September 7, 2000

John Paul Cowan
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15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER UNIT 3 - PRESSURIZER HEATER EMERGENCY POWER SUPPLY (TAC NO. MA9544).

Dear Mr. Cowan:

By letter dated July 20, 2000, as supplemented by letter dated August 22, 2000, Florida Power Corporation (FPC) requested temporary relief from the positions in Item 2.1.1 of NUREG-0578, "TMI [Three-Mile Island]-2 Lessons Learned Task Force Status and Short-Term Recommendations," and Item II.E.3.1 of NUREG-0737, "Clarification of TMI Action Plan Requirements," for Crystal River Unit 3. These items provide the U.S. Nuclear Regulatory Commission's positions that the plant should have a redundant set of pressurizer heaters, powered from separate emergency power supplies, to establish and maintain natural circulation in the hot standby condition following a loss of offsite power. The FPC request resulted from the expectation that current pressurizer code safety/relief valves leakage may increase to the point where the plant may not be able to meet the above mentioned positions. This will occur if the leak rate exceeds 6.0 gallons per minute (gpm). The FPC request was for a one-time, 2-month, relief period and included the following two commitments:

- Evaluate Improved Technical Specification 3.4.8 Bases for revision to conform to the approval of the relief request prior to the safety/relief valve leakage exceeding 6.0 gpm, and

- Shutting down to repair/replace the leaking valve within 2 months of the leakage exceeding 6.0 gpm.

We have reviewed your request and find it acceptable. Our safety evaluation is enclosed. This completes our efforts on TAC No. MA9544. If you have any questions concerning this issue, please contact me at (301) 415-1495.

Sincerely,

/RA/
L. Wiens, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: Safety Evaluation

cc w/enclosure: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO

PRESSURIZER HEATER POWER SUPPLY

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NO. 50-302

1.0 INTRODUCTION

On March 8, 2000, Florida Power Corporation, the licensee for Crystal River Unit 3 (CR-3), identified reactor coolant system (RCS) leakage from the pressurizer steam volume through pressurizer safety/relief valve RCV-8. As of July 17, 2000, the identified leakage through the valve was approximately 1.7 gallons per minute (gpm). Improved Technical Specification (ITS) limiting condition of operation (LCO) 3.4.12.c limits identified RCS leakage to 10 gpm. However, the licensee has determined that, because of the substantially higher enthalpy associated with the leakage from the pressurizer steam volume, compliance with the positions contained in Item 2.1.1 of NUREG-0578, "TMI [Three-Mile Island]-2 Lessons Learned Task Force Status and Short-Term Recommendations," and Item II.E.3.1 of NUREG-0737, "Clarification of TMI Action Plan Requirements," would be lost if the leakage exceeded 6 gpm. These items provide the U.S. Nuclear Regulatory Commission's (NRC's) positions that the plant should have a redundant set of pressurizer heaters, powered from separate emergency power supplies, to establish and maintain natural circulation in hot standby condition upon a loss of offsite power (LOOP). The noncompliance would occur because, for leakage greater than 6 gpm, reliance on both emergency power supplies would be required for the use of pressurizer heaters to establish and maintain natural circulation in hot standby.

By letter dated July 20, 2000, as supplemented by letter dated August 22, 2000, the licensee requested temporary relief from the positions contained in Item 2.1.1 of NUREG-0578 and Item II.E.3.1 of NUREG-0737 for CR-3. The licensee's request resulted from its expectation that current pressurizer code safety/relief valves leakage may increase to above 6 gpm, the point where the plant may not be able to meet the above mentioned positions. The licensee's request was for a one-time, 2-month, relief period and included the following two commitments:

- Evaluate ITS 3.4.8 Bases for revision to conform to the approval of the relief request prior to RCV-8 leakage exceeding 6.0 gpm, and

- Shut down to repair/replace the leaking valve within two months of the leakage exceeding 6.0 gpm.

The licensee did not request relief or changes to ITS LCO 3.4.12 related to RCS operational leakage. Therefore, the requirement of this LCO would continue to apply during the requested period of relief.

2.0 EVALUATION

2.1 Deterministic Evaluation

ITS LCO 3.4.8 requires the pressurizer to be operable in Modes 1, 2, and 3. Action B and Surveillance Requirement (SR) 3.4.8.2 further require that at least 252 kW of pressurizer heaters be capable of being powered from each emergency power supply. As discussed in the Bases section to the LCO, these ITS requirements implement the positions in Item 2.1.1 of NUREG-0578 and Item II.E.3.1 of NUREG-0737. If the leakage through pressurizer safety/relief valve RCV-8 exceeds 6.0 gpm, the LCO requirements would no longer be sufficient to meet the intent of these positions (i.e., the plant would lose the redundant capability discussed in the NUREGs).

The licensee has provided guidance and training to the operator on how to maintain natural circulation following a LOOP with RCV-8 leakage above 6.0 gpm and only one emergency power supply and associated heaters available. This guidance was provided in the form of administrative guidance that discusses compensatory actions for cooldown and pressure reduction of the RCS using approved emergency operating procedures (EOPs). The guidance directs operators to maintain subcooling by lowering RCS temperature and pressure. Lowering RCS pressure would decrease RCV-8 leak rate which would result in a lower required heater capability for maintaining pressure control. The administrative guidance provides a graph of target RCS pressures necessary to sustain hot standby for a given leak rate. Cooling would be provided by the emergency feedwater system and the secondary side of a steam generator. RCS inventory would be maintained by letdown and makeup. The guidance also allows the operators to cool the plant down to lower modes of operation or to conditions that would allow the initiation of the decay heat removal system.

In addition, the EOPs provide guidance to the operators on how to maintain natural circulation cooling with no pressurizer heater capability. In this case, RCS pressure would continually decrease due to the loss of inventory out of RCV-8 and a cooldown would have to be initiated. As in the case where one emergency power supply is available, subcooling would be maintained by RCS cooling via the emergency feedwater system and the steam generators; and RCS inventory would be maintain by letdown and makeup. Specific operator training was also provided on this scenario.

If the capability to maintain natural circulation is lost, the RCS would begin to heat up. In this case the EOPs direct operators to initiate steps to re-establish natural circulation by (a) lowering steam generator pressure to increase the temperature difference between the RCS and the steam generator, (b) opening the hot leg vents to remove non-condensable gases, and/or (c) increasing steam generator level and further increasing primary to secondary temperature difference to promote natural circulation. If natural circulation is not recovered and a loss of adequate subcooling occurs, the EOPs direct operators to establish high pressure injection and power operated relief valve cooling (i.e., feed and bleed cooling). Operator training scenarios have not included the specific scenario of proceeding from a LOOP to a loss of subcooling.

However, events with a loss of heat transfer and the use of the corresponding EOPs, including EOPs for feed and bleed cooling, have been included. In addition, during simulator training, operators have demonstrated their ability to transition from feed and bleed cooling with a solid RCS to steam generator cooling.

2.2 Risk Insights

The pressurizer heaters are not credited in the CR-3 risk models. Rather, the risk models rely upon the high-pressure makeup/injection system. Thus, the limited capability of the pressurizer heaters during a LOOP event is not reflected in an increase to the calculated core damage frequency. Though this request for relief does not result in an increase to the calculated core damage frequency, it would potentially result in greater reliance on the high-pressure makeup system for pressure control during a LOOP event, which would also cause additional burdens on the operators. Thus, it would be preferable to maintain the pressurizer heater capability to provide this function.

The licensee provided information, based on its current probabilistic safety assessment (PSA), that for the 2-month duration of the relief request, the probability of a LOOP event that is not recovered within 2 hours (the time allowed to transfer the pressurizer heaters to the emergency diesel generators) coincident with the loss of an emergency diesel generator is low (7.62×10^{-5}). For this condition, which does not result in core damage without additional failures, there is still one emergency diesel generator available and backup capability using the high-pressure makeup system and diesel-backed emergency feedwater to maintain natural circulation. The probability of also failing the high-pressure makeup and emergency feedwater capabilities would be at least an additional 10^{-2} to 10^{-4} below the cited condition value.

Even though the above condition is a low probability and there is still available one emergency diesel generator and backup capability using the high-pressure makeup system and diesel-backed emergency feedwater, sequences involving a LOOP initiating event and emergency diesel generator failure are some of the dominant accident sequences identified in the CR-3 individual plant evaluation (IPE). Based on the CR-3 IPE, the LOOP initiating event is one of highest contributors to core damage frequency from internal events (24.3%, 3.4×10^{-6}/year), which is dominated by station blackout, and the emergency diesel generators are identified as one of the most risk significant components. However, the contribution of pressurizer heater failures is not an important factor in the risk significance.

To validate the technical basis of the licensee's submittals, prior to reaching the condition in which both emergency diesel generators would be required for a LOOP event, the availability and operability of both emergency diesel generators, both pressurizer heater banks, diesel-backed emergency feedwater, and the high-pressure makeup system should be confirmed. The licensee has indicated that they have reviewed and removed work activities from their 12-week schedule that may affect the switchyard prior to the planned outage to replace the leaking safety relief valve, and that work activities are procedurally controlled and integrated into the CR 3 work control process to ensure that only necessary work will be allowed under strict control. These controls and operability checks should limit the potential for creating a LOOP and confirm that the systems relied upon for pressure control will function if required.

3.0 CONCLUSIONS

We have reviewed the licensee's request for temporary relief from the positions in Item 2.1.1 of NUREG-0578 and Item II.E.3.1 of NUREG-0737. We find the licensee's request acceptable because there is reasonable assurance that continued operation of the plant for up to 2 months with the specified configuration (i.e., loss of redundancy of the pressurizer heater capability) would not result in undue risk to the public health and safety. This conclusion is based on the availability of other means of providing natural circulation cooling in the event of a loss of pressurizer heaters and the low probability of a LOOP event that is not recovered within 2 hours, concurrent with the failure of an emergency power source during this period. This conclusion is also based on the licensee's actions to heighten operator awareness of the situation; the licensee's actions to train operators on the specific alternate procedures that would be required to place the plant in a safe condition if offsite power is lost; and the licensee's implementation of strict controls on activities that may affect the licensee's ability to respond to a LOOP, including rescheduling work that can potentially affect the switchyard.

4.0 REFERENCES

1. Letter from J. J. Holden (FPC) to USNRC, "Pressurizer Heaters Emergency Power Supply, NUREG-0578, TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations, Item 2.1.1 and NUREG-0737, Clarification of TMI Action Plan Requirements, Item II.E.3.1," July 20, 2000.

2. Letter from J. J. Holden (FPC) to USNRC, "Pressurizer Heaters Emergency Power Supply, NUREG-0578, TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations, Item 2.1.1 and NUREG-0737, Clarification of TMI Action Plan Requirements, Item II.E.3.1," August 22, 2000.

3. NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations," July 1979.

4. NUREG-0737, "Clarification of TMI Action Plan Requirements," November 1980.

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Date: September 7, 2000

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