GAGE-BABCOCK & ASSOCIATES, INC.
CHICAGO OFFICE • 135 ADDISON AVENUE, ELMHURST, IL 60126 • (312) 530-1494

PAUL D. SMITH, P.E., *President*
BERT M. COHN, P.E., *Senior Vice President*

November 25, 1981
File 7917-6

U.S. Nuclear Regulatory Commission
Chemical Engineering Branch, NRR
ATTN: Mr. V. Benaroya
Washington, D.C. 20555

Gentlemen:

Contract NRC-03-81-140
Crystal River Unit 3
Appendix R Exemption Request

By letter dated March 19, 1981, Florida Power Corporation submitted their interpretation and evaluation for an exemption of Section III.G of Appendix R to 10 CFR 50 for the steam driven emergency feedwater pump area.

Enclosed is our review and evaluation of the licensee's submittal for the requested exemption item using 10 CFR Part 50, Appendix R and the guidelines contained in the Standard Review Plan, Section 9.5.1, "Fire Protection System," and Appendix A.

Sincerely,

Bert M. Cohn

Bert M. Cohn
Project Director

Encl.

cc: C. Poslusny
W. Johnston
E.E. Grenier
B.L. Grenier
Contracting Officer

A006
S1/1

ENCLOSURE I
EXEMPTION REQUEST
CRYSTAL RIVER UNIT 3
DOCKET NO. 50-302

1.0 INTRODUCTION

By letter dated March 19, 1981, the licensee requested an exemption from Section III.G of Appendix R to 10 CFR Part 50 in that an automatic fire suppression system is not required for the motor driven and steam driven emergency feedwater pump area.

2.0 DISCUSSION

In the Safety Evaluation Report, it was our concern that a single unmitigated fire would affect both the motor driven and the steam driven emergency feedwater pumps. One of these two pumps is required for safe shutdown. As a result of the SER the licensee provided additional ionization detectors for the area in addition to the existing portable 25 lb. type ABC fire extinguisher and a 1-1/2 in. fire hose station. The licensee also stated he will provide a 1 hr. fire rated wall, which is an extension of the existing 8 ft. high, 6 in. thick concrete wall for the protection of the motor operated valves for each pump. The licensee will also provide a marinite board heat shield for protection of conduits against a lube oil fire in the steam driven emergency feedwater pump area adjacent to the corridor and redundant safety-related conduits. Because of the low fire loading for both areas, as well as the danger of "thermal shock" to the steam driven emergency feedwater pump due to the inadvertent operation of the sprinkler system, the licensee states that an automatic fire suppression system is not needed.

3.0 EVALUATION

On October 30, 1981, a site visit was made to Crystal River Unit #3 to evaluate the exemption request. Both the motor driven and turbine driven emergency feed pump are located in the intermediate building, elevation 95'-0", adjacent and open to the annulus area outside primary containment in Fire area 2 and 3 respectively. Fire area/zone #1 is the access corridor on the outside peripheral of the primary containment with Fire area/zones 2 and 3 off the access corridor in a room separated from each other by a 8 ft. high concrete wall; 3 hr. fire rated walls on three sides enclose these pumps with the partial barrier ending at the access corridor.

There are no cable trays present in fire area/zone 2, only conduit for train B. In fire area/zone #3, besides conduits for train A and B, cable trays for train A are also located. The power cable for the motor driven pump, as well as other conduits for train B, run approximately 6 ft. high and in front of the steam driven emergency feedwater pump. Other safety-related conduits from the motor driven feedwater pump run up the wall and over the steam driven feedwater pump. The exact conduits and/or cable trays needed for hot and cold shutdown beside the conduit in front of the steam driven pump could not be determined at the site visit; however, the licensee stated that the Appendix R criteria had been applied for the area and the results of the analysis would be submitted to the NRC shortly.

In-situ combustibles in fire area/zone 2 consist of 4 gal. of lubricating oil for the motor driven pump; combustibles in fire area/zone 3 consist of 10 ft^3 of cable insulation and 10 gal. of lubricating oil. While short-duration severe fires may occur, the average fire load in these areas is quite low.

The floor and ceiling are 3 hr. fire rated construction. Located at the ceiling in fire area/zone 2 and 3 are two (1 in each zone) approximately 3 ft. x 3 ft. openings into the next elevation above 119!-0", fire area/zone 3 -- the pressurizer control cabinet area bounded by 3 hr. fire-rated walls with open access to zone 2 and 4, similar to the elevation 95'-0" below. Safety-realated cable trays in this zone are for channel B only and safety-related pressurizer control cabinets 3A and B. Combustible materials in this zone consist of cable insulation (33 ft^3, representing a fire load of 41,000 Btu/ft^2 in the space).

A 4 ft. high metal barrier is installed around the perimeter of the two openings at this elevation. A 3 hr. fire-rated fire damper protects and separates these two elevations. A smoke detector is installed at the ceiling for the 95 ft. elevation at the metal grading below the fire damper in fire zone 2. There is no exposure from either zone to the other.

Separating fire area/zone 2 at elevation 95 containing the motor driven emergency feed pump from fire area/zone 3 with the steam driven feedwater pump is a partial 8 ft. high concrete wall extending out and ending at the access corridor. At the rear of the wall is a drainage trough that communicates under the wall to both pumps. Also along both sides of this partial wall are motor operated valves for alignment of each pump. The licensee has previously committed to extending this wall out 3 ft. to protect isolation discharge valve EFV-14 for the motor driven pump located in zone 2 from a postulated fire in zone 3. A postulated exposure fire located at the end of this extended partial fire partition will still expose redundant equipment and conduit needed for hot shutdown. Also, the use of the 1-1/2 in. fire hose in the immediate area to extinguish such a postulated exposure fire may damage both the motor driven and steam driven feedwater pumps during manual firefighting. A floor drain is located in the access corridor outside of these two zones.

The licensee has only considered in-situ combustibles for each area and not an exposure fire from transient combustibles that can be brought into the area during plant operation. The existing marinite board heat shield for the motor driven conduits located in front of the steam driven pump offers partial protection against a possible lube oil fire that develops from a pressurized oil leak and hot steam lines. This shield offers no protection against a postulated exposure fire. This radiant heat shield only protects the conduit on two sides and is installed only where they pass in front of the steam pump.

The licensee also states in his exemption request that there is danger of "thermal shock" to the steam driven emergency feedwater pump due to the inadvertent operation of a wet-pipe sprinkler system. This danger is minimized in sensitive areas by using a pre-action sprinkler system, employing closed-head automatic sprinklers attached to a piping system containing air that is under pressure, with a supplemental fire detection system installed in the same area as the sprinklers.

Inadvertent operation is prevented by requiring actuation of a detector and a sprinkler head before water is discharged; likewise, a pipe break will cause no water discharge. Existing smoke detectors can be used both to alarm in the control room and to open the pre-action valve. Since under normal conditions the sprinkler piping is under supervised air pressure, loss of air pressure will be annunciated in the control room.

Both in fire/zone areas 2 and 3, conduit and piping create a fairly congested situation. Due to necessary maintenance on valves, motor, turbine, pump impellers, etc., any fire barrier enclosing conduit near the floor is likely to be damaged. Total reliance cannot be placed on the fire barrier alone, especially since during the 40-year life of the plant, portions of the fire barrier may be penetrated. Since these zones are fairly small, an exposure fire may jeopardize any required conduit that is protected by a damaged fire barrier and result in loss of circuit integrity. Additional protection is needed to provide an acceptable level in these two fire areas/zones.

4.0 CONCLUSION

Based on our evaluation we conclude that the fire protection presently being provided by the licensee is not sufficient to prevent damage to redundant safety-related systems necessary for hot shutdown. The existing separation and barriers between conduits and equipment are insufficient to minimize adverse effects of fire on safety-related systems. The licensee's exemption request from the requirements of Section III, G of Appendix R to 10 CFR Part 50 should not be granted.

To meet Section III,G of Appendix R to 10 CDR Part 50, the licensee should provide the following:

1. A pre-action sprinkler system for fire area/zones 2 and 3 with alarm and annunciation in the control room over supervised fire alarm circuits.

2. A 1 hr. fire rated barrier (will maintain circuit integrity for 1 hr. when tested per ASTM E-119) for all redundant conduits routed in front of the steam driven emergency feedwater pump, as well as for all redundant conduits and/or cable trays above the 8 ft. high partial concrete barrier and within 20 ft. of each other. The barrier should totally enclose the conduit/cable tray it is protecting.

3. A 1 hr. fire rated barrier (tested as per ASTM E-119, "Fire Test of Building Construction and Materials") extending out from the end of the existing partial concrete wall approximately 3 ft. into the corridor and then to coordinate 308 between G and H. This will effectively shield one train from water damage should a fire hose be used in the area. The extension should be as high as the original partial wall. The proposed wall, U.L. design #U508, is acceptable.