January 3, 1989

Docket No. 50-338

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Mr. W. R. Cartwright
Vice President - Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

Dear Mr. Cartwright:

SUBJECT: NORTH ANNA UNIT 1 - ISSUANCE OF AMENDMENT AND EXEMPTION RE: FUEL RODS CLAD WITH ADVANCED ZIRCONIUM-BASE MATERIAL (TAC NO. 69797)

The Commission has issued the enclosed Amendment No. 111 to Facility Operating License No. NPF-4 for the North Anna Power Station, Unit No. 1 (NA-1). The amendment revises a license condition to NA-1 Facility Operating License No. NPF-4 in response to your application dated September 30, 1988. The amendment is effective as of the date of issuance.

The amendment revises license condition 2.D.3(d) to the NA-1 Facility Operating License No. NPF-4 to state: "VEPCO may use two (2) fuel assemblies containing fuel rods clad with an advanced zirconium base alloy cladding material as described in the licensee's submittals dated February 20, 1987 and September 30, 1988." 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.

NA-1 is currently operating with two assemblies containing fuel rods clad with an advanced zirconium-based material as approved by an amendment and exemption (NRC letter dated May 13, 1987) for Cycle 7 operation. The purpose of this amendment and exemption is to permit the use of a slightly different zirconium-based advanced cladding material in the same two fuel assemblies for NA-1, Cycle 8.

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, to permit the use of two lead test assemblies clad with an advanced cladding material (zirconium-base alloy).

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

Sincerely,

Original signed by

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

Enclosures:
1. Amendment No. 111 to NPF-4
2. Safety Evaluation

cc w/enclosures:
See next page

LA:PDII-2	PM:PDII-2	D:PDII-2	OGC-WF	ADRE	D:DRP
DMiller	LEngle	HBerkow		GLainas	SVarga
11/28/88	11/28/88	11/28/88	11/05/88	11/8 /88	12/8 /88

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DATED: JANUARY 3, 1989

AMENDMENT NO. 111 TO FACILITY OPERATING LICENSE NO. NPF-4-NORTH ANNA UNIT 1

Docket File
NRC & Local PDRs
PDII-2 Reading
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G. Lainas, 14/H/3
H. Berkow
D. Miller
L. Engle
OGC-WF
D. Hagan, 3302 MNBB
E. Jordan, 3302 MNBB
B. Grimes, 9/A/2
T. Meek(4), P1-137
Wanda Jones, P-130A
E. Butcher, 11/F/23
ACRS (10)
GPA/PA
ARM/LFMB
B. Wilson, R-II

cc: Plant Service list

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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. 111
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 September 30, 1988, 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, Paragraph 2.D.3(d) of Facility Operating License NPF-4 is revised to read:

   2.D.3(d) VEPCO may use two (2) fuel assemblies containing fuel rods clad with an advanced zirconium base alloy cladding material as described in the licensee's submittals dated February 20, 1987 and September 30, 1988.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Steven A. Varga, Director
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Date of Issuance: January 3, 1989

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO EXEMPTION AND AMENDMENT NO. 111

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 September 30, 1988, the Virginia Electric and Power Company (the licensee or VEPCO) proposed an amendment to Facility Operating License No. NPF-4 for the North Anna Power Station, Unit No. 1 (NA-1). Specifically, the proposed change, in the form of a revised license condition for NA-1, would permit the use of two (2) Westinghouse fuel assemblies containing advanced cladding material. The licensee is currently irradiating two demonstration fuel assemblies in NA-1 containing fuel rods clad with an advanced zirconium base alloy. This alloy cladding is expected to have superior corrosion resistance compared to conventional Zircaloy-4 cladding. Developing advanced cladding materials with improved corrosion resistance is important because corrosion is one of the most limiting parameters with regard to achieving extended burnups. Approval for the use of this advanced alloy cladding in the two demonstration fuel assemblies at NA-1 was first given in Amendment No. 94 to Facility Operating License NPF-4 issued on May 13, 1987.

DISCUSSION

To enhance the understanding of the effects of small variations in alloy composition on in-pile corrosion and creep performance and to obtain a more comprehensive data base, the licensee has proposed to irradiate fuel rods clad with additional advanced zirconium base alloys which differ slightly in composition from Zircaloy-4 and the advanced cladding currently being irradiated in the NA-1 demonstration fuel assemblies. The chemical compositions of these advanced alloys are similar to Zircaloy-4 and the advanced alloy currently being irradiated. The licensee has proposed that fuel rods clad with these advanced alloys be irradiated in the NA-1 Cycle 8 core which is scheduled for startup in the second quarter of 1989. These fuel rods would be inserted in the demonstration fuel assemblies in place of the presently NRC-approved cladding rods which would be removed. 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 the advanced 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).

The use of two assemblies with fuel rods clad with an advanced 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-approved fuel rod design methods specified in "Extended Burnup Evaluation of Westinghouse Fuel," WCAP-10125-P-A, December 1985. Existing reload design and safety analysis limits as applicable to NA-1 will apply. This will include consideration in the core physics analysis of peaking factors and core average linear heat rate effects. The two fuel assemblies do not change the existing reload design and safety analysis limits and, therefore, the current NA-1 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 the additionally advanced zirconium base alloy cladding will perform at least as well as fuel rods with Zircaloy-4 cladding and the advanced cladding currently being irradiated in the NA-1 demonstration fuel assemblies. The two advanced cladding demonstration fuel assemblies currently in service in NA-1 are a slightly different advanced zirconium base alloy cladding and were approved for use in NA-1 by Amendment No. 94 issued May 13, 1987.

Although the new advanced zirconium base 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. However, complete resolution of this issue is not necessary at this time to assure that operation with two (2) test assemblies will be adequately safe. For the use of this material in test assemblies, the composition of the zirconium base 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 Emergency Core Cooling System (ECCS) evaluation models. In the absence of a clear definition of the actual compound "Zircaloy" as stated in 10 CFR 50.46, an exemption from the provision of 50.46 which limits its application to "Zircaloy" is needed.

For the foregoing reasons, the staff has concluded that use of two test assemblies containing the advanced alloy in the NA-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, does not change the existing reload design and safety analysis limits and satisfies 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 continued use of two lead assemblies composed of an advanced cladding material (zirconium base alloy).

EVALUATION

Based on the above, the two advanced zirconium alloy test fuel assemblies meet the guidelines for lead test assemblies. 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 base 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

Pursuant to 10 CFR 51.21, 51.32 and 51.35, an environmental assessment and finding of no significant impact has been prepared and published in the Federal Register on December 9, 1988 (53 FR 49806). Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

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: January 3, 1989

Principal Contributor:

L. B. Engle