



Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37379

February 11, 2000

10 CFR 50.12

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of) Docket Nos. 50-327
Tennessee Valley Authority) 50-328

SEQUOYAH NUCLEAR PLANT (SQN) - REQUEST FOR EXEMPTION IN ACCORDANCE WITH 10 CFR 50.12, "SPECIFIC EXCEPTIONS" FOR THE USE OF M5 ADVANCED ALLOY IN FUEL ROD CLADDING

Pursuant to the provisions of 10 CFR 50.12, TVA requests an exemption from the requirements specified in 10 CFR 50.44, "Standards for Combustible 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 50 Appendix K, "ECCS Evaluation Models," Paragraph I.A.5, regarding the use of zircaloy or ZIRLO as a fuel rod cladding material for SQN. If granted, this exemption would allow TVA to load and produce power with fuel assemblies manufactured with M5 advanced zirconium alloy fuel rod cladding in place of zircaloy or ZIRLO cladding.

In parallel, TVA is preparing a technical specification change to support and allow the use of the M5 alloy for fuel rod cladding. This exemption and the associated technical specification change must be approved prior to the use of the M5 alloy. TVA currently plans to load test assemblies into the Unit 2 core during the next refueling outage scheduled for late October 2000. TVA requests the approval of this exemption by October 2000 to support this effort.

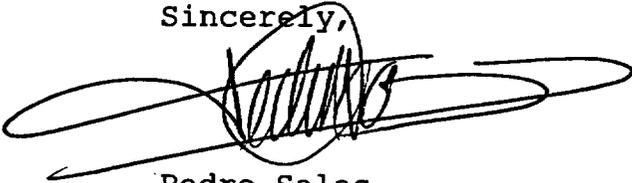
The enclosure to this letter describes the background and the justification for seeking this exemption.

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Please direct questions concerning this issue to me at
(423) 843-7170 or J. D. Smith at (423) 843-6672.

Sincerely,

A handwritten signature in black ink, appearing to read 'Pedro Salas', is written over a large, loopy scribble that extends across the width of the page.

Pedro Salas
Licensing and Industry Affairs Manager

Enclosure

cc (Enclosure):

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ENCLOSURE

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT (SQN)
UNITS 1 AND 2

REQUEST FOR EXEMPTION IN ACCORDANCE WITH 10 CFR 50.12,
"SPECIFIC EXCEPTIONS" FOR THE USE OF
M5 ADVANCED ALLOY IN FUEL ROD CLADDING

BACKGROUND

10 CFR 50.44 and 10 CFR 50.46 provide various requirements for light water reactor system performance during and following a postulated loss-of-coolant accident (LOCA) for reactors containing uranium oxide fuel pellets clad in either zircaloy or ZIRLO. 10 CFR 50 Appendix K, Paragraph I.A.5, requires that the Baker-Just equation be used in emergency core cooling system (ECCS) evaluation models for determining the rate of energy release, hydrogen generation, and cladding oxidation for fuel rod cladding. All three of these regulations, either explicitly or implicitly, state or assume that either zircaloy or ZIRLO is to be used as the fuel rod cladding material.

In order to accommodate the high fuel rod burnups that are required for today's modern fuel management schemes and core designs, Framatome Cogema Fuels (FCF) developed the M5 advanced fuel rod cladding and fuel assembly structural material. M5 is an alloy composed of primarily zirconium (approximately 99 percent) and niobium (approximately 1 percent) that has demonstrated superior corrosion resistance and reduced irradiation induced growth relative to both standard and low-tin zircaloy.

The M5 alloy would be used at SQN for fuel rod cladding, as well as for fuel assembly spacer grids, fuel rod end plugs, and fuel assembly guide and instrument tubes. Such use of the M5 alloy at SQN will permit longer fuel residence times, higher fuel burnups, and reduced reload feed batch sizes, with corresponding improvements in fuel cycle economics. These improvements will be accompanied by increased performance margins with regard to fuel rod corrosion and fuel rod and fuel assembly growth. Reduced feed batch sizes will also help to reduce the spent fuel storage burden at SQN.

The chemical composition of the M5 advanced alloy differs from the specifications for either zircaloy or ZIRLO. Therefore, in the absence of the requested exemption, use of the M5 advanced alloy falls outside the language and intent of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR 50 Appendix K, Paragraph I.A.5.

Approval of this exemption request will allow the use of M5 advanced alloy as a fuel rod cladding material at SQN.

REQUEST

Following NRC approval of this exemption from the applicable regulations and its approval of appropriate amendments to the SQN technical specifications, TVA plans to utilize fuel rods constructed with the M5 advance zirconium alloy cladding.

JUSTIFICATION

10 CFR 50.12 authorizes the Commission, upon application by any interested person, to grant exemptions from the requirements of the regulations when special circumstances are present. TVA believes that such special circumstances are present in this instance to warrant exemption from the regulatory requirements of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR 50 Appendix K, Paragraph I.A.5. Specifically, Section (ii) of 10 CFR 50.12(a)(2) states:

(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.

TVA believes, for the reasons described below, that the use of the M5 advanced alloy as a fuel rod cladding material achieves the underlying purposes of 10 CFR 50.44, 10 CFR 50-46, and 10 CFR 50 Appendix K, Paragraph I.A.5.

The underlying purpose of 10 CFR 50.46 is to ensure that facilities have adequate acceptance criteria for the ECCS. FCF demonstrates in referenced Topical Report BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," 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 reference 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.

Because the underlying purpose of 10 CFR 50.46 is achieved through the use of the M5 advanced alloy as a fuel rod cladding material, special circumstances are present under 10 CFR 50.12(a)(2)(ii) for granting an exemption to 10 CFR 50.46.

The underlying purposes of 10 CFR 50.44 and 10 CFR 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. FCF demonstrates, in Appendix D of the reference, 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 an LOCA will remain within the SQN design basis.

Because the underlying purposes of 10 CFR 50.44 and 10 CFR 50 Appendix K, Paragraph I.A.5 are achieved through the use of the M5 advanced alloy as a fuel rod cladding material, special circumstances are present under 10 CFR 50.12(a)(2)(ii) for granting exemptions to 10 CFR 50.44 and 10 CFR 50 Appendix K, Paragraph I.A.5.

Conclusions

Based on the above, the underlying purposes of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR 50 Appendix K, Paragraph I.A.5, which are to provide adequate acceptance criteria for ECCS and to ensure that cladding oxidation and hydrogen generation are appropriately limited and accounted for during LOCA evaluation, are accomplished through the use of the M5 advanced alloy as a fuel rod cladding material.

The granting of this exemption request would have no impact on plant radiological or nonradiological effluents and involves no radiation exposure.

Because these underlying purposes have been preserved, TVA concludes that the proposed exemption does not present an undue risk to the health and safety of the public and is consistent with the common defense and security.

Reference

BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel," Framatome Cogema Fuels, Lynchburg, VA, January 2000.