

March 15, 2000

Mr. Guy G. Campbell, Vice President - Nuclear
FirstEnergy Nuclear Operating Company
5501 North State Route 2
Oak Harbor, OH 43449-9760

SUBJECT: 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 - DAVIS-BESSE
NUCLEAR POWER STATION (TAC NO. MA3589)

Dear Mr. Campbell:

The Commission has issued the enclosed exemption from the requirements of 10 CFR 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 Part 50 of Title 10, Code of Federal Regulations, "ECCS Evaluation Models," for the Davis-Besse Nuclear Power Station. This exemption is in response to your letter dated September 15, 1998 (Serial Number 2553).

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

Sincerely,

/RA/

Douglas V. Pickett, Senior Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure: Exemption

cc w/encl: See next page

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Mr. Guy G. Campbell
FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station, Unit 1

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of)
)
FIRSTENERGY NUCLEAR OPERATING COMPANY) Docket No. 50-346
)
(Davis-Besse Nuclear Power Station))

EXEMPTION

I.

The FirstEnergy Nuclear Operating Company (FENOC, the licensee) is the holder of Facility Operating License No. NPF-3, which authorizes operation of the Davis-Besse Nuclear Power Station (DBNPS). The license provides, among other things, that the license is subject to all rules, regulations, and orders of the Commission now or hereafter in effect.

The facility consists of a pressurized-water reactor at the licensee’s site in Ottawa County, Ohio.

II.

Section 50.44 of Title 10 of the Code of Federal Regulations, “Standard for Combustible Gas Control System in Light-Water-Cooled Power Reactors,” requires, among other items, that each 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) Metal-water reaction involving the fuel cladding and the reactor coolant, (2) Radiolytic decomposition of the reactor coolant, and (3) Corrosion of metals.

Section 50.46 of Title 10 of the Code of Federal Regulations, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors," requires, among other items, that each 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 conform 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 Part 50 of Title 10 of the Code of Federal Regulations, "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.

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 DBNPS operating Cycle 13. 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 the DBNPS.

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 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.

III.

The underlying purpose of 10 CFR 50.46 is to ensure that facilities have adequate acceptance criteria for ECCS. In its topical report BAW-10227P, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," 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. 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, 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 DBNPS design basis.

The staff has reviewed the FCF'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, the 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.

IV.

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 FENOC 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 (65 FR 794).

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 15th day of March 2000