



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

July 31, 2000

Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

SUBJECT: SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE
OF AMENDMENTS REGARDING USE OF M5 ALLOY IN THE
CONSTRUCTION OF FUEL ASSEMBLIES (TAC NOS. MA8490
AND MA8491)

Dear Mr. Scalice:

The Commission has issued the enclosed Amendment No. 258 to Facility Operating License No. DPR-77 and Amendment No. 249 to Facility Operating License No. DPR-79 for the Sequoyah Nuclear Plant, Units 1 and 2, respectively. These amendments are in response to your license amendment application dated February 18, 2000.

These amendments revise Technical Specification (TS) Section 5.3, "Design Features - Reactor Core," and TS Section 6.9, "Administrative Controls - Reporting Requirements" to identify M5 alloy as a material used in the construction of fuel assemblies and to cite the topical report that describes the fuel.

A copy of the Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-327 and 50-328

Enclosures: 1. Amendment No. 258 to License No. DPR-77
2. Amendment No. 249 to License No. DPR-79
3. Safety Evaluation

cc w/enclosures: See next page

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/RA/

Ronald W. Hernan, Senior Project Manager, Section 2
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-327

SEQUOYAH NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 258
License No. DPR-77

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (the licensee) dated February 18, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 258 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 45 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: **July 31, 2000**

ATTACHMENT TO LICENSE AMENDMENT NO. 258

FACILITY OPERATING LICENSE NO. DPR-77

DOCKET NO. 50-327

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

5-4
6-13a

INSERT

5-4
6-13a

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of zircaloy or M5 clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with NRC-approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff-approved codes and methods, and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

R184

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 53 full length and no part length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

- a. In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,
- b. For a pressure of 2485 psig, and
- c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 12,612 $\pm$ 100 cubic feet at a nominal T_{avg} of 525°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

ADMINISTRATIVE CONTROLS

CORE OPERATING LIMITS REPORT (continued)

6. WCAP-10054-P-A, Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code, August 1985, (W Proprietary)
(Methodology for Specification 3/4.2.2 - Heat Flux Hot Channel Factor)
7. WCAP-10266-P-A, Rev. 2, "THE 1981 REVISION OF WESTINGHOUSE EVALUATION MODEL USING BASH CODE", March 1987, (W Proprietary).
(Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor).
8. BAW-10227P-A, "Evaluation of Advance Cladding and Structural Material (M5) in PWR Reactor Fuel," February 2000, (FCF Proprietary)
(Methodology for Specification 3/4.2.2 - Heat Flux Hot Channel Factor)

R227

6.9.1.14.b The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met.

6.9.1.14.c THE CORE OPERATING LIMITS REPORT shall be provided within 30 days after cycle start-up (Mode 2) for each reload cycle or within 30 days of issuance of any midcycle revision of the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

R159

SPECIAL REPORTS

6.9.2.1 Special reports shall be submitted within the time period specified for each report, in accordance with 10 CFR 50.4.

R76

6.9.2.2 This specification has been deleted.

R245



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-328

SEQUOYAH NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. **249**
License No. DPR-79

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Tennessee Valley Authority (the licensee) dated February 18, 2000, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-79 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 249, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 45 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Richard P. Correia, Chief, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: **July 31, 2000**

ATTACHMENT TO LICENSE AMENDMENT NO. 249

FACILITY OPERATING LICENSE NO. DPR-79

DOCKET NO. 50-328

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

REMOVE

5-4
6-14

INSERT

5-4
6-14

DESIGN FEATURES

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of zircaloy or M5 clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with NRC-approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff-approved codes and methods, and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions. Sequoyah is authorized to place a limited number of lead test assemblies into the reactor, as described in the Framatome Cogema Fuels Report BAW-2328, beginning with the Unit 2 Operating Cycle 10 core.

R172

R234

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 53 full length and no part length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

- 5.4.1 The reactor coolant system is designed and shall be maintained:
- In accordance with the code requirements specified in Section 5.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,
 - For a pressure of 2485 psig, and
 - For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 12,612 ± 100 cubic feet at a nominal T_{avg} of 525°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

ADMINISTRATIVE CONTROLS

CORE OPERATING LIMITS REPORT (continued)

6. WCAP-10054-P-A, Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code, August 1985, (W Proprietary)
(Methodology for Specification 3/4.2.2 - Heat Flux Hot Channel Factor) R214
7. WCAP-10266-P-A, Rev. 2, "THE 1981 REVISION OF WESTINGHOUSE EVALUATION MODEL USING BASH CODE", March 1987, (W Proprietary).
(Methodology for Specification 3.2.2 - Heat Flux Hot Channel Factor).
8. BAW-10227P-A, "Evaluation of Advance Cladding and Structural Material (M5) in PWR Reactor Fuel," February 2000, (FCF Proprietary)
(Methodology for Specification 3/4.2.2 - Heat Flux Hot Channel Factor)

6.9.1.14.b The core operating limits shall be determined so that all applicable limits (e.g., fuel thermal-mechanical limits, core thermal-hydraulic limits, ECCS limits, nuclear limits such as shutdown margin, and transient and accident analysis limits) of the safety analysis are met. R146

6.9.1.14.c THE CORE OPERATING LIMITS REPORT shall be provided within 30 days after cycle start-up (Mode 2) for each reload cycle or within 30 days of issuance of any midcycle revision of the NRC Document Control Desk with copies to the Regional Administrator and Resident Inspector.

SPECIAL REPORTS

6.9.2.1 Special reports shall be submitted within the time period specified for each report, in accordance with 10 CFR 50.4. R64

6.9.2.2 This specification has been deleted.

R231



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 258 TO FACILITY OPERATING LICENSE NO. DPR-77
AND AMENDMENT NO. 249 TO FACILITY OPERATING LICENSE NO. DPR-79

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NOS. 50-327 AND 50-328

1.0 INTRODUCTION

In an application dated February 11, 2000, pursuant to Section 50.12 of Part 50 of the *Code of Federal Regulations* (10 CFR 50.12), the Tennessee Valley Authority (TVA) requested an exemption from the requirements of 10 CFR 50.44, "Standard for Combustion Gas Control in Light-Water-Cooled Power Reactors," 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Reactors," and 10 CFR Part 50, Appendix K, "ECCS Evaluation Models." These regulations set forth requirements for plants that use zircaloy or ZIRLO fuel rod cladding material by specifying acceptance criteria for Emergency Core Cooling Systems and fuel cladding performance evaluation for normal operation, anticipated operational occurrences and accident conditions. The exemption would allow TVA to use a newly designed cladding and structural material developed by Framatome Cogema Fuels (FCF), designated M5.

The exemption was approved by the staff on July 26, 2000, and has been forwarded to TVA under separate cover.

On February 18, 2000, TVA submitted a request to amend the Technical Specifications (TSs) for the Sequoyah Nuclear Plant, Units 1 and 2. These amendments would revise TS Section 5.3, "Design Features - Reactor Core," and TS Section 6.9, "Administrative Controls - Reporting Requirements" to identify M5 alloy as a material used in the construction of fuel assemblies and to cite the topical report that describes the fuel.

2.0 EVALUATION

2.1 Applicability of Topical Report

TVA proposes to use M5 for fuel rod cladding, fuel assembly spacer grids, fuel rod end plugs, the fuel assembly guide, and instrument tubes. M5 is an alloy composed of approximately 99 percent zirconium and 1 percent niobium, is designed for high fuel rod burnup conditions, and exhibits superior corrosion resistance and reduced irradiation-induced growth. In September 1997, FCF submitted Topical Report BAW-10227P, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," for NRC staff review. The topical

report justified the use of M5 as cladding and structural material in pressurized-water reactor cores and provided the licensing basis for the FCF advanced cladding and structural material. In a safety evaluation report (SER) dated February 4, 2000, NRC approved Topical Report BAW-10227P, concluding that the M5 properties and the mechanical design methodology, as defined in BAW-0227P, "are in accordance with SRP [Standard Review Plan] Section 4.2, 10 CFR 50.46, and 10 CFR Part 50, Appendix K and therefore, are acceptable for reload licensing applications up to rod averaged burnup levels of 62,000 MWd/MTU and 60,000 MWd/MTU for Mark B and Mark-BW fuel designs, respectively." The staff SER and the approved topical report were published on February 11, 2000, as BAW-10227P-A. The staff has determined that BAW-10227P-A is applicable to Sequoyah because the fuel designs are consistent with the requirements of the topical report.

2.2 Acceptability of TS Changes

TVA proposed TS changes that include M5 as fuel cladding and structural material. TS Section 5.3.1, "Design Features - Reactor Core - Fuel Assemblies," currently specifies only zircaloy or ZIRLO fuel rod cladding, and the licensee has proposed to change the TSs to include M5 fuel rod cladding. These changes are required to permit the planned use of the M5 alloy for fuel rod cladding and structural material at Sequoyah. The staff has determined that this TS change is acceptable because BAW-10227P-A applies to Sequoyah and, in an exemption issued separately, determined that M5 material properties are similar to the zirconium-based materials currently used as cladding material and that the 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K, fuel system performance evaluation and acceptance criteria can be applied to M5 material as a cladding and structural material. Therefore, the staff concludes that the use of the M5 alloy for fuel rod cladding and structural material, and the proposed TS change, are acceptable for Sequoyah Units 1 and 2.

The licensee also proposed to add the NRC-approved Topical Report BAW-10227P-A as Item 8 in Section 6.9.1.14.a, "Core Operating Limits Report." This section of the TSs lists the topical reports that contain the NRC-approved methodologies that the licensee uses to determine the core operating limits for each reload cycle. Inclusion of the M5 topical report in TS 6.9.1.14.1 will support reactor transient and accident analyses to ensure that the results of these analyses meet the applicable safety limits, and thus, ensure that values for cycle-specific parameters are appropriate. Therefore, this TS change is acceptable.

The staff has reviewed the licensee's proposed TS changes related to the use of the M5 advanced alloy for fuel rod cladding and structural material. On the basis of its review, the staff concludes that the use of the M5 alloy is acceptable for Sequoyah Units 1 and 2, and, therefore, the proposed TS changes are acceptable.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Tennessee State official was notified of the proposed issuance of the amendments. The State official had no comments.

4.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has

determined that the amendments involve no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (65 FR 17920). The amendments also change record keeping or reporting requirements. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and (c)(10). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

5.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: Z. Abdullahi, NRR

Dated: **July 31, 2000**

Mr. J. A. Scalice
Tennessee Valley Authority

SEQUOYAH NUCLEAR PLANT

cc:

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