Florida Power
CORPORATION

July 16, 1980

File: 3-0-3-a-3

Mr. J. P. O'Reilly
Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Suite 3100
101 Marietta Street, N.W.
Atlanta, GA 30303

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
IE Bulletins 79-02 and 79-14,
Including Revision 1 and Supplements 1&2

Dear Mr. O'Reilly:

The attached report, prepared by Gilbert Associates, Inc., for Florida Power Corporation, is in response to the open items of IE Bulletin 79-14, identified in the NRC Inspection Report, 50-302/80-2, dated February 21, 1980.

It is the conclusion of the report that nothing has been found to indicate that the Crystal River Unit 3 is unsafe to operate.

The reanalysis and modifications of the piping supports is complete within the scope of Bulletins 79-02 and 79-14, and the modifications were accomplished completely during the current outage.

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If you have any questions regarding this report, please contact this office.

Very truly yours,

FLORIDA POWER CORPORATION

Patsy Y. Baynard

Patsy Y. Baynard
Manager
Nuclear Support Services

Simpson(IEBul79-14)DN-75-3

Attachment

cc: Director
Office of Inspection & Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Director
Division of Operating Reactors
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

FPC RESPONSE TO OPEN ITEMS OF
IE BULLETIN 79-14
IDENTIFIED IN INSPECTION REPORT 50-320/80-02

SECTION 1 - GENERAL INFORMATION

This report is in response to the open items identified in the NRC audit held on January 24-25, 1980, of NRC IE Bulletin No. 79-14, dated July 2, 1979, including Rev. 1, dated July 18, 1979, Supplement 1, dated August 15, 1979, and Supplement 2, dated September 7, 1979, for the Crystal River Unit 3 power plant.

It is the conclusion of this report that, having completed the review of the open items of the bulletin, the seismic analyses as originally done apply to the actual installed safety-related piping systems. Exceptions to this conclusion were of a type which do not compromise the safe operation of the plant or for which remedial actions have been completed.

SECTION 2 - AUDIT OPEN ITEMS

The four open items identified in the January 24-25, 1980, audit of NRC IE Bulletin 79-14 are as follows:

A. Verification of material properties.

B. Verification of valve type.

C. New support loadings will be calculated for reanalyzed lines.

D. Verification of the use of response spectrum curves.

SECTION 3 - OPEN ITEMS FINDINGS

A. Verification of material properties.

Procedure

A sample of the pipe fabrication spool sheets was selected to include one spool sheet from each seismic analysis. The material report code was obtained for one piece of pipe for each of these spool drawings. The material report code provides traceability of the fabrication spool sheet to the material report sheet, which contains material specification data, including size, schedule, chemical and physical properties, heat treatment data, etc. The material report sheet was then compared to the manufacturer's spool sheet for agreement with the piping material, outside diameter, and wall thickness. The manufacturer's spool sheets had previously been compared against the data used in the seismic analyses.

SECTION 3 - OPEN ITEMS FINDINGS (Continued)

A. Verification of material properties. (Continued)

Results

Two hundred and one (201) analyses were checked. Spool drawings or material codes could not be found for twelve (12) analyses. These twelve analyses had low stress levels and are still considered satisfactory. One hundred and eighty-nine (189) spool drawings checked showed complete agreement for outside diameter and wall thickness data. In all cases, the type of material, carbon or stainless steel, was in agreement. Twenty (20) spools listed different grades within the same type of stainless steel, which means the analysis is satisfactory, because the modulus of elasticity and allowable stresses are the same for the same type of stainless steel. Three (3) spool sheets disagreed on the type of stainless steel used. However, these analyses are satisfactory, since the analysis stress levels are below the allowable stress levels for the installed material.

B. Verification of valve type

Procedure

A sampling of valves was checked in the field to determine agreement between the as-installed valve versus the valve used in the analyses. This sample included all five (5) valves that were dual-ordered due to late delivery of the original valves, and the four (4) valves that were listed in the Master Valve Listing as being replaced. The other valves were picked at random to give a total of sixty-two (62), which represents ten percent of the total number of valves included in the seismic analyses.

Results

The five (5) valves that were dual-ordered and the four (4) valves that were listed as changed were not the same as the valves included in the seismic analyses. The actual weights and centers of gravity were close enough to consider the original seismic analyses still valid. The remaining fifty-three (53) showed agreement between the analysis and the field-installed valve.

C. New support loadings will be calculated for reanalyzed lines

Procedure

The existing hanger designs were checked with the new loadings generated by the sixteen (16) reanalyses found necessary by the IE Bulletin 79-14 review.

SECTION 3 - OPEN ITEMS FINDINGS (Continued)

C. New Support loadings will be calculated for reanalyzed lines (Continued)

Results

Of the two hundred and twenty (220) supports checked, fifteen (15) required adjustments and eleven required modifications. The adjustments and modifications have been completed.

D. Verification of the use of response spectrum curves in piping analyses

Procedure

The response spectra input decks were reviewed for being an accurate representation of the response spectra curves. Also, all two hundred and one (201) analyses were reviewed as to elevation of piping and building location to determine if the correct response spectrum was used for each analysis.

Results

Three (3) errors were found in the response spectra input deck. These errors were determined to be minor by comparing the correct response spectra to the incorrect response spectra used and by examining the natural frequencies of the analyses involved.

Approximately half of the seismic analyses would have different response curves selected if today's conservative criteria of using the response curve corresponding to the maximum height of the piping configuration or enveloping two (2) building's response curves even if a line had only one (1) attachment in one (1) of the buildings. The selection of the Floor Response Spectra Curves (FRSC) was recognized in the original performance of analyses (1973-1975) as a critical input to the seismic dynamic modal analyses. As such, it was included in the Design Review Checklist. The philosophy in the selection of the FRSC for Crystal River Unit 3 was to select the one (1) that was most representative of the piping being analyzed. The FRSC was viewed as a conservative representation of the response of the structures to an earthquake. While attempting to be conservative, judgment was used in the selection of the FRSC in piping analysis so as not to introduce unnecessary conservatism of the FRSC in piping analysis so as not to introduce unnecessary conservatism arbitrarily. The location of piping anchors (equipment nozzle or a fabricated support) were considered to be the greatest contributors of the earthquake input from the structure into the piping system. Linear supports, especially rigid rods, were considered to have a lesser input. Piping systems located entirely in one (1) structure, but having a singular attachment to a second structure (such as a building penetration), were subjected, in most cases, to the FRSC applicable for the main structure, although differential building movements were evaluated. In reflecting on the CR-3 seismic analyses, it is felt that a more conservative FRSC could have been used, but it is also believed that the FRSC were chosen adequately. Sample analyses (CR-22, -26, -52, -53, -90, -107, - 114, -127, and -142) were re-run to evaluate these beliefs. It was shown that the results for FRSC CRA1 (Auxiliary Building elevation 119') are almost identical to those for FRSC CR05 (ground response). (Many times FRSC CR05 was used, when, by today's standards, FRSC CRA1 would have been chosen.) Other sample runs were made using a FRSC one (1) elevation higher than the one originally selected. These runs also showed a small (10% to 18%) increasein stress levels and support loads. The reason for these negligible or small increases appears to be: (1) for the first case, the CR05 FRSC is handled in a different manner than the other FRSCs. Its vertical response is set equal to the horizontal responses, whereas, for all other FRSCs the vertical response is set equal to two-thirds of the horizontal responses; (2) for the second case, the responses for different levels within the same building vary mainly at the peaks, for only a small range of frequency values. A third sample run was made where only one (1) FRSC was used, while present-day criteria indicates that an envelope of two (2) FRSCs for two (2) different buildings should have been used. These runs were made using the FRSC from a structure that wasn't originally included and showed the stress levels and support loads to be lower, indicating that the original curve selected was the more severe of the two.

In conclusion, it is felt that all the seismic class piping will function as designed during a safe shutdown earthquake event for the following reasons. Although a more conservative criteria is used today to select FRSCs, the method utilized for CR-3 was deemed satisfactory as demonstrated by the sample reanalyses performed. Also, many conservatisms were included in the CR-3 seismic design which are not used today. One of these is that the FRSCs were constructed using 1/2% equipment damping, while today, 1, 2, or 3% equipment damping is used, depending on pipe size, and whether an OBE or an SSE analysis is being performed. Conservatism also exists in that present-day response spectra do not use SSE response as twice the magnitude of OBE response. This, in reality, means that the SSE is approximately 1.6 OBE. Moreover, as shown in Attachment A, CR-3 used double the OBE stresses and pipe support loads to compare to 1.2 S_h, whereas, today's methodology compares the OBE stress levels to 1.2 S_h and the SSE stress level to 1.8 S_h.

SECTION 4 - CONCLUSION

Nothing was found in the verification of material properties, valve types, or response spectra used, to indicate that the CR-3 plant is not safe to operate. The pipe support modifications due to reanalyses is complete within the scope of Bulletins 79-02 and 79-14.