

March 23, 2000

Mr. W. R. McCollum, Jr.
Vice President, Oconee Site
Duke Energy Corporation
P. O. Box 1439
Seneca, SC 29679

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 RE: EXEMPTION FROM
FUEL CLADDING REQUIREMENTS (TAC NOS. MA6466, MA6467, AND
MA6468)

Dear Mr. McCollum:

The Commission has approved the enclosed exemption from certain requirements of Title 10 of the *Code of Federal Regulations* (CFR) contained in 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR Part 50. This action is in response to your application dated September 15, 1999, to allow the use of Framatome Cogema Fuels "M5" advanced alloy as a fuel rod cladding material at the Oconee Nuclear Station, Units 1, 2, and 3. This exemption is necessary since the chemical composition of M5 differs from the Zircaloy and ZIRLO cladding material specified in the regulations.

A copy of the exemption has been forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

David E. LaBarge, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure: Exemption

cc w/encl: See next page

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
DUKE ENERGY CORPORATION) Docket Nos. 50-269, 50-270, and 50-287
)
(Oconee Nuclear Station, Units 1, 2, and 3)

EXEMPTION

I.

The Duke Energy Corporation (Duke/the licensee) is the holder of Facility Operating License Nos. DPR-38, DPR-47, and DPR-55, that authorize operation of the Oconee Nuclear Station, Units 1, 2, and 3 (Oconee), respectively. The licenses provide, among other things, that the facilities are subject to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

The facilities consist of pressurized water reactors located on Duke's Oconee site in Seneca, Oconee County, South Carolina.

II.

The proposed action is in accordance with the licensee's application for exemption contained in a submittal dated September 15, 1999, and is needed to allow the use of Framatome Cogema Fuels (FCF) "M5" advanced alloy as a fuel rod cladding material. This exemption is necessary since the chemical composition of M5 differs from the Zircaloy and ZIRLO cladding material specified in 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR Part 50. These regulations contain acceptance and analytical criteria regarding the light water nuclear reactor system performance during and following a postulated loss-of-coolant accident (LOCA). These regulations assume the use of only two types of fuel cladding material, Zircaloy

and ZIRLO. However, the licensee has requested use of FCF M5 advanced alloy for fuel rod cladding at Oconee. 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 percent tin) and low-tin Zircaloy (1.2 percent 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 fuel cladding material at Oconee.

III.

Section 50.12 of Title 10 of the Code of Federal Regulations, "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. Special circumstances are present where 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 10 CFR 50.46 is to ensure that facilities have adequate acceptance criteria for emergency core cooling systems (ECCS). In its topical report BAW-10227-P, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," FCF demonstrated 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 topical report (which was approved by the staff on February 4, 2000) also showed that the M5 fuel cladding was capable of satisfying this design and acceptance criteria. Therefore, the

underlying purpose of 10 CFR 50.46 is achieved through the use of M5 as a fuel rod cladding material.

The underlying purposes of 10 CFR 50.44 and Appendix K to 10 CFR Part 50, paragraph I.A.5, are to ensure that the 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 (which assumes zirconium as the cladding material) be used in the ECCS evaluation model to determine the rate of energy release, hydrogen generation, and cladding oxidation from the metal/water reaction. In their topical report, FCF demonstrated that the Baker-Just model is conservative in all post-LOCA scenarios with respect to the use of M5 advanced alloy as a fuel rod cladding material. Therefore, the underlying purposes of 10 CFR 50.44 and 10 CFR Part 50 Appendix K, paragraph I.A.5 are achieved through the use of M5 as a fuel rod cladding material.

Because there are properties of M5 that differ from the specifications for Zircaloy or ZIRLO, which are referenced in the regulations, the staff has determined that an exemption would be required to allow the use of M5 as a fuel rod cladding material. The proposed action would not exempt the licensee from complying with the acceptance and analytical criteria of 10 CFR 50.44, 10 CFR 50.46 and Appendix K to 10 CFR Part 50 applicable to the cladding. The exemption would only allow the application of the criteria set forth in these regulations to the M5 cladding material.

Since the acceptance and analytical criteria set forth in the applicable regulations would continue to be applicable to the M5 fuel cladding, the staff has concluded that the proposed exemption is authorized by law, does not present an undue risk to the public health and safety, and is consistent with the common defense and security. Further, since the underlying purposes of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K 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, 10 CFR 50.46, and 10 CFR Part 50, Appendix K exist. Therefore, the staff concludes that the proposed exemption to 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR Part 50 related to the fuel cladding material for Oconee Nuclear Station Units 1, 2, and 3 is acceptable.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants Duke an exemption from the requirements of 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR Part 50, related to the fuel cladding material for the Oconee Nuclear Station, Units 1, 2, and 3.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not result in any significant effect on the quality of the human environment (65 FR 15659).

This exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

John A. Zwolinski, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Dated at Rockville, Maryland, this 23rd day of March 2000.

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IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants Duke an exemption from the requirements of 10 CFR 50.44, 10 CFR 50.46, and Appendix K of 10 CFR Part 50, related to the fuel cladding material for the Oconee Nuclear Station, Units 1, 2, and 3.

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Oconee Nuclear Station

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