states that "the methodology used to identify the safe shutdown paths and components is in accordance with the Plant-Specific Procedure (PSP) except as noted herein." However, the exceptions are not found in the report. Please identify the exceptions clearly so that the staff can evaluate their impact.

3. The report on Page 15 (Item No. 6) permits operator action to accomplish the safe shutdown function. However, it is not clear from the report whether the egress that could be created after a safe shutdown earthquake (SSE)-type as a result of falling (or failure) of non-seismic components was considered in the operator action. Please provide information to show that the assumed recovery of all malfunctions/damages by use of operator action within the needed period of time can be accomplished in the plant condition after an SSE-type earthquake (see also items 7 and 8).

4. In item No. 10 on Page 16 of the report, the equipment types that were not included for seismic evaluation include "equipment ... which, upon loss of power, will fail in the desired position or state ...." Please verify that, under *all* concerned plant conditions, the *control devices* of such equipment that may cause a failure of the equipment in an undesirable state have been included in the safe shutdown equipment list.

5. Item 4 on Page 17 of the report indicates that "inherently-rugged" equipment types include "pressure and temperature gauges, flow elements and other items defined in the PSP." However, the PSP (Reference 2, Section 3.3.5) does not include the temperature gauges and flow elements, nor does it list any items other than the valves already included in the report. Please list all equipment types that were considered "inherently rugged" and for items which were not listed in the PSP, please provide information to show seismic adequacy of these items, including mounting.

Unless otherwise mentioned, "the report" means Reference 4, and all subsequent page number and section number citations are from this report.

Attachment

6. Regarding relay evaluation, the report on Page 17 (Section 4.1.2, Item No. 6) states that relays "associated with safe shutdown equipment are ... evaluated (but not specifically identified) as part of the cabinet evaluation." Please describe how the relay evaluation was performed without identifying the relays, e.g., model number and provide examples to show that the seismic adequacy of the installation of essential relays was verified during the "walkdown."

7. The report on Page 26, Section 4.4.11 states that "all required lighting supplement will be accomplished with flashlights and portable lights." Please show, in the potential absence of electrical lighting after an SSE, how the operators will be able to perform all recovery actions that were taken credit for in the potentially degraded plant condition. (See also RAI Item No. 3 above.)

8. The report on Page 29 (Section 4.6) states that after the SSE "the operator may have first tried to shut down using equipment not included in the SSEL." This may delay the operator action further if ultimately the A-46 shutdown path is to be followed. Please demonstrate that this delay in operator action will not compromise safety and was considered toward on time recovery from potential malfunctions, especially, in light of RAI Item Nos. 3 and 7 above.

9. Regarding decay heat removal alternatives, there seems to be an alternative path missing from Figure 4-4 (Page 34) for low pressure operation. If so, please provide the missing information.

10. The report on Page 36, Section 5.1.3 states that "all [underline added] reinforced concrete pads are integrally attached to the concrete floors by dowels." Please explain how this was verified.

11. In Reference 1, the staff has stated that meeting the caveats is an essential element of the experience-based approach documented in the Generic Implementation Procedure (GIP) and that it would use the GIP caveats to evaluate the licensees' USI A-46 resolution program. There are several caveats that are listed in the GIP but not in the PSP (Reference 2). It is acknowledged that some justifications are provided in the Technical Basis document (Reference 3) to show that the missing caveats are not of concern for Crystal River, mostly because of low seismicity. But, as the staff had already pointed out, meeting the caveats is a prerequisite for application of the experience-based approach. Caveats were prepared by experts considering potential vulnerabilities of equipment. The purpose was that an experienced engineer would go over the *entire* checklist of caveats to verify that there were no concerns for the identified vulnerabilities. For example, consider Caveats 4 and 7 of Equipment Class 1. One may make a plant-specific case for exceeding caveat limits on attached weights and cutouts but there should be some limits even for a low-seismicity site. Elimination of the caveats from the list makes the engineer systematically verify *site-specific conditions* and judge whether such conditions are acceptable given the identified *generic* vulnerability concerns. Therefore, the staff does not consider the justifications provided in Reference 3 to be adequate and please demonstrate how the missing caveats (a potential list is provided below) were satisfied for Crystal River 3.

Class 1	Caveat	4 - Attached weight of 100 pounds or less 7 - Cutouts not large 8 - Doors/brackets secured 9 - Natural frequency relative to 8 Hz limit considered
Class 2	Caveat	3 - Side-to-side restraint of breaker 5 - Attached weight of 100 pounds or less 8 - Cutouts not large 9 - Door secured
Class 3	Caveat	5 - Attached weight of 100 pounds or less 8 - Cutouts not large 9 - Doors secured
Class 4	Caveat	8 - Weak-way bending 10 - Doors secured
Class 5	Caveat	4 - Check of long unsupported piping 8 - Relays (if any)
Class 6	Caveat	3 - Check of long unsupported piping 6 - Relays
Class 7	Caveat	2 - Valve body not of cast iron 3 - Valve yoke not of cast iron for piston-operated valves and spring-operated pressure relief valves 4 - Mounted on one-inch diameter pipe line or greater 5 - Valve operator cantilever length for air-operated diaphragm valves, spring-operated pressure relief valves, and light-weight piston-operated valves 6 - Valve operator cantilever length for substantial piston-operated valves 7 - Actuator and yoke not independently braced
Class 8A	Caveat	2 - Valve body not of cast iron 3 - Valve yoke not of cast iron 4 - Mounted on one-inch diameter pipe line or greater 5 - Valve operator cantilever length for motor-operated valves 6 - Actuator and yoke not independently braced
Class 8B	Caveat	2 - Valve body not of cast iron 3 - Valve yoke not of cast iron 4 - Valve operator cantilever length 5 - Actuator and yoke not independently braced
Class 9	Caveat	4 - No possibility of excessive duct distortion causing binding or misalignment of fan

Class 10	Caveat 3 -	Doors secured
	4 -	No possibility of excessive duct distortion causing binding or misalignment of internal fan
	8 -	Relays
Class 11	Caveat 2 -	No reliance on weak-way bending of steel plate or structural steel shapes
	5 -	Relays
Class 12	Caveat 5 -	Relays
Class 13	Caveat 6 -	Relays
Class 14	Caveat 2 -	Contains only circuit breakers and switches
	3 -	Doors secured
Class 16	Caveat 4 -	No reliance on weak-way bending of steel plate or structural steel shapes
	6 -	Doors secured
Class 17	Caveat 6 -	Relays
Class 18	Caveat 2 -	Evaluate computers and programmable controllers separately
	5 -	Natural frequency relative to 8 Hz limit considered
Class 20	Caveat 2 -	Evaluate computers and programmable controllers separately
	3 -	Evaluate strip chart recorders separately
	7 -	Doors secured

12. In Reference 5, the staff identified the need for adherence to the GIP for anchorage evaluation which is a critical item in equipment seismic adequacy verification. Based on information provided in Section 5.1.3 on Page 36, it is not clear whether anchorage verification was adequately performed. Statements such as "where practical, anchor bolts were tightness tested by hand to assure that they did not freely spin in place" do not provide an assurance of "wrench tightness" discussed in the GIP and endorsed by the PSP (Reference 2). Please provide documentation to demonstrate that equipment anchorage was evaluated per Section 4.4, Appendix C and GIP's equipment-specific anchorage caveats.

13. It appears that there are equipment items on the SSEL that are not covered by the GIP or PSP (e.g., equipment class "0" on page 57 of the report). Since there are no specific instructions available in the GIP for seismic adequacy verification of these items by use of experience data, please show how their seismic adequacy verification has been accomplished, and submit supporting data for staff evaluation.

14. The following requests pertain to the equipment outlier list provided in Table 5-4 of the report:

    a) There are over 100 outlier items; but as of the report preparation date (December 18, 1995) none of them were resolved. Please provide an updated outlier resolution list describing how the outliers were resolved. The staff intends to select a few items from the completed list for a more-detailed review of their resolution.

    b) For unanchored cabinets (e.g., SEQ 652-659), the resolution plan was to address "overturning/sliding potential." The potential for rattling is not necessarily eliminated by addressing the "overturning/sliding potential." Please provide information to demonstrate how the equipment performance will be assured without eliminating the potential for cabinet rattling.

    c) No resolution plan was provided for poor rack construction (SEQ 198 and 202). Please describe how this issue was resolved to assure equipment functionality.

15. The following questions pertain to the list of 35 inaccessible items included in Table 5-5, pages 54-56 of the report:

    a) As of the report preparation date (December 18, 1995), the inspection of most items were deferred. Please confirm that the inspection has been completed and provide the results to demonstrate their seismic adequacy.

    b) For those items for which inspection will not be (or was not) performed (e.g., items resolved based on "walked down from outside the room" and 12 tanks as mentioned on page 58 of the report, etc.), please provide information to demonstrate how the seismic adequacy will be (or was) verified (e.g., meeting the caveats).

    c) Please provide a revision of Table 5-5 identifying, in updated brief summaries, the resolutions of originally deferred items. If the resolution of an item is not complete, please provide a specific schedule for its resolution.

16. Regarding cable and conduit raceways, the staff had previously rejected your reasons for not adhering to the GIP on the basis that they are qualitative (References 1 and 5). Therefore, the staff is requesting additional information that (1) identifies the cable and conduit raceways examined by the seismic capability engineers (SCEs) during its plant-specific walkdown, and (2) summarizes the results of the assessment and the basis for the conclusions reached by the SCEs in verifying cable and conduit raceway seismic adequacy.

    The requested information should also detail the criteria and methodology mentioned in the letter from P. Beard (FPC) to NRC Document Control Desk (on Generic Letter 87-02), dated August 27, 1993.

The need for the walkdown review of the cable and conduit raceway systems is evidenced by the identification of potential weak links by the Third Party Review. For example, the beam clamps identified in the Third Party Review are the types of plant-specific details that need to be verified. This reinforces the need for an A-46 review of the seismic adequacy of the cable and conduit raceway systems by the SCEs. For the beam clamps, please provide documentation (loading, capacity, etc.) to demonstrate that they pass the GIP criteria for supports.

17. The following requests pertain to Appendix B to the report:

    a) It appears from the tabular information that certain equipment items on the SSEL did not require seismic evaluation (e.g., Page 10, SEQ 875, etc.). Please describe how the verification of seismic adequacy was accomplished for these equipment items without a seismic evaluation.

    b) For some other equipment items, the "EVAL" column is empty (e.g., page 27). Provide the missing information.

18. The following requests pertain to the screening verification data sheets included in Appendix C to the report:

    a) Many equipment items including tanks have been identified as Class 21. However, there is no Class 21 in the equipment class distribution shown in Table 5-6, Page 57 of the report.

    b) Please describe what is Class 21 and how (i.e., following which criteria) equipment in Class 21 is verified for seismic adequacy.

    c) Please explain how these equipment items were considered acceptable without verification of anchorage and interaction.

    d) Page 6 of Appendix C, Items AHHE-29A, 29B and 30A are listed as similar equipment. However, items 29A and 29B are categorized in Class 10, and item 30A is categorized in Class 21. Please explain.

    e) The equipment descriptions often do not match with the equipment class. For example, on Page 8 of Appendix C, ID-10-TE is described as a tank but belongs to Class 19 which represents temperature sensors. Since this is the only information the staff has regarding equipment descriptions, please verify appropriateness of the description of equipment <u>throughout</u> the report, correct as necessary, and provide a consistent set of definitions.

    f) For several items, anchorage verification was not considered necessary (e.g., bottom boric acid storage tanks ID No. CA-10-TE and CA-12-TE, Page 8 of Appendix C). Please justify why anchorage verifications were not necessary to demonstrate equipment seismic adequacy.

g) For cabinets RCPM-3A and 3B, it was stated on Page 43 in Appendix C that their anchorage and interaction verifications are not applicable. It is understood that the inspection of these cabinets have been deferred (see page 55 of the report, Table 5-5, SEQ Nos. 533 and 534) and it is expected that the anchorage and interaction verifications will be done at a future outage. Therefore, please justify why the table in Appendix C shows that the anchorage and interaction verifications of these Class 20 equipment items are not applicable even though the PSP requires such verifications.

19. The following requests pertain to Section 2.1, Ground Response Spectra (Page 5 of the Seismic Evaluation Report dated January 2, 1996):

a) Please state which input acceleration was used to develop the CR3 floor response spectra (FRS) used in the implementation of USI A-46 program, 0.05g or 0.10g. In the submittal, it appears that 0.05g Housner spectrum was used as input ground motion. The licensing basis SSE for CR3 has a peak ground acceleration of 0.10g which is consistent with the regulation (10 CFR Part 100, Appendix A) for the minimum peak ground acceleration. Furthermore, by letter dated April 16, 1996, the licensee has committed to use this SSE magnitude for USI A-46 program, and was accepted by the staff letter dated December 16, 1993. Also in the submittal, several ground response spectra were provided, such as Figures 2-1, 2-2 and 2-3 without specifically stating which one was used. These figures were not discussed in the text of the submittal. Instead, Figures 2-35, 2-36 and 2-37 were mentioned without the figures included in the report and, no relationship between these later figures and figures 2-1, 2-2 and 2-3 was discussed. Provide clarifications.

b) Please explain Figure 2-4 on page 11. In particular, discuss the ground spectrum represented by a horizontal line and how the FRS are related to the ground spectra. Also, provide the damping values corresponding to the various spectra.

20. The following requests pertain to Section 2.2, In-Structure Response Spectrum (Page 7):

a) Six items of equipment in the safe shutdown equipment list were identified as outliers "to be treated later." The submittal stated that they were identified because the CR3 FRS exceed the Seismic Qualification Utility Group (SQUG) Reference Spectrum. Please state why cable trays and conduits are not part of the outliers. Does this imply that there are no cable trays and conduits at these elevations where the floor response spectra exceeds the reference spectrum at certain frequencies as described on page 7 of the seismic evaluation report?

b) It is not clear how the FRS presented in the seismic evaluation report were developed. Please provide a discussion which includes deviations, if any, from the staff safety evaluation on the subject, dated December 16, 1993. Please provide detailed information of the spectra including damping values, the input ground motion used and the structural model as well as the final results that are used for

the plant. In particular, please provide a detailed description of the development of the FRS for the interior of the Reactor Building at the 160-foot elevation which is shown in the Figure 2-3, page 11.

21. Information Notice 95-49 discusses a potential problem with the Thermo-Lag fire barrier panels. In particular, the Notice discusses the seismic resistance capability of the cable tray and its support when the appropriate weight and modulus of the Thermo-Lag are included in the analysis. Please discuss how this issue has been considered in the CR3 A-46 evaluation of the cable tray loads and the potential for seismic Category II and seismic Category I structure, system or component interactions.

22. With respect to tanks and heat exchangers (Table 6-1, on page 60), please provide a calculation performed for the outlier resolution of the tank ID# WDT-3A (SEQ #18). In addition, please provide representative calculations for four other tanks which are not outliers, preferably a large flat bottom tank, a vertical tank with legs, a vertical tank on a steel base frame or a skirt, and a horizontal heat exchanger as described on page 58 of the report. Please provide the technical basis (reference) for the buckling calculations of the tanks and their supporting members.

23. The report states that no significant or programmatic deviations from the PSP were made (Page 64). Please provide a clear explanation of what "no significant deviation" means. Please itemize those evaluations/methodologies in PSP which you did not follow or from which you deviated. You should discuss what the deviations are and why they are justified. A definition including the use of examples as to what is considered significant should be provided.

24. Check 6 "Gap at Threaded Anchor" on page 4-39 of GIP-2, requires an evaluation of the gap size between the equipment base and the concrete surface. What is the percentage of the total number of anchorages that were inspected for gaps and what is the largest gap found?

    In addition, there is a potential to shear off the anchor bolts when insufficient gap is provided between the equipment or its support frame and the anchor bolts. This potential exists because the equipment support may expand due to thermal loads and the anchor bolts which are imbedded in the concrete may not expand as much or at the same rate. Provide a worst case calculation of equipment anchor loads and the equipment or supporting frame stresses due to the potential differential temperature.

    On the other hand, when the gaps are too large, impact forces may be introduced due to earthquake load. Discuss how the impact loads are considered in the evaluation. Provide the worst case calculation including the margin to failure or evaluation criteria.

25. Referring to the in-structure response spectra provided in your 120-day-response to the NRC's request in Supplement No. 1 to GL 87-02, we request the following information:

a) Please identify structure(s) which have in-structure response spectra (5% critical damping) for elevations within 40-feet above the effective grade, which are higher in amplitude than 1.5 times the SQUG Bounding Spectrum.

b) With respect to the comparison of equipment seismic capacity and seismic demand, indicate which method in Table 4-1 of GIP-2 was used to evaluate the seismic adequacy for equipment installed on the corresponding floors in the structure(s) identified in Item (a) above. If you have elected to use method A in Table 4-1 of the GIP-2, please provide a technical justification for not using the in-structure response spectra provided in your 120-day-response. It appears that some A-46 licensees are making an incorrect comparison between their plant's SSE ground motion response spectrum and the SQUG Bounding Spectrum. The SSE ground motion response spectrum for most nuclear power plants is defined at the plant foundation level. The SQUG Bounding Spectrum is defined at the free field ground surface. For plants located at deep soil or rock sites, there may not be a significant difference between the ground motion amplitudes at the foundation level and those at the ground surface. However, for sites where a structure is founded on shallow soil, the amplification of the ground motion from the foundation level to the ground surface may be significant.

c) For the structure(s) identified in Item (a) above, please provide the in-structure response spectra designated according to the height above the effective grade. If the in-structure response spectra identified in the 120-day-response to Supplement No. 1 to GL 87-02 was not used, provide the response spectra that were actually used to verify the seismic adequacy of equipment within the structures identified in Item (a) above. Also, please provide a comparison of these spectra to 1.5 times the Bounding Spectrum.

References

1. "SE of FPC's Plant-Specific Criteria and Procedures for Seismic Verification of CR3 Nuclear Plant Equipment Response to GL 87-02 (USI A-46)," NRC transmittal letter dated May 2, 1996.

2. "PSP for Verification of Nuclear Plant Equipment, Revision 1," FPC transmittal letter 3F0994-06, dated September 16, 1994.

3. "Technical Basis for the CR3 PSP to Resolve NRC GL 87-02," August 27, 1993.

4. "Seismic Evaluation Report for USI A-46, Revision 0," FPC transmittal letter No. 3F1295-18 (Docketed January 2, 1996).

5. NRC letter, L. Raghavan to Percy M. Beard (FPC), dated April 12, 1994.