Florida Power
CORPORATION

August 8, 1984
3F0884-02

Director of Nuclear Reactor Regulation
Attention: Mr. George W. Rivenbark, Acting Chief
Operating Reactors Branch #4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Crystal River Unit 3
Docket No. 50-302
Operating License No. DPR-72
NUREG 0737, Item II.E.1.1
Turbine Driven Emergency Feedwater Pump Missile Potential

Dear Sir:

In our February 29, 1984 letter, Florida Power Corporation stated that additional information regarding the emergency feedwater (EFW) pump turbine internally generated missile source concern should be available by June 30, 1984. This response also satisfies Item 2b of your SER dated May 1, 1984.

FPC Engineering contacted Terry Corporation, the EFW pump turbine manufacturer, and Missile Impact Analysis E/L 20622 was generated. Excerpts from the analysis report are as follows:

Discussion:

In response to customer comments/questions on the Missile Impact Analysis E/L 20622, a review of the potential for wheel burst and resulting missile escape from the turbine casing has been made. This review consisted of three phases: 1) review of E/L 20622; 2) calculation of maximum runaway speed of the turbine; and 3) estimation of the probability of simultaneous failures of control, overspeed trip and coupling systems. The results are as follows:

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1. A more refined computer model of the actual wheel configuration results in a slightly higher burst speed of 14,600 RPM versus the 13,800 RPM calculated in E/L 20622.

2. The runaway speed of the turbine rotor assuming wide open trip and control valves, maximum nozzle area, maximum inlet steam pressure and no connected load has been calculated at 11,950 RPM which is 2,650 RPM or 18% below wheel burst speed.

3. In order for the turbine to achieve runaway speed, there are three totally separate systems or components not subject to common mode failures which must fail simultaneously; the speed control governor, the overspeed trip system and the coupling to the driven equipment (since the runaway speed assumes no connected load). Failure probabilities based on test data and manufacturers data were assigned to each system or component and multiplied together, since there is no common mode. The overall probability of runaway is in the range of 10^{-8} to 10^{-9}.

Conclusions:

The conclusions in Missile Impact Analysis, E/L 20622, that in the event of a wheel burst a missile would be generated, are considered correct. However, it is judged impossible to achieve the necessary rotor speed on saturated steam, and the probability of three separate simultaneous system failures of the speed governor, overspeed trip and coupling is so small as to not be a safety concern.

Based on the above analysis, it is not necessary to install missile shields around the emergency feedwater pump turbine.

Sincerely,

G. R. Westafer
Manager, Nuclear Operations
Licensing and Fuel Management

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