May 13, 1987

Docket No. 50-338

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Mr. W. L. Stewart
Vice President - Nuclear Operations
Virginia Electric and Power Company
Post Office Box 26666
Richmond, Virginia 23261

Dear Mr. Stewart:

The Commission has issued the enclosed Amendment No. to Facility Operating License No. NPF-4 for the North Anna Power Station, Unit No. 1 (NA-1). The amendment adds a license condition to NA-1 Facility Operating License No. NPF-4 in response to your application dated February 20, 1987. The amendment is effective as of the date of issuance.

The amendment adds a license condition to the NA-1 Facility Operating License No. NPF-4 which states: "VEPCO may use two (2) fuel assemblies containing fuel rods clad with an advanced zirconium base alloy cladding material as described in VEPCO's letter dated February 20, 1987." These two fuel assemblies meet the guidelines for lead test fuel assemblies and are enveloped by the existing NA-1 reload design and safety analysis limits.

For the reasons set forth in the enclosed Safety Evaluation, the Commission grants an exemption from the provision of 10 CFR 50.46 requiring the use of an approved ECCS evaluation model for reactors with Zircaloy clad fuel, with respect to the use of two lead test assemblies clad with an advanced cladding material (zirconium base alloy).

A copy of the Safety Evaluation is also enclosed. The notice of issuance will be included in the Commission's next regular bi-weekly Federal Register notice.

Sincerely,

/s/

Leon B. Engle, Project Manager
Project Directorate II-2
Division of Reactor Projects-I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. to NPF-4
2. Safety Evaluation

cc w/enclosures:
See next page

*See previous concurrence

*LA:PD22	*PM:PD22	OGC*	D:PD22	AD:DRP	
DMiller	LEngle:hc		LRubenstein	GLainas	BBoger
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DMiller	LEngle:hc		LRubenstein
4/24/87	4/24/87	4/7/87	4/ /87

Mr. W. L. Stewart
Virginia Electric & Power Company

North Anna Power Station
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

DOCKET NO. 50-338

NORTH ANNA POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 94
License No. NPF-4

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Virginia Electric and Power Company et al., (the licensee) dated February 20, 1987, 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.

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2. Accordingly, Paragraph 2.D.3 is hereby added to Facility Operating License NPF-4 to read:

   2.D.3 VEPCO may use two (2) fuel assemblies containing fuel rods clad with an advanced zirconium base alloy cladding material as described in VEPCO's letter dated February 20, 1987.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Bruce A. Boger

Bruce A. Boger, Acting Director
Division of Reactor Projects-I/II

Date of Issuance: May 13, 1987

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 94

FACILITY OPERATING LICENSE NO. NPF-4

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

NORTH ANNA POWER STATION, UNIT NO. 1

DOCKET NO. 50-338

INTRODUCTION

By letter dated February 20, 1987, the Virginia Electric and Power Company (VEPCO or licensee) proposed an amendment to Facility Operating License No. NPF-4 for the North Anna Power Station, Unit No. 1 (NA-1). Specifically, the proposed license condition would allow the licensee to insert two (2) Westinghouse fuel assemblies with advanced cladding material in the NA-1 Cycle 7 core. The fuel assemblies will contain a number of fuel rods clad with a zirconium base alloy instead of the presently used Zircaloy-4 to obtain further confirmation of the alloy clad's improved corrosion performance at reactor conditions. The two fuel assemblies have removable top nozzles which allow access to all fuel rods for inspection. The fuel rods with the alloy cladding will contain nominally 95% dense UO_2 pellets and will have the same rod dimensions as other fuel rods presently in the core. The fuel rods will have Zircaloy-4 end plugs, and will be pressurized with helium.

The NA-1 Technical Specification 5.3.1 describes the reactor core as consisting of assemblies containing 264 fuel rods clad with Zircaloy-4. In order to allow for the insertion of fuel rods clad with a zirconium base alloy in the two fuel assemblies, a license condition would specify NRC approval for the use of the two fuel assemblies containing fuel rods clad with the advanced cladding material (zirconium base alloy).

DISCUSSION

Fuel rods clad with the zirconium base alloy cladding have been irradiated in a foreign reactor at linear power levels up to 17 kilowatts per foot (kw/ft) and at burnups greater than those planned for the NA-1 fuel assemblies. Corrosion and hydriding data obtained on the alloy cladding were compared with reference Zircaloy-4 cladding of fuel rods irradiated as controls in the same test assemblies. Based on the irradiation results of the test assemblies in the foreign reactor, it is expected that the zirconium base alloy waterside corrosion and hydriding will be less than that expected for Zircaloy-4 clad fuel rods. Irradiation results also showed lower clad irradiation growth (delta L/L) and creepdown for the zirconium alloy compared

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with Zircaloy-4. These irradiation results were considered in the design of the fuel rods with zirconium alloy clad in order to assure that all the current fuel rod design bases are satisfied for the planned irradiation life of the NA-1 fuel assemblies.

The use of two assemblies with fuel rods clad with a zirconium base alloy will not result in any new accident since the two assemblies and their fuel rods will satisfy the same design bases used for other assemblies in the fuel region as specified in the NRC approved Westinghouse report, "Reference Core Design Report - 17 x 17 Optimized Fuel Assembly," WCAP-9500-A, Volume 2, May 1982. For each reload core until discharge, the fuel assemblies will be specifically evaluated using NRC approved standard methods specified in the VEPCO report, "Reload Nuclear Design Methodology," VEP-FRD-42, Revision 1-A, September 1986, and the Westinghouse report, "Improved Analytical Models Used in Westinghouse Fuel Rod Design Computations," WCAP-8720, October 1976 and Addendum dated June 1982 and December 1983. The two fuel assemblies do not change the existing reload design and safety analysis limits and therefore, the current NA Updated Final Safety Analysis Report (UFSAR) remains bounding. Finally, the irradiation data and design analysis provide sufficient evidence to support the determination that fuel rods with zirconium base alloy cladding will perform, at the very least, as well as fuel rods with the present Zircaloy-4 cladding.

The NRC staff considers these two assemblies to be lead test assemblies (LTAs). LTAs are expected to meet several guidelines. These are: (1) the number of LTAs should not exceed four, (2) the LTAs should not be limiting with respect to any specified acceptable fuel design limit, and (3) all the safety analysis methods should be approved by the NRC staff. The staff has reviewed Westinghouse's proprietary information submitted on February 5, 1987, and determined that these two assemblies satisfy these LTA guidelines. Therefore, the staff concludes that as long as the safety analysis results continue to be valid, these two fuel assemblies are acceptable for insertion into the NA-1 Cycle 7 core and future cores.

Although the new zirconium based alloy is very similar in composition to "Zircaloy," it is not clear that it falls within the scope of 10 CFR 50.46 which applies to "Zircaloy" clad fuel. Resolution of this question will involve substantial effort in checking into the rulemaking process on which 10 CFR 50.46 is based. However, complete resolution of this issue is not necessary at this time to assure that operation with 2 test assemblies will be adequately safe. For the use of this material in test assemblies, the composition of the zirconium based alloy is very similar to zircaloy in all significant respects; moreover, the test assemblies are not located in the portions of the core expected to experience highest burnup and highest power density. The performance of these assemblies in the event of a LOCA will be bounded by the performance previously calculated for the other zircaloy clad assemblies in the core which was based on accepted ECCS evaluation models. In the absence of resolution of whether the zirconium based alloy material can be considered to be "Zircaloy", an exemption from the provision of 50.46 limiting its application to "Zircaloy" is needed.

For the foregoing reasons, the staff has concluded that use of two test assemblies containing the new alloy in the North Anna No. 1 reactor will not present an undue risk to public health and safety and is consistent with the common defense and security. In addition, as discussed above the use of such assemblies would conform to all current fuel design bases and do not change the existing reload design and safety analysis limits and satisfy the guidelines for lead test assemblies. The staff has determined that there are special circumstances present as specified in 10 CFR 50.12(a)(2); specifically, application of the provision of 50.46 calling for use of approved ECCS models for reactors with Zircaloy clad fuel is not necessary in this case in which the approved ECCS model remains the basis for ECCS design even though 2 lead test assemblies are clad with a zirconium alloy not yet demonstrated to fall within the term Zircaloy. Accordingly, the Commission has determined that the granting of an exemption is warranted in this case and the licensee is exempt from the requirement of 50.46 relating to Zircaloy clad fuel with respect to the use of two lead assemblies composed of an advanced cladding material (zirconium base alloy).

EVALUATION

Based on the above, the two new zirconium alloy test fuel assemblies meet the guidelines for LTAs. Also, the two test fuel assemblies do not change the existing NA-1 reload design and safety analysis limits and the current NA-1 UFSAR remains bounding. Although the use of the zirconium based alloy requires an exemption as discussed above for use in test assemblies, the characteristics of this material are very similar to zircaloy in all significant respects. Consequently, the existing safety evaluations are fully applicable to the new material.

ENVIRONMENTAL CONSIDERATION

A Notice of Issuance of an Environmental Assessment and Finding of No Significant Impact relating to the proposed license condition for NA-1 was published in the Federal Register on May 13, 1987 (52 FR 18035).

CONCLUSION

We have 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, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: May 13, 1987

Principal Contributors:

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