7590-01-P

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
FLORIDA POWER CORPORATION ET AL.	)	Docket No. 50-302
	)	
(Crystal River Unit 3)	)	
	)	

EXEMPTION

I.

The Florida Power Corporation et al. (FPC or the licensee) is the holder of Facility Operating License No. DPR-72, which authorizes the operation of Crystal River Unit 3. The license states that the licensee is subject to all rules, regulations, and orders of the Nuclear Regulatory Commission (NRC or the Commission) now or hereafter in effect.

The facility consists of a pressurized-water reactor at the licensee's site located in Citrus County, Florida.

II.

The Code of Federal Regulations at 10 CFR Part 50, Appendix K, Section I.D.1, "Single Failure Criterion," requires that accident evaluations use the combination of emergency core cooling system (ECCS) subsystems assumed to be operative "after the most damaging single-failure of ECCS equipment has taken place." The proposed action would exempt the licensee from the single-failure requirement for very-low-probability scenarios under certain circumstances. The exemption is limited to the systems required for preventing boron precipitation during the long-term cooling phase of a loss-of-coolant accident (LOCA). 10 CFR

50.46(b)(5) requires that the ECCS be capable of providing long-term core cooling. Post-accident boron precipitation is a potential, but unlikely, challenge to maintaining long-term core cooling.

By letter dated October 31, 1997, as supplemented by letters dated December 13, 1997, February 27, 1998, and April 24, 1998, FPC requested an amendment to its operating license for Crystal River Unit 3. The FPC amendment request addressed prevention of boron precipitation following a LOCA that involved the following:

(1) Reactor vessel vent valves (RVVVs) that are effective when needed for all LOCA conditions except for (a) some LOCAs between the reactor coolant pumps and the reactor vessel (RV) at an elevation below the cold-leg mid-pipe at the junction with the RV and (b) decay heat generation rate comparable to approximately a month following extended operation at full power for some LOCAs.

(2) If the RVVVs are not effective, then, according to the licensee's calculations, Motor Control Center (MCC) 3AB is needed to provide power to open valves within 8 hours for the worst-case LOCA to (a) initiate water injection via auxiliary pressurizer spray (APS) or (b) initiate the dump-to-sump (DTS) method of moving water from a hot leg to the reactor building sump.

Should MCC 3AB fail before the APS or DTS initiates, both of these systems will fail to initiate in these licensing scenarios. In a June 4, 1998, submittal, FPC requested an exemption from the single-failure requirement with respect to this failure. FPC justified its request by stating that the proposed exemption meets the underlying purpose of the rule in that there are conservatisms in the calculations that cause underprediction of available repair time, so that, using realistic assumptions, sufficient time would be available to perform repairs to restore MCC 3AB if needed. As a result, the licensee stated that there was reasonable assurance of the availability of an active boron precipitation method (APS or DTS) if one were needed. FPC states that timely recognition of boron precipitation is assured by compliance with plant

procedures and further states that prompt operator actions will be taken to restore an active method in the event of MCC 3AB failure.

One element of the licensee's justification was to credit flow through the hot-leg nozzle gaps. According to FPC's calculations, APS is not fully effective until 21 hours after LOCA initiation, but it may be needed within 8 hours if a single failure other than the failure of MCC 3AB makes DTS unavailable FPC addressed this problem by crediting flow through hot-leg nozzle gaps to provide a boron dilution means for the first 21 hours. However, the NRC does not accept credit for hot-leg nozzle gap flow because FPC has not established that the nozzle gaps will remain functional after a LOCA. Therefore, during this time period, a failure to meet the Appendix K Item I.D.1 single- failure criterion remains. However, the NRC has determined that the licensee has given adequate justification in its submittal to extend the exemption to this scenario.

III.

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or . on its own initiative, grant exemptions from the requirements of 10 CFR Part 50 (1) when the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security and (2) when special circumstances are present. Special circumstances are present whenever, according to 10 CFR 50.12(a)(2)(ii), "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule...."

The underlying purpose of the single-failure criterion requirement is to assure long-term cooling performance of the ECCS in the event of the most damaging single-failure of ECCS equipment. As a licensing review tool, the single-failure criterion helps assure reliable systems as an element of defense in depth. As a design and analysis tool, it promotes reliability through enforced redundancy. Since only those systems or components that are judged to have a

credible chance of failure are assumed to fail, the criterion is applied to such responses as valve movement on demand, emergency diesel generator start, short circuit in an electrical bus, and fluid leakage caused by gross failure of a pump or valve seal during long-term cooling. Reactor vessels or certain types of structural elements within systems, when combined with other unlikely events, are not assumed to fail because the probabilities of the resulting scenarios have been deemed sufficiently small that they need not be considered. Certain passive failures 24 hours or more after initiation of a LOCA, such as pipe breaks, are not addressed as single failures because the compounded probabilities were judged sufficiently small that they could be discounted without affecting overall systems reliability.

The single-failure criterion was developed without the benefit of numerical failure assessments. Regulatory requirements and guidance consequently were based upon categories of equipment and examples that must be covered or that are exempt, and do not allow a probabilistic consideration during routine implementation. Hence, a single failure, whether or not there is a substantial impact upon overall system reliability, would not meet the regulatory requirements. A non-beneficial result is inconsistent with the objective of the single-failure criterion, which was not intended to force changes if essentially no benefit would accrue. This is the case with the potential MCC 3AB failure.

FPC estimated that the combined probability of the LOCA of concern and failure of MCC 3AB is 10^{-10}/reactor-year. (The probability of the LOCA of concern is 10^{-7}/reactor-year and the failure probability of MCC 3AB given the LOCA of concern is 10^{-3}/reactor-year.) If MCC 3AB were to fail, FPC would initiate its Emergency Plan Implementing Procedure to re-power MCC 3AB from an alternate electric power source. FPC stated that sufficient time will be available and that radiological conditions should permit such activities.

In addition, there are other conservatisms in the licensee's analyses. These include:

- Presence of buffer compounds may increase solubility limit margins. FPC concluded that solutes in the sump water will increase boron solubility, but did not credit the effect in its

calculations. This is a conservatism when considering MCC 3AB repair and APS unavailability time.

- Decay heat was calculated using Appendix K methods. FPC's calculations, in accordance with its licensing basis, use a decay heat generation rate that is roughly 25 percent too high. A realistic decay heat would increase the time available before boron precipitation became a concern. This is a significant conservatism when considering MCC 3AB repair and APS unavailability time.
- Boron solubility. FPC used a boron solubility decreased by 4 weight percent from the published values, consistent with previously accepted evaluation models. This is a conservatism when considering MCC 3AB repair and APS unavailability time.
- Boron precipitation. The approved evaluation models are based upon preventing precipitation. Should precipitation occur, significant boron would have to precipitate to prevent core cooling. This unquantified conservatism is significant when considering MCC 3AB repair and APS unavailability time.

Despite the licensee's determination that there is no safety-significant vulnerability associated with the two particular instances of failing to meet the single-failure criterion, FPC has developed and implemented procedures to address the conditions should they occur. It has shown that there is essentially no benefit to be achieved by investing in additional equipment to eliminate the single-failure aspects since the combined probability of the LOCA of concern with the failure is very low. With regard to the availability of APS during the first 21 hours following a LOCA should DTS be unavailable, realistic calculations without the conservative assumptions discussed above predict that APS would be available.

These calculations, along with the low estimate of core damage probability resulting from this scenario, result in a conclusion that essentially no benefit would be achieved by requiring modifications to meet the single-failure criteria for the specific scenario during this time period.

IV.

For these foregoing reasons, the NRC staff has concluded that it is not necessary to meet the single-failure requirement of Appendix K, Section I.D.1, with respect to (1) failure of Motor Control Center 3AB and the resulting inability to initiate an active means of controlling core boron concentration and (2) the active methods not meeting the single-failure criterion for the period when approved licensing methods predict that APS is not effective following certain LOCAs to adequately ensure that boron precipitation does not interfere with long-term cooling. The NRC staff has determined that there are special circumstances present, as specified in 10 CFR 50.12.(a)(2)(ii), in that application of 10 CFR Part 50, Appendix K, Section I.D.1, is not necessary in order to achieve the underlying purpose of this regulation, which is to provide adequate assurance that boron precipitation will not interfere with the capability of the ECCS to provide long-term core cooling.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), this exemption is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest. Therefore, the Commission hereby grants the following exemption:

> The Florida Power Corporation, et al., is exempt from the single-failure criterion requirement of 10 CFR Part 50, Appendix K, Section I.D.1, with respect to (1) failure of Motor Control Center 3AB and the resulting inability to initiate an active means of controlling core boron concentration and (2) failure of the active means to meet the single-failure criterion for the period when approved licensing methods predict that APS is not effective following reactor coolant pump discharge breaks provided that: procedural guidance shall be maintained that describes the actions necessary to restore an active method of boron precipitation mitigation in the event of a failure of Motor Control Center 3AB.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will have no significant impact on the quality of the human environment (63 FR 54162).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Frank J. Miraglia, Acting Director
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland,
this 29th day of October 1998.