

September 26, 2003

Mr. Dale E. Young, Vice President
Crystal River Nuclear Plant (NA1B)
ATTN: Supervisor, Licensing & Regulatory Programs
15760 W. Power Line Street
Crystal River, Florida 34428-6708

SUBJECT: CRYSTAL RIVER UNIT 3 - ISSUANCE OF EXEMPTION FROM 10 CFR 50.44,
10 CFR 50.46, AND APPENDIX K TO PART 50 OF TITLE 10 FOR
FRAMATOME COGEMA FUELS M5 ADVANCED ALLOY FOR FUEL ROD
CLADDING (TAC NO. MB6590)

Dear Mr. Young:

The Commission has issued the enclosed exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.44, "Standards for combustible gas control system in light-water-cooled power reactors," 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," for the Crystal River Unit 3 nuclear power plant. This exemption is in response to the Florida Power Corporation letter dated October 23, 2002, as supplemented July 25, 2003.

A copy of the exemption is being forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA by C.Patel for/

Brenda Mozafari, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: Exemption

cc w/encl: See next page

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
FLORIDA POWER CORPORATION
CRYSTAL RIVER UNIT 3 NUCLEAR GENERATING PLANT
DOCKET NO. 50-302
EXEMPTION

1.0 BACKGROUND

Florida Power Corporation (the licensee) is the holder of Facility Operating License No. DPR-72, which authorizes operation of the Crystal River Unit 3 Nuclear Generating Plant (CR-3). The license provides, among other things, that the facility is subject to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

The facility consists of one pressurized-water reactor located in Citrus County, Florida.

2.0 REQUEST/ACTION

Section 50.44 of Title 10 of the *Code of Federal Regulations* (10 CFR 50.44), "Standards for combustible gas control system in light-water-cooled power reactors," requires, among other items, that "[e]ach boiling or pressurized light-water nuclear power reactor fueled with oxide pellets within cylindrical zircaloy or ZIRLO cladding must, as provided in paragraphs (b) through (d) of [that] section, include means for control of hydrogen gas that may be generated, following a postulated loss-of-coolant accident (LOCA) by: (1) [m]etal-water reaction involving the fuel cladding and the reactor coolant, (2) [r]adiolytic decomposition of the reactor coolant, and (3) [c]orrosion of metals."

Section 50.46 of 10 CFR Part 50, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," requires, among other items, that "[e]ach boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated [LOCAs] conforms to the criteria set forth in paragraph (b) of [that] section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated [LOCAs] of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated LOCAs are calculated."

Appendix K to 10 CFR Part 50, "ECCS Evaluation Models," requires, among other items, that the rate of energy release, hydrogen generation, and cladding oxidation from the metal/water reaction shall be calculated using the Baker-Just equation.

Finally, 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K make no provisions for use of fuel rods clad in a material other than zircaloy or ZIRLO. The licensee has requested the use of Framatome Cogema Fuels (FCF) "M5" advanced alloy for fuel rod cladding for the CR-3 operating Cycle 14. The M5 alloy is a proprietary zirconium-based alloy comprised of primarily zirconium (~99 percent) and niobium (~1 percent). The elimination of tin has resulted in superior corrosion resistance and reduced irradiation-induced growth relative to both standard zircaloy (1.7% tin) and low-tin zircaloy (1.2% tin). The addition of niobium increases ductility, which is desirable to avoid brittle failures. Since the chemical composition of the M5 alloy differs from the specifications for zircaloy or ZIRLO, a plant-specific exemption is required to allow the use of the M5 alloy as a cladding material at CR-3.

Section 50.12 of 10 CFR Part 50, "Specific exemptions," states, among other items, that the Commission may, upon application by any interested person or upon its own initiative, grant

exemptions from the requirements of the regulations of this part, which are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security. The Commission will not consider granting an exemption unless special circumstances are present. In accordance with 10 CFR 50.12(a)(2)(ii), special circumstances are present whenever 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.

3.0 DISCUSSION

The underlying purpose of 10 CFR 50.46 is to ensure that facilities have adequate acceptance criteria for ECCS. On February 4, 2000, the NRC staff approved Topical Report BAW-10227P, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," in which Framatome Cogema Fuels (FCF) demonstrated that the effectiveness of the ECCS will not be affected by a change from zircaloy fuel rod cladding to M5 fuel rod cladding. The analysis described in the topical report also demonstrates that the ECCS acceptance criteria applied to reactors fueled with zircaloy clad fuel are also applicable to reactors fueled with M5 fuel rod cladding.

The underlying purposes of 10 CFR 50.44 and 10 CFR Part 50, Appendix K, paragraph I.A.5, are to ensure that cladding oxidation and hydrogen generation are appropriately limited during a LOCA and conservatively accounted for in the ECCS evaluation model. Specifically, Appendix K requires that the Baker-Just equation be used in the ECCS evaluation model to determine the rate of energy release, cladding oxidation, and hydrogen generation. In their topical report BAW-10227P, FCF demonstrated that the Baker-Just model is conservative in all post-LOCA scenarios with respect to the use of the M5 advanced alloy as a fuel rod cladding material, and that the amount of hydrogen generated in an M5-clad core during a LOCA will remain within the CR-3 design basis.

The NRC staff has reviewed the licensee's advanced cladding and structural material, M5, for pressurized-water reactor fuel mechanical designs as described in BAW-10227P. In a safety evaluation dated February 4, 2000, for topical report BAW-10227P, the NRC staff concluded that, to the extent and limitations specified in the staff's evaluation, the M5 properties and mechanical design methodology are acceptable for referencing in fuel reload licensing applications. Therefore, since the underlying purposes of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K, paragraph I.A.5 are achieved through the use of the M5 advanced alloy as a fuel rod cladding material, the special circumstances required by 10 CFR 50.12(a)(2)(ii) for the granting of exemptions to 10 CFR 50.44 and 10 CFR Part 50, Appendix K, paragraph I.A.5 exist.

4.0 CONCLUSION

The Commission has determined that, pursuant to 10 CFR 50.12, 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 licensee an exemption from the requirements of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will have no significant impact on the environment (68 FR 55662).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Ledyard B. Marsh, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland,
this 26th day of September 2003.

Mr. Dale E. Young
Florida Power Corporation

Crystal River Nuclear Plant, Unit 3

cc:

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