Florida
Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302

August 1, 1997
3F0897-01

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555-0001

Subject: Crystal River 3 - Request For Additional Information on the Resolution of Unresolved Safety Issue (USI) A-46 (Generic Letter 87-02)

References: A. NRC to FPC letter, 3N0197-20, dated January 28, 1997
B. FPC to NRC letter, 3F0397-28, dated March 27, 1997

Dear Sir:

The purpose of this letter is to complete Florida Power Corporation's (FPC) response to the NRC's request for additional information on the resolution of USI A-46. Reference A requested FPC to provide additional information regarding the resolution of USI A-46 for Crystal River Unit 3 (CR-3). Reference B transmitted a partial response to this request and committed to respond to the remaining requests by July 21, 1997. The response to the remaining requests is provided as Enclosure 1 to this letter. Reference B also committed to revise the Screening Evaluation Work Sheets (SEWS) associated with the four air handling components, AHHE-13A, AHHE-13B, AHHE-30A, and AHHE-30B. These SEWS have been revised, re-signed, and placed into the SEWS file. The information is available for inspection.

Reference B also committed to resolve USI A-46 outliers appropriately in accordance with FPC's schedule for CR-3 Restart from the current outage and by the end of Refuel 12. FPC recently committed to provide information regarding the status of outlier resolutions to the NRC at the CR-3 Restart Progress Meeting held on July 21-22, 1997, in Rockville, MD. Enclosure 2 to this letter provides the USI A-46 outlier resolution schedule and status. FPC is developing and implementing a comprehensive plan to address structural extent of condition issues at CR-3 which includes USI A-46. FPC's complete response to the NRC RAI for USI A-46 and the resolution of outliers is part of this program. FPC would appreciate the opportunity to present this program to the NRC at a future meeting.

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The response to RAI Item No. 23 in Enclosure 1 states that anchorage calculations for tanks and heat exchangers to confirm the engineering judgement of anchorage adequacy will be completed prior to restart but no later than December 1, 1997. Items discussed or indicated within this RAI response as being completed are available for inspection.

Sincerely,

J. J. Holden, Director
Nuclear Engineering and Projects

JJH/RSC/CGP
Enclosures: 1. Response to NRC RAI
2. USI A-46 Outlier Resolution Schedule and Status

Attachments to Enclosure 1:

A. FPC Calculation S93-0149
B. FPC Calculation S92-0171
C. FPC Calculation S94-0011

cc: Regional Administrator, Region II
Senior Resident Inspector
NRR Project Manager

NRC RAI (USI A-46) COMMITMENT
3F0897-01

COMMITMENT	LETTER REF.	DATE DUE
...a few (currently, five have been identified) anchorage calculations were not performed for tanks and heat exchangers... These anchorage calculations will be performed in accordance with the requirements of the PSP. The results of these calculations shall confirm the judgement of anchorage adequacy. These calculations will be completed prior to restart, scheduled for December 1997, but not later than December 1, 1997.	RAI Item No. 23 Response (Enclosure 1)	December 1, 1997

ENCLOSURE 1

FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3
DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

RESPONSE TO NRC RAI

VERIFICATION OF SEISMIC ADEQUACY OF EQUIPMENT IN OPERATING REACTORS UNRESOLVED SAFETY ISSUE (USI) A-46, GENERIC LETTER 87-02

LIST OF ABBREVIATIONS

CR-3 ..... **Crystal River Unit 3**

DHR..... **Decay Heat Removal**

EPRI ..... **Electric Power Research Institute**

FPC ..... **Florida Power Corporation**

FRS..... **Floor Response Spectra**

GIP..... **Generic Implementation Plan**

MAR ..... **Modification Approval Record**

OBE ..... **Operating Basis Earthquake**

PSP..... **Plant Specific Procedure**

RAI..... **Request for Additional Information**

SCE ..... **Seismic Capability Engineer**

SEP..... **Systematic Evaluation Program**

SEQ ..... **Sequence numbers corresponding to the SSEL components**

SEWS..... **Screening Evaluation Work Sheet**

SQUG..... **Seismic Qualification Utility Group**

SRT ..... **Seismic Review Team**

SSE ..... **Safe Shutdown Earthquake**

SSEL..... **Safe Shutdown Equipment List**

SVDS..... **Screening Verification Data Sheet**

USI ..... **Unresolved Safety Issue**

ZPA ..... **Zero Period Acceleration**

CRYSTAL RIVER UNIT 3

RESPONSE TO NRC RAI

UNRESOLVED SAFETY ISSUE (USI) A-46, GENERIC LETTER 87-02

By letter dated December 31, 1995 (3F1295-18), Florida Power Corporation (FPC) provided the documentation of the seismic evaluation (The Report) performed to address USI A-46 at Crystal River Unit 3 (CR-3). The evaluation was performed using FPC's Plant Specific Procedure (PSP) for resolving USI A-46.

By NRC letter dated January 28, 1997 (3N0197-20), the NRC determined that additional information was necessary to complete their review of the CR-3 Report and provided a Request for Additional Information (RAI). FPC completed a response to nine (9) of the NRC's requests and submitted them by letter dated March 27, 1997 (3F0397-28).

The NRC's RAI included twenty-five (25) requests, many of which have sub-parts. Responses to requests Nos. 2, 6, 9, 10, 14, 15, 17, 18, and 19 were provided in FPC letter, 3F0397-28, dated March 27, 1997. A list that identified and described 111 outliers was also included with this response

Responses to the remainder of the requests are provided on the following pages.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

The following provides a cross reference listing of the open issues identified in the NRC SE of FPC's PSP (transmitted to FPC by NRC letter dated May 2, 1997) with RAI Responses by FPC that provide information to show that the open issues have been addressed during walkdowns:

NRC SE OPEN ISSUE*	FPC RAI/RESPONSES**	
	3/27/97	Enclosure 1
Sections 2.1 & 3.0(1)	2, 6, 9	4, 11
Sections 2.2 & 3.0(2)	4, 11	6
Sections 2.3 & 3.0(3)	10, 14, 18	12, 23, 24
Sections 2.4 & 3.0(4)	--	16
Sections 2.5 & 3.0(5)	--	22
Sections 2.6 & 3.0(6)	14, 18	11, 12, 13, 23, 24
Sections 2.7 & 3.0(7)	--	11

* These open issue references are those transmitted to FPC by the NRC in the SE enclosed with the NRC to FPC letter dated May 2, 1997. Sections 2.0 and 3.0 of the NRC SE discuss these open issues.

** This list provides direction to finding information in responses to the NRC RAI provided by FPC to the NRC in letter, 3F0397-28, dated March 27, 1997, and in this RAI response (Enclosure 1) submittal, to show that the open issues identified in the SE have been addressed during walkdowns.

The technical bases for the CR-3 Plant Specific Procedure (PSP) have been presented and explained as submitted with FPC to NRC letter, 3F0893-12, dated August 27, 1993. This includes a detailed comparison of the guidelines in the CR-3 Plant Specific Procedure and SQUG's Generic Implementation Procedure (GIP) to ease NRC's review. The CR-3 Plant Specific Procedure either agrees with the GIP, or the CR-3 plant meets the GIP or its intent. Where the CR-3 Plant Specific Procedure differs with the GIP, this is almost always because CR-3 is a low seismic site with a SSE ZPA of 0.1g, whereas the GIP was developed so it would be applicable even for a California plant with a SSE ZPA of 0.25g. Like the USI A-46 approach in GL 87-02, the CR-3 Plant Specific Procedure provides criteria for an adequate level of safety, especially considering the fact that CR-3 is in a low seismic region.

The responses listed above that provide information for the SE open issues are consistent with these technical bases. In addition, Enclosure 2 to this RAI response submittal provides a schedule of identified outliers to be resolved.

NRC REQUEST NUMBER 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).

FPC RESPONSE:

The complete section referenced above from the report is as follows:

4.1.1 Generic Criteria and Assumptions

6. Operator action is permitted, if necessary, to accomplish the safe shutdown function provided that sufficient manpower and time are available and proper procedures are in place.

Response to a seismic event at CR-3 is accomplished by the use of Abnormal Procedure (AP) 961, "Earthquake," and the existing normal and emergency operating procedures. As provided in the report, the SSEL was reviewed for compatibility with plant procedures in accordance with the PSP guidelines. This review concluded that the operation and emergency procedures contained adequate guidance to ensure that safe shutdown could be achieved and maintained if only the equipment on the SSEL is available following a SSE. Operator actions that may need to be taken to compensate for equipment or system failure, and are considered to be out of the normal routine, were addressed in Section 4.3 of the report.

The majority of operator actions addressed in Section 4.3 of the report are performed by control room operators inside the control room. Other actions that are required to be performed include breaker and valve alignments and switch manipulations in the control complex, auxiliary building, intermediate building, turbine building, and outside by the condensate storage tank.

The control complex (including the control room), auxiliary building, intermediate building, emergency diesel generator building, and reactor building are seismic Class I structures. Potential egress problems that could be created after a SSE as a result of falling (or failure) of non-seismic components were therefore judged not to be significant in affecting any operator actions that could be necessary in these areas.

Egress from the control complex to perform operator actions in other plant areas is via the turbine building. Egress from the control complex and the performance of operator actions in the turbine building are not expected to be a significant hazard in an operator's ability to access plant equipment. Earthquake experience has shown that typical industrial grade equipment and structures are inherently rugged and not susceptible to damage which would result in the structures or equipment inhibiting operator access at A-46 plant SSE levels. Additionally, plant areas that may require operator action are accessible via multiple pathways. Potential egress blockage in any one pathway would not prevent alternate access to plant areas.

The operator actions that are performed outside the control room are backup and/or redundant actions to other equipment on the primary safe shutdown pathways and are not critical actions that must be performed in a short time period following an earthquake to ensure safe shutdown. The Operations department has determined that accomplishment of these actions can be completed within the needed time period after an earthquake.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

The complete section referenced above from the report is:

> *10. The following equipment types are not identified for seismic evaluation:*
>
> *Equipment which could operate but does not need to operate and which, upon loss of power, will fail in the desired position or state without relying on mechanical movement. This type of equipment is defined as passive for the purposes of this section.*

This statement in item no. 10 of the report is the same as that which appears in Section 3.1.2 of both the GIP and the PSP and was repeated for completeness in the report.

Most of the enclosures (e.g., cabinets, panels, switchgear, MCCs) containing control devices were included in the SSEL. The intent was to include any enclosure that might contain relays or other control devices associated with equipment already on the SSEL. In the process of doing this, enclosures containing control devices for equipment not on the SSEL were also included in the SSEL. No attempt has been made to identify this equipment, just as no attempt has been made to associate the relays in the enclosures which were walked down, with equipment that is on the SSEL. This is consistent with the methodology for addressing relays as described in the PSP transmitted to the NRC by FPC letter, 3F0893-12, dated August 27, 1993.

Section 2.2 of the NRC's, "Safety Evaluation of Florida Power Corporation's Plant-Specific Procedures for Seismic Verification of Crystal River 3 Nuclear Plant Equipment Response to Generic Letter 87-02 (USI A-46)," dated May 2, 1996, addresses this issue. In this SE reference, the staff accepted FPC's position on inspection, and inclusion of relays into the SSEL. The walkdown effort included cabinets, panels, and other equipment that might contain such devices. The walkdowns did find some relays with missing support clips, and other outliers that might affect relays. These were included in the outlier report (e.g., outlier ID nos. 19, 63, 64, 65, 66, 67) and are in the process of being repaired, or replaced. See Enclosure 2 to this RAI response for status of outliers. Similar to the walkdown effort for relays, the FPC walkdowns also included the contactors and motor starters contained in these cabinets and panels.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

The following summarizes the types of equipment excluded from the scope of review in the Plant Specific procedure due to their inherent ruggedness:

a. Major pieces of equipment in the Nuclear Steam Supply System (NSSS) that are located inside containment (e.g., reactor vessel, steam generators, etc.). These are excluded because of their demonstrated ruggedness. Plant Specific Procedure Section 1.3.2.

b. Manually-operated valves and self-actuating check valves without external actuators are considered inherently rugged and need not be evaluated for seismic adequacy in the USI A-46 program. If a check valve has an external actuator, then this actuator and its connection to the check valve were evaluated for seismic adequacy. On the other hand, if a power-operated valve (e.g., a motor-operated valve), is opened or closed manually by a human operator using the handwheel (rather than using the power drive), then it should be on the Seismic Review SSEL and it was also evaluated for seismic adequacy. Plant Specific Procedure Section 3.3.5.

c. The shell of tanks and heat exchangers and the shell-to-support welds. These items are rugged enough to withstand the loads which can be transmitted to them from the anchor bolts and support saddles and therefore, evaluation for seismic adequacy is not necessary. Plant Specific Procedure 7.4.2.

Regarding the recording of inherently rugged items on the SSEL, the PSP states:

> "While it is not necessary to verify the seismic adequacy of inherently rugged equipment, it is recommended that, when such equipment is active for accomplishing a safe shutdown function, the equipment be included on the Safe Shutdown Equipment List (SSEL) for completeness. It could be labeled as being in equipment class "R" (i.e., inherently rugged). For example, if a manual valve with a handwheel operator is opened or closed by a plant operator (i.e., the valve is performing an active function), then this valve could be added to the working copy of the SSEL for reference purposes to show what item of equipment is used to accomplish this active function. However, this manual valve need not be evaluated for seismic adequacy and need not be included on the Seismic Review SSEL."

As recording inherently rugged and passive items in the SSEL is optional in the PSP, the only items that were recorded in the SSEL were non-safety related items (valves and one in-line flow element). The valves were tracked because the CR-3 databases did not indicate whether or not these valves were

manual or power operated or if check valves have an external actuator. All valves classified as inherently rugged were reviewed either by a walkby of the item to determine the method of operation or by a review of the item when associated SSEL items were walked down. All items classified as inherently rugged (54 items) are manual valves operated by a handwheel. Manual operated valves and check valves without external actuators were considered inherently rugged and the equipment class was identified as "N/A" in the report. The remaining valves were assigned the appropriate equipment class and were seismically evaluated.

Other than the manual valves, the only item included in the SSEL that fits the category described above for inherently rugged items is MU-012-FT (an in-line flow transmitter). The evaluation for this item is described in the response to RAI Item No. 13.

NRC REQUEST NUMBER 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.)

FPC RESPONSE:

The complete statement referenced from the report is:

4.4.11 Lighting Requirements

a. Required Lighting

There are no requirements for any permanent lighting. All required lighting supplement will be accomplished with flashlights and portable lights. Both battery powered and plug-in units connected to a diesel backed outlet will be utilized.

b. Lighting Verified

The local battery powered light units were originally installed Seismic, anti falldown in Category 1 Structures. During the walkdowns these units were generically reviewed for interaction concerns by the walkdown teams. The results of this review confirmed that the units would not fall down during an earthquake. Since the unit remains in place it should function as required after the event, providing additional ambient lighting for operations personnel.

FPC has determined that the statement above in paragraph (b), "Lighting Verified," regarding original seismic, anti-falldown installation of local battery powered light units (i.e., emergency lighting), cannot be verified. However, the statements following the first sentence of paragraph (b) regarding the A-46 walkdown reviews confirming that the units would not fall down during an earthquake are correct. These reviews, conducted by the SRT, confirm that the units will remain in place and should function after the event.

Emergency lighting and portable flashlights are available and will be used by Operations personnel as needed to perform actions required to shutdown the plant following an earthquake. Flashlights and lanterns are staged and maintained for use by Operations personnel at the Remote Shutdown Panel, Cable Spreading Room, Auxiliary Building, and Turbine Building. The operator actions necessary for an earthquake have been discussed in the response to RAI Item No. 3. Operations department review of these actions has determined that these actions can be adequately performed with the existing emergency lighting and/or flashlights.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

Section 3.7 of the PSP requires a documented review by the Operations department to ensure that the shutdown path selected for USI A-46 and included in the plant-specific SSEL is a *"legitimate safe shutdown path consistent with plant procedures and operator training."* It further provides suggested methods to assure that operators can perform actions expected of them in the A-46 program. The review of the Safe Shutdown Equipment List (SSEL) by the CR-3 Operations department considered the need to change normal and emergency operating procedures and training to accomplish all required operator actions within the required times and available resources to shut down the plant.

The equipment relied on for shutdown in response to an abnormal event is the same as required by the symptomatic operating procedures and Operations personnel are trained to continue to the next level of equipment until the plant reaches hot shutdown. The additional time spent selecting the next level of equipment is part of the normal response to an abnormal event and will not impact the safe shutdown of the plant. Additionally, the emergency operating procedures are symptomatic based and would ensure the prompt entry into the applicable emergency procedure based on plant conditions regardless of the actions performed up to that time. This approach ensures that no time would be lost in taking the required plant actions.

NRC REQUEST NUMBER 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 caveats 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 - Door/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

FPC RESPONSE:

This RAI raises issues regarding 50 caveats that are in the GIP but not in the PSP. The following response presents a discussion of key general issues related to caveats, followed by a caveat-by-caveat discussion of the 50 caveats.

The RAI makes the following statement: *"...there should be some limits even for a low-seismicity site."* There exists empirical data on the good performance of lightly anchored and even unanchored power and industrial equipment of common construction in past earthquakes. This information is available from those plants that have experienced earthquakes and had little or no seismic design. The 0.1g ZPA SSE at CR-3 is not a very significant earthquake. Combining CR-3's low seismicity with the demonstrated inherent ruggedness of common industrial equipment, supports the basis that a minor earthquake such as the CR-3 SSE should not result in major damage to equipment at CR-3, with the possible exception of the ceramics in the switchyard. The Technical Basis Report presented data demonstrating that relays did not chatter in earthquakes with ZPAs less than 0.14g.

The RAI appears to assume that if a GIP caveat is not explicitly stated on the PSP SEWS, it was not considered by the SRT. A-46 walkdowns at CR-3 were performed by a fully trained SRT. The SRT at CR-3 had the same training as SRTs at all other A-46 plants. There was no special training program to limit SCEs to PSP considerations, nor was there a training program to help the SRT unlearn those parts of the GIP not explicitly included in the PSP. The SRT at CR-3 evaluated equipment at CR-3 based on their knowledge of the issues in the entire GIP.

The caveats in the PSP or GIP SEWS summarize the documentation of the seismic walkdown. The caveats on the PSP SEWS do not summarize all the factors (whether they were explicit GIP caveats or other issues) that the SRT considered in their evaluation. The lack of a specific caveat does not and did not prevent the SRT from including the issue in their evaluation. As SQUG and NRC have recognized, the judgment of the SRT is the key factor in a successful A-46 evaluation, which is why SCEs had to complete an extensive training program.

While low seismicity was a factor in not explicitly including some GIP caveats in the PSP, it was not the only factor. A plant pre-walkthrough was used to gather insight on the specifics of plant construction at CR-3. For example, this walkthrough discovered the ruggedness of the CR-3 raceway supports, which was not anticipated. An important consideration was the determination that the equipment at CR-3 is generally representative of equipment in the experience database.

FPC could have addressed the caveat issue in another way. Consider the "cutouts not large" caveat, for example. Had FPC included this caveat in the PSP, and a cutout larger than that specified in the GIP was found, the SRT would have concluded the cutout to be acceptable. Thus, the difference would have been that this caveat would have been identified in the SEWS (and final report) as one where the intent of the caveat was met. On the other hand, if the cutout was so large that the SRT would consider it to be an outlier, or to simply need further evaluation, they certainly would have noticed it and noted it in their walkdown even though the caveat was not included in the PSP.

Thus, the difference in the outcome would have been how the NRC was advised of the conclusion: (1) in the final report in the list of items meeting the intent of the caveat, but not its specific wording, (2) in the PSP as an item that was pre-screened, or (3) in the final report as an outlier.

Caveats That Were Pre-Screened. The following caveats listed in the RAI fall into the category just discussed, which is called pre-screening:

Class 1	GIP Caveat 4 - Attached weight
	GIP Caveat 7 - Cutouts not large
Class 2	GIP Caveat 3 - Breaker restraint
	GIP Caveat 5 - Attached weight
	GIP Caveat 8 - Cutouts not large
Class 3	GIP Caveat 5 - Attached weight
	GIP Caveat 8 - Cutouts not large
Class 4	GIP Caveat 8 - Weak-way bending
Class 7	GIP Caveat 2 - No cast iron body
	GIP Caveat 3 - No cast iron yoke
	GIP Caveat 4 - Pipe one inch or more
	GIP Caveat 5 - Valve operator length
	GIP Caveat 6 - Valve operator length
Class 8A	GIP Caveat 2 - No cast iron body
	GIP Caveat 3 - No cast iron yoke
	GIP Caveat 4 - Pipe one inch or more
	GIP Caveat 5 - Valve operator length
Class 8B	GIP Caveat 2 - No cast iron body
	GIP Caveat 3 - No cast iron yoke
	GIP Caveat 4 - Pipe one inch or more
	GIP Caveat 5 - Operator length
Class 9	GIP Caveat 4 - Duct distortion
Class 10	GIP Caveat 4 - Duct distortion
Class 11	GIP Caveat 2 - Weak-way bending
Class 16	GIP Weak-way bending caveat is not in GIP
Class 20	GIP Caveat 3 - Strip chart recorders

Caveats on Doors. The issue associated with the following caveats listed in the RAI were considered in the walkdown, even though the caveat was not included in the PSP SEWS:

Class 1	GIP Caveat 8 - Doors secured
Class 2	GIP Caveat 9 - Doors secured
Class 3	GIP Caveat 9 - Doors secured
Class 4	GIP Caveat 10 - Doors secured
Class 10	GIP Caveat 3 - Doors secured
Class 14	GIP Caveat 3 - Doors secured
Class 16	GIP Caveat 6 - Doors secured
Class 20	GIP Caveat 7 - Doors secured

A typical GIP caveat for this issue is as follows: *"MCC/BS Caveat 8 - Doors/Buckets Secured. All doors and drawout buckets should be secured by a latch or fastener. The concern addressed by this caveat is that the doors and drawout buckets could open during an earthquake and repeatedly impact the housing, causing internal components such as relays and contactors to malfunction or chatter."*

This clarifies that the "doors secured" caveat is a seismic interaction issue, and this is how it was treated in the A-46 walkdowns at CR-3. That is, doors the SRT considered suspect were addressed in the

INTERACTION EFFECTS portion of the PSP SEWS. A search of CR-3 SEWS identified the following cases where the SRT noted "doors secured" issues:

SF-9-FIT - Interaction 1: Door not latched - latch mechanism missing. No relays, therefore not a credible interaction.
DPDP-8B - Interaction 1: Three (3) screws missing on doors in front of cabinet. No relays, so interaction (if it could occur) is not credible.
RR1B - Interaction 5: Door does not latch at top; judged OK. See sketch on original SEWS.
RR2B - Interaction 5: Door does not latch at top. Concern is potential banging effect on the relays.

Piping Caveats. The issues associated with the following caveats were evaluated using GIP guidance, even though the caveats were not included in the PSP:

Class 5	GIP Caveat 4 - Nozzle loads
Class 6	GIP Caveat 3 - Nozzle loads
Class 7	GIP Caveat 7 - Actuator and yoke independently braced
Class 8A	GIP Caveat 6 - Actuator and yoke independently braced
Class 8B	GIP Caveat 5 - Actuator and yoke independently braced

A search of CR-3 SEWS identified the following cases where the SRT noted issues associated with piping runs per the PSP classified Caveat 7 (this PSP caveat envelopes the GIP caveats listed above):

DCP-1B : A long run of piping connected to this decay heat cooling pump has an axial support which uses a pipe clamp without any axial lugs that could be visually confirmed. This requires further review.

SWP-1C : Piping on discharge side of this service water pump is not restrained (in direction perpendicular to shaft of motor/pump) for about 40' of approx 16" pipe. Pipe load on pump should be looked into to see if loads on pump from pipe are adequately iow.

These pumps are identified as outliers. See Enclosure 2 to this RAI response for status of outliers.

Caveats on 8 Hz Issue. The following caveats in the RAI are not applicable to CR-3, because floor response spectra were used in the PSP instead of 1.5 times the SQUG Bounding Spectrum, where the 8 Hz issue would normally be used:

Class 1	GIP Caveat 9 - 8 Hz issue
Class 18	GIP Caveat 5 - 8 Hz issue

Caveats on Programmable Controllers. As explained in the Technical Basis Report, the following caveat was included because, at the time SQUG included it, there was little earthquake data on the performance of the subclass of computers and programmable controllers (for example, IR/BS Caveat 2 of the GIP includes the following: *"The concern is that the subclass of computers and programmable controllers is so diverse that they may not be adequately represented by the earthquake experience class."*) The concern about representation has since been resolved since these devices are found in large quantities in industry and have been reviewed at post-earthquake industrial sites. Programmable controllers have also been evaluated like other components mounted in an instrument rack, panel, or cabinet, for any suspicious mounting details or interactions. The concerns with programmable controllers are focused on ensuring that these cards are properly mounted within their enclosures and that their connections will stay positive subsequent to the seismic event.

Class 18	GIP Caveat 2 - Programmable Recorders
Class 20	GIP Caveat 2 - Programmable Recorders

Relay Caveats. The following discussion describes how FPC's evaluation of A-46 relays is consistent with a previous request from NRC. The following caveats are addressed below:

Class 5	GIP Caveat 8 - Relays
Class 6	GIP Caveat 6 - Relays
Class 10	GIP Caveat 8 - Relays
Class 11	GIP Caveat 5 - Relays
Class 12	GIP Caveat 5 - Relays
Class 13	GIP Caveat 6 - Relays
Class 14	GIP Caveat 2 - No sensitive items
Class 17	GIP Caveat 6 - Relays

Although relays were also specifically checked in the case of Chillers (Class 11), Distribution Panels (Class 14), and Engine-Generators (Class 17), the following describes FPC's general approach to the relay issue:

NRC's April 12, 1994 letter to FPC contained the following:

"(2) Electrical Relays

Since the likelihood of encountering an SSE in the range of 0.1g to 0.15g peak ground acceleration during the remaining licensed term of your facility is low, it is unlikely that a potential seismic event would produce vibratory ground motion of sufficient intensity to cause a significant number of relays to experience chatter, especially if it is confirmed that the anchorages for the relays and the equipment housing them are sufficient to withstand a design basis earthquake. For the small number of relays which may experience chatter and cause undesirable effects on safe shutdown equipment, appropriate operator action may be sufficient to cope with the undesirable effects (e.g., reset the relay, work around any affected equipment, etc.) within the time needed to avoid core damage. Thus, a reduced scope of electrical relay evaluation would satisfy the intent of the USI A-46 concern regarding potential seismic-induced relay malfunction subject to the following:

a. Confirmation, by plant walkdowns, that all essential relays in the safe shutdown path are properly installed; i.e., installed per design drawings with adequate anchorages. This may be accomplished by a confirmatory walkdown of a sample population of the safe shutdown relays.

b. A commitment to replace all 'Bad Actor Relays' (EPRI NP-7148-SL, Appendix E), which are considered susceptible to chatter at very low vibration levels, during maintenance or modification activities that occur for other reasons for the balance of plant life.

c. A commitment to develop a top-level procedure for coping with the consequences of relay chatter.."

FPC responded positively to all of the above in its August 15, 1994 letter to NRC (3F0894-02). FPC's response to Paragraph (a) is as follows:

"Sections 1.3.2, 1.3.5, and 4.0 of the PSP will be modified to more completely describe the relay verification performed by the seismic capability engineers (SCE's) during the plant walkdown. In addition, a caveat will be added to Appendix B for each of the following equipment classes:

1. *Motor Control Centers*
2. *Low Voltage Switchgear*
3. *Medium Voltage Switchgear*
4. *Transformers*
14. *Distribution Panels*
16. *Battery Chargers and Inverters*
18. *Instruments on Racks, and*
20. *Instrumentation and Control Panels and Cabinets*

The caveat will read:

'Relays Properly Installed and Supported. All observable relays should be properly installed as intended by the manufacturer. Relays should be installed on structurally sound members. Any unusual relay orientation or mounting detail should be examined to ensure relay does not experience unusually high in-cabinet amplification. Relay mounting should be visually checked to ensure chatter will not occur due to seismic interactions or other phenomena.'

The Screening Evaluation Work Sheets (SEWS) for each of these equipment classes will be modified to add a check-off for this caveat.

This revision to the PSP will be submitted to the NRC by September 2, 1994. None of the equipment walked down to date contains any relays. Thus, this change will have no impact on the work already done.

The CR-3 Safety Shutdown Equipment List (SSEL) conservatively includes all (over 130) safety related panels and cabinets. It also includes over 40 non-safety related panels and cabinets that were considered important to smooth and stable plant operation. No attempt has been made to associate specific relays with individual cabinets because of the time it would require. However, because of the very conservative methodology used for adding these components to the SSEL, there is a high probability that these panels and cabinets, along with the equipment in the other cabinets noted above, contain all of the relays associated with SSEL equipment."

The above means all (observable) relays in the above 200 panels and cabinets, not just essential relays, were included in the walkdown.

FPC considers the above to be responsive to NRC's request for a *"walkdown of a sample population of the safe shutdown relays."*

NRC REQUEST NUMBER 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."

FPC RESPONSE

Unlike the approach NRC used in developing the seismic IPEEE, SQUG did not identify the subset of GIP guidelines that are adequate for a low seismic site like CR-3. This was FPC's intent in developing the PSP. Instead, the vast majority of the GIP guidelines are the same for a plant whether it has an SSE with a ZPA of 0.1g (like CR-3 in Florida) or 0.25g (like Rancho Seco in California, which was an A-46 plant).

FPC does not agree that *"anchorage evaluation ... is a critical item in seismic adequacy verification..."* for a low seismic site like CR-3. This statement is not supported by post-earthquake investigations. As documented in the Technical Basis report, even relays were not observed to chatter at ZPAs below 0.14g.

FPC does not agree that the PSP endorsed that "wrench tightness" *needed* to be assured. However, SCEs were free to do this if they judged it necessary to ensure the anchorage was adequate (see Section 4.4 of the PSP).

The anchorage checks made in accordance with Section 4.1.4 of the PSP are done by experienced Structural Engineers. These engineers completed all training required by the PSP (which is the same as the GIP, Revision 2). Both SCEs participating in the walkdown team must agree that the anchorage is adequate, based on visual assessment, drawing review, or, if required, calculations. These methods, or other appropriate methods, were used to reach a consensus on anchorage adequacy. If both SCEs did not agree that the anchorage is adequate, the component was treated as an outlier and handled in accordance with Section 5 of the PSP. This process meets the intent of the GIP, Revision 2 in that their combined expertise is considered adequate to determine the degree of rigor needed to evaluate the anchorage of equipment at a low seismic risk site such as CR-3. The rationale for this position is described in greater detail in Appendix E of the Technical Basis for the Plant Specific Procedure to resolve NRC Generic Letter 87-02. The cost of performing more detailed evaluations, as described in the GIP, is not considered to be a worthwhile or prudent expenditure, since the action does not produce a safety benefit commensurate with the cost.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

As identified in the Table on page 57 of the report, there are three items that have been classified as equipment class "0". These three items are identified below and the evaluation of these items (taken directly from the SEWS for those items) is provided:

1. MU-012-FT, Make-up Flow Transmitter (sequence number 162).

The conclusion for MU-012-FT is that it is acceptable.

In response to the question "Is Equipment Seismically Adequate", the SRT wrote the following:

"Rugged in-line item. Only seismic vulnerability would be seismic interaction on the electrical fitting. There are no credible interactions."

2. ASV-050, EFTB-1 Trip & Throttle (sequence number 731).

Two walkdowns were performed on this item (9/22/95 and 9/28/95). The second walkdown was performed after review of vendor drawings.

The conclusion for ASV-050 is that it is acceptable.

The SEWS includes the following statements regarding the seismic adequacy of this item:

"Valve appears to be manually operated. Not sure how it operates. Need to determine the method of operation and functional requirements (especially the trip function). [9/22/95]"

"Review of vendor drawing (Ametek no. 89G-X024V) and additional walkdown by D. Rutherford and H. Johnson confirmed manually operated throttle valve and indicated that the rod to the trip mechanism is attached to a lever on a governor. The lever is positively held in place by a dynamically stable latching mechanism. Latch can only release when driven by governor. The trip mechanism is judged to be dynamically stable. [9/28/95]."

3. Ceiling, Control Room Ceiling (sequence number 886).

The control room ceiling is not an SSEL item; however, due to its effect as a potential seismic interaction issue for many SSEL items, it was given its own sequence number and was reported as a separate item for outlier tracking. The conclusion for the Control Room Ceiling is that it has unresolved outliers.

The SEWS includes the following statements regarding the seismic adequacy of this item:

"OUTLIER: Review of CR-3 Main Control Room Ceiling for A-46 as interaction source for Control Room Cabinets on SSEL.

1. Lights - Adequately supported where strap goes under support and provides restraint. However, strap goes from one light to the next one, so the strap is not effective at the end of, or at a gap in, a run of lights. In addition, many connections of light supports to main members are not correctly installed (ends of spring loaded wire clips are not engaged in holes). Lens for light is not positively secured.

2. Main Strut Members - Main members are spliced every 4 feet. The joint is such that axial loads on the members (axial loads do occur in earthquakes - especially for ceilings not laterally braced like CR-3) will likely break the joint. This will not cause the main member to fall, but it could tilt and cause ceiling panels and lights to fall.

3. Secondary Strut members - The secondary strut members are gravity supported only - at the splice discussed above. Even if the splice does not break, the secondary members are likely to fall - which will likely cause ceiling panels and lights to fall.

OUTLIER RESOLUTION:

(a) Perform installation design review to determine if the intended installation methods would be seismically adequate, and

(b) maintenance to install ceiling as intended if this is determined to be seismically adequate or install modification to assure seismic adequacy."

The resolution of the outlier issues for the control room ceiling is now affected by the planned replacement of the Control Room Ceiling during the current outage. The new control room ceiling will be seismically verified to assure that it is not a potential seismic interaction hazard for safety related or SSEL items. See Enclosure 2 to this RAI response for status of outliers.

NRC REQUEST NUMBER 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 97-02), 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 systems by the SCEs. For the beam clamps, please provide documentation (loading, capacity, etc.) to demonstrate that they pass the GIP criteria for supports.

FPC RESPONSE:

FPC Response to Paragraph 1:

Cable tray and conduit raceways were not systematically examined in the A-46 walkdowns. However, the following was done:

- Reviewed the history of cable and conduit raceway seismic design at CR-3.
- Determined that CR-3 raceway design criteria is very rugged, especially for a low seismic site.
- Performed a walkthrough to confirm general adherence to the CR-3 seismic design criteria. See Technical Basis for CR-3 PSP, Appendix B - Raceways.
- Concluded that a full GIP walkdown was not necessary to assure CR-3 raceways are seismically adequate.

As discussed below however, systematic walkdowns were performed in response to the finding of the Third Party Reviewer, and as part of the Maintenance Rule Inspections.

FPC Response to Paragraph 2:

The FPC letter dated August 27, 1993, transmitted the Technical Basis for the Crystal River 3 PSP which includes Appendix B that describes adequacy of raceway.

FPC Response to Paragraph 3:

The raceways were not part of the original scope of A-46. They were included in A-46 by mutual agreement between SQUG and NRC to resolve outstanding issues from the Systematic Evaluation Program (SEP), and reportedly to resolve issues that had risen at other plants.

Typically, raceways at SEP plants were not seismically designed, and even after the SEP Owners Group had conducted extensive testing, they and the NRC had not agreed on acceptable criteria.

Since post-earthquake investigations of power and industrial facilities provided substantial data on how raceways not designed for earthquakes performed in strong motion earthquakes, it was natural for SQUG to develop the A-46 criteria they did.

In contrast to SEP plants, the raceways at CR-3 were seismically designed from the beginning. Moreover, as noted earlier, their seismic design is very rugged. Even the Third Party (peer) Reviewer agrees: *"The distributed systems are generally well designed and very rugged for a low seismicity site."* Thus, apart from the issue raised by the A-46 Third Party Reviewer, there is no outstanding specific issue related to the seismic adequacy of the raceways at CR-3.

The Third Party Review comment is as follows: *"During the field walkthrough, a conduit support configuration which uses a friction clamp was identified at various locations."* After the Third Party Review Report was received, the locations were walked down where the Third Party Review found the poorly configured friction clamp detail. The friction clamps were found to be on non-safety conduit routed to non-safety telephone booths. Thus, the Third Party Reviewer comment was not found to be relevant to A-46 raceway adequacy issues.

While FPC agrees with the Third Party Reviewer's next comment: *"In all cases observed, it was judged that enough redundancy existed in the conduit support configuration that reliance on the friction clamp was not necessary."* and even though the Third Party Reviewer had found the poor friction clamp detail on non-safety conduit only, a large sample walkdown of the plant was performed to determine if there were other plant areas where the poor friction clamp detail existed. The walkdown included the turbine building, control building, auxiliary building, and intermediate building. The reactor building was not walked down because the plant was operating and the main steam valve area was not walked down.

The walkdown focused on the issue raised by the Third Party Reviewer: The presence of friction clamp type supports where the friction plane is vertical. Such supports do not resist gravity loads by a positive connection, but do so by friction only. SQUG singled out these supports because when they are pervasive in supporting a system and they have been the root cause of system collapse in past strong motion earthquakes.

The walkdown found the following:

1. There are a number of friction clamp type conduit supports in CR-3 (three different basic types). These supports are not pervasive, nor are they common, nor are they a typical support. The most common conduit support is constructed with Unistrut framing, and is well- and positively-supported. Friction type supports are more common in the turbine building than in safety-related buildings. However, they are found in safety-related buildings. Typically, friction type supports appear to have been used in later modifications rather than in the original construction (except for the turbine building). Some safety-related rooms had no such supports.

2. No conduit supported by friction supports seen in the walkdown presented an earthquake hazard to the electrical cable within it, or to equipment nearby or below it.

3. Where friction type supports are used, they are typically lightly loaded. Very often, they are used to support a single conduit. Based on tug tests performed in the walkdown, friction type supports appear to have more than adequate capacity.

4. Many, but not all, of the friction type supports use setscrews. Setscrews have well-defined capacities in the direction parallel to the "friction plane." For example, most of the friction type supports in the turbine building are a P3087 Unistrut component, which uses 4 setscrews. The "Design Slip Load" for this component is 300 to 800 pounds per component (or 75 to 200 pounds per setscrew) using a safety factor of 3.

5. Except for the case found by the Third Party Reviewer, it is not known if the friction supports found in this walkdown are associated with safety-related or non-safety conduit. However, the friction supports found by the Third Part Reviewer are on non-safety conduit, which is consistent with the plant criteria that such supports are not to be used on safety-related conduit.

More recently, the entire plant was walked down as part of Maintenance Rule (MR) inspections (including the reactor building and main steam valve area which were not included in the above walkdown). The maintenance walkdown was performed by the same SCEs that performed the A-46 walkdown. Part of this walkdown was to inspect cable tray and conduit raceways. Note that these SCEs are familiar with A-46 issues related to cable tray and conduit.

154 anomalies found as a result of the MR inspections were associated with cable trays and conduit. No findings had safety significance. All were recommended as items to be taken care of as a normal maintenance activity. 127 of the 154 were associated with conduit (e.g., missing clamp, clamp present but not engaging conduit, clamp bolt missing, rusted clamp). 27 were associated with cable trays (e.g., tray hold-down missing; which is not an A-46 issue for trapeze supports, tray cover missing or askew; which is not an A-46 issue).

A generic issue identified in the MR inspection is that many plastic cable ties are broken or brittle due to aging. This issue is being addressed through the MR.

The maintenance inspections are continuing in the hard-to-access areas that require scaffolding. Cable tray and conduit raceways will be included.

NRC REQUEST NUMBER 20a

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 CR-3 FRS exceed the Seismic Qualification 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?

FPC RESPONSE:

Due to the rugged design of CR-3 raceway supports, the FPC Plant Specific Procedure does not require the evaluation of conduit and cable tray. They were not included in CR-3's A-46 program. Therefore, no outliers could be included. By not including them in the outlier lists, it does not imply that there are no cable trays or conduits at the higher elevations. It simply means they were not examined as part of the CR-3 A-46 program. Justification for not including cable tray and conduit raceways is in the Technical Basis Document.

As a point of information however, CR-3 raceways were originally designed for earthquake loads, including raceways at high elevations where the floor response spectra exceed the SQUG spectra. Moreover, in the upgraded seismic design criteria adopted in 1982-83, new raceway supports are designed for the effects of gravity loads and three directions of earthquake (two directions at a time). In addition, the CR-3 design criteria used a very low damping value of 0.5%. This exceeds SQUG's A-46 criteria, where the effects of earthquake directions are typically not combined, and damping values larger than 0.5% are used or implied.

NRC REQUEST NUMBER 20b

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.

FPC RESPONSE:

FPC did not deviate from the staff safety evaluation dated December 16, 1993 other than the deviations already identified to the staff. Specifically, FPC did not perform verification of equipment and anchorage's to Supplement 1 to Generic Letter 87-02. Instead FPC developed and implemented the "Plant Specific Procedure" for resolution of USI A-46.

The FRS used for the A-46 program is consistent with the information provided by previous correspondence with the staff, including the reference safety evaluation. Further information is found in:

1. USNRC Request for Additional Information (RAI) on Floor Response Spectra for the Resolution of USI A-46 (TAC No. M69440), dated July 9, 1993.

2. Letter from FPC to NRC, dated September 7, 1993 (3F0993-04) - includes responses to 5 out of 6 RAI questions.

3. Letter from FPC to NRC, dated October 6, 1993 (3F1093-04) - includes responses to the remaining sixth question.

To address the second part of the question, FPC has included two FPC Calculations, S93-0149, Rev 0 and S92-0171, Rev 0. See Attachments A and B to this RAI response, respectively. These calculations contain the detailed information on damping values, input ground motion, structural model, and final FRS curves. FPC Calculation S93-0149, in particular, deals with the Reactor Building.

Only a portion of S92-0171 is included. The computer output attachments to the calculation were not photocopied.

NRC REQUEST NUMBER 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 CR-3 A-46 evaluation of cable tray loads and the potential for seismic Category II and seismic Category I structure, system or component interactions.

FPC RESPONSE:

CR-3's A-46 evaluations did not include calculations of loads on, or resistances of, cable trays or their supports. Thus, the thermo-lag issues in the RAI were not evaluated in CR-3's resolution of A-46, at least in terms of quantitative evaluation of integrity of cable trays or their supports.

However, CR-3 has had seismic design criteria for cable trays from the beginning. The modifications to install Thermo-Lag on these cable trays included calculations to assure that the seismic design basis is maintained. Issues like those in the RAI are addressed in CR-3's plant-specific criteria for seismic design or modification of cable trays and their supports. For A-46 however, if a cable tray or a cable tray support, with or without Thermo-Lag, was proximate to SSEL equipment, that would typically be noted on the SEWS, and dispositioned as warranted by the specifics of the potential seismic interaction. No interactions of concern for A-46 were noted by the SRT.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

No outlier resolution has been determined yet for the WDT-3A. This is being scheduled to be evaluated in accordance with the FPC normal scheduling process. This outlier is categorized as Post-Restart in the outlier resolution schedule and status included in Enclosure 2 of this submittal.

Attachment C to this RAI response includes a copy of Florida Power Calculation S94-0011, Rev 0. This is one of two calculations done to address tank and heat exchanger evaluations for USI A-46. This qualification is performed to the requirements of the PSP, which is in turn based on the GIP. The technical basis for this evaluation is contained in the GIP and PSP.

ADDITIONAL RESPONSE

(1) WDT-3A is currently an outlier because appropriate drawings could not be found at the time the calculations were performed. The resolution of this outlier is being scheduled. See Enclosure 2 to this RAI response for status of outliers.

(2) For an example of a large flat bottom tank that is not an outlier, use the Condensate Storage Tank (CDT-1) on pages 29 to 53 of FPC Calculation S94-0011. This calculation was performed using the PSP Section 7 methodology (which is identical to the GIP method).

(3) For an example of a horizontal tank that is not an outlier, use the Boric Acid Tank (CAT-5A) on pages 103 to 114 of FPC Calculation S94-0011.

(4) For an example of a horizontal heat exchanger, use DCHE-1A (or one of several other heat exchanger calculations) in FPC Calculation S96-0013 which was submitted with FPC to NRC letter (3F0397-28), dated March 27, 1997, as Attachment 5. These calculations were performed using the PSP Section 7 methodology (which is identical to the GIP method).

(5) For an example of a vertical tank on legs, use SWT-1 (or one of the other vertical tanks on legs) in FPC Calculation S96-0013 which was submitted with FPC to NRC letter, 3F0397-28, dated March 27, 1997, as Attachment 5. Because the anchorage was judged to be the critical structural element, these were simple bounding calculations which focused on the anchorage.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

In the PSP, "no significant or programmatic deviations" means exactly the same as in the GIP. In Section 1.3, the GIP described "no significant or programmatic deviations ' as follows:

"The implementation guidance in the GIP, i.e., all of the GIP except the SQUG commitments, comprises acceptable methods for implementing the noted SQUG commitments. USI A-46 licensees may use the GIP guidance or may substitute clearly equivalent methods without prior notification of the NRC. However, USI A-46 licensees must notify the NRC of significant or programmatic deviations from the GIP guidance. If, prior to submitting the schedule and commitment letter of Part I, Section 2.1.1, licensees know they will implement significant or programmatic deviations from the GIP guidance, they should notify the NRC Staff in the commitment letter. If significant or programmatic deviations are implemented without prior notification of the NRC Staff in the commitment letter, licensees must then notify the NRC Staff of these deviations no later than the final USI A-46 summary report. However, licensees are encouraged to notify the NRC Staff as soon as they decide to make significant or programmatic deviations from the GIP guidance. This will provide an opportunity for the Staff to comment prior to implementation. Justification for these significant or programmatic deviations will be prepared and made available onsite for NRC audit. Notification is not required for minor, i.e., less than significant or programmatic, deviations from the GIP guidance. However, documentation of minor deviations should be available onsite for NRC audit."

At the level of the GIP, as a member of SQUG, FPC did notify NRC of its intent to significantly deviate from the GIP, and later submitted the PSP to the NRC to describe the deviations in detail. FPC also submitted a report describing the technical basis for the deviations.

At the level of the PSP, there were no significant programmatic deviations from the PSP. Recently, minor programmatic deviations were discovered in that a few (currently, five have been identified) anchorage calculations were not performed for tanks and heat exchangers, however, the SCEs judged the anchorage completely adequate. These anchorage calculations will be performed in accordance with the requirements of the PSP. The results of these calculations shall confirm the judgement of anchorage adequacy. These calculations will be completed prior to restart, scheduled for December 1997, but not later than December 1, 1997. Deviations from the PSP evaluation process took place at the level of evaluation of specific items of equipment. The walkdown team noted such deviations on the SEWS for that specific item of equipment. This took the form of identifying equipment that met the intent but not the letter of the PSP. Recently, a few cases were found where the intent of the caveat was met but this was not noted in the A-46 final report. These cases include small aluminum cabinets where the caveat calls for steel.

NRC REQUEST NUMBER 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?

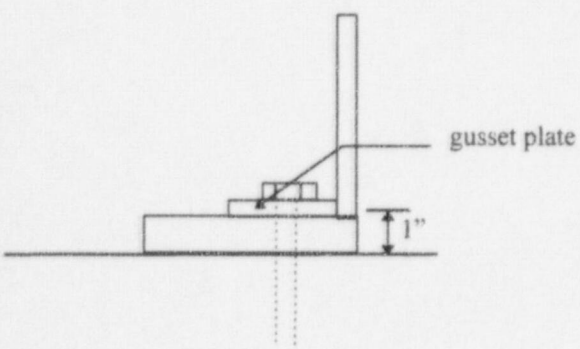
In addition, there is a potential to shear off the anchor bolts when insufficient gap is provided between the equipment or its support frame and the anchor bolts. This potential exists because the equipment support may expand due to thermal loads and the anchor bolts which are imbedded in the concrete 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.

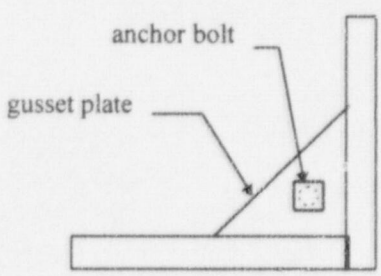
FPC RESPONSE:

a. Evaluation of gap in accordance with Check 6 "Gap at Threaded Anchor".

Checking for gap in accordance with Check 6 of the GIP was performed for all equipment with threaded anchors in the accessible areas around the equipment. This was performed in accordance with the PSP Section 4.4 which states: "SCEs should consider the anchorage attributes in Section 4.4.1 of the GIP (Reference 36), as they judge appropriate, in their evaluation of the specific anchorage, support, or load path." The result of this check is that a gap of 1 inch was found in seven distribution panels (Class 14). This gap is a standard detail for these distribution panels as the anchorage is through a triangular gusset plate 1 inch up from the bottom of the base.



Elevation View of Anchorage Load Path



Plan View of Anchorage Load Path

In each case, due to added restraint at the top of the distribution panel from conduit or wireways, the SRT judged that the gap is acceptable.

b. Potential to Shear off the Anchor Bolts Due to Thermal Loads

This issue is related to restrained thermal expansion of equipment such as heat exchangers. FPC has recently identified a problem in this area and is currently evaluating the extent of condition. This issue is not related to the seismic issues that are addressed by USI A-46. Identified problems will be addressed through FPC's corrective action system. Since this problem is unrelated to the seismic qualification of this equipment, it would be inappropriate to address this issue under USI A-46.

c. Impact Forces Due to Large Gaps

CR-3 anchorage and fastener design for thermal expansion has one end of the expansion fixed (small play between the hole and the plate and tightened bolt) and the other end designed for motion (slotted hole, sliding surfaces, and bolt not torqued tight). In this case, impact is not possible due to the restraint provided to the equipment at the fixed end. For equipment where thermal expansion is not a significant effect (e.g., a pump) sliding is restrained by anchor bolts (tightened bolt). The SRT did visually examine the accessible anchorage for all SSEL equipment. No issues related to excessive slotted hole size were identified by the SRT.

NRC REQUEST NUMBER 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.

FPC RESPONSE:

a. There are no structures that 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. Not applicable

c. Not applicable