JAN 19 1982

DCS-MS-016

Docket File
NRC PDR
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OI&E-4
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DMB
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Docket Nos. 50-338
and 50-339

Mr. R. H. Leasburg
Vice President-Nuclear Operations
Virginia Electric and Power Company
Post Office Box 26666
Richmond, Virginia 23261

Dear Mr. Leasburg:

The Commission has issued the enclosed Amendment Nos.36 and16 to Facility Operating License Nos. NPF-4 and NPF-7 for the North Anna Power Station, Unit Nos. 1 and 2 (NA-1&2). The amendments consist of changes to the Technical Specifications and are the subject (of the NRC staff's continuation of its review of your application transmitted by letter dated March 6, 1981 (Serial No. 109) supplemented by letters dated March 26, 1981 (Serial No. 195) and August 18, 1981 (Serial No. 495), and in our discussions with you regarding these matters.

The amendments are our follow-up action-related to the issuance (April 29, 1981). of Amendment Nos. 27 and 8 to Facility Operatin License Nos. NPF-4 and NPF-7 for NA 1&2.

The amendments revise the NA-1&2 Technical Specifcations to allow an increase in enrichment for new and spent fuel from 3.7 weight percent of U-253 to 4.1 weight percent of U-235.

Copies of the related Safety Evaluation and the Notice of Issuance are also enclosed.

Sincerely,

Original signed by:

Leon B. Engle, Project Manager
Operating Reactors Branch#3
Division of Licensing

Enclosures:
1. Amendment No. 36 to NPF-4
2. Amendment No. 16 to NPF-7
3. Safety Evaluation
4. Notice of Issuance

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PDR ADOCK 05000338
P PDR

no legal objection to notice & amd only - no legal review of safety evaluation or no significant hazards determination

OFFICE	ORB#3:DL	ORB#3:DL	RAClark	ORB:DL	OELD		
SURNAME	PMKreutzer	LEngle/dd	ORB#3:DL	TNovak	DSwanson		
DATE	1/4/82	1/5/82	1/05/82	1/6/82	1/8/82		

NRC FORM 318 (10-80) NRCM 0240 OFFICIAL RECORD COPY USGPO: 1981—335-960

Virginia Electric and Power Company

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Atomic Safety and Licensing
Appeal Board Panel
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

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

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NO. 50-338

NORTH ANNA POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 36
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 (the licensee) dated March 6, 1981, as supplemented March 26, 1981, and August 15, 1981 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.D.(2) of Facility Operating License No. NPF-4 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No.36, 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 the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: January 19, 1982

ATTACHMENT TO LICENSE AMENDMENT

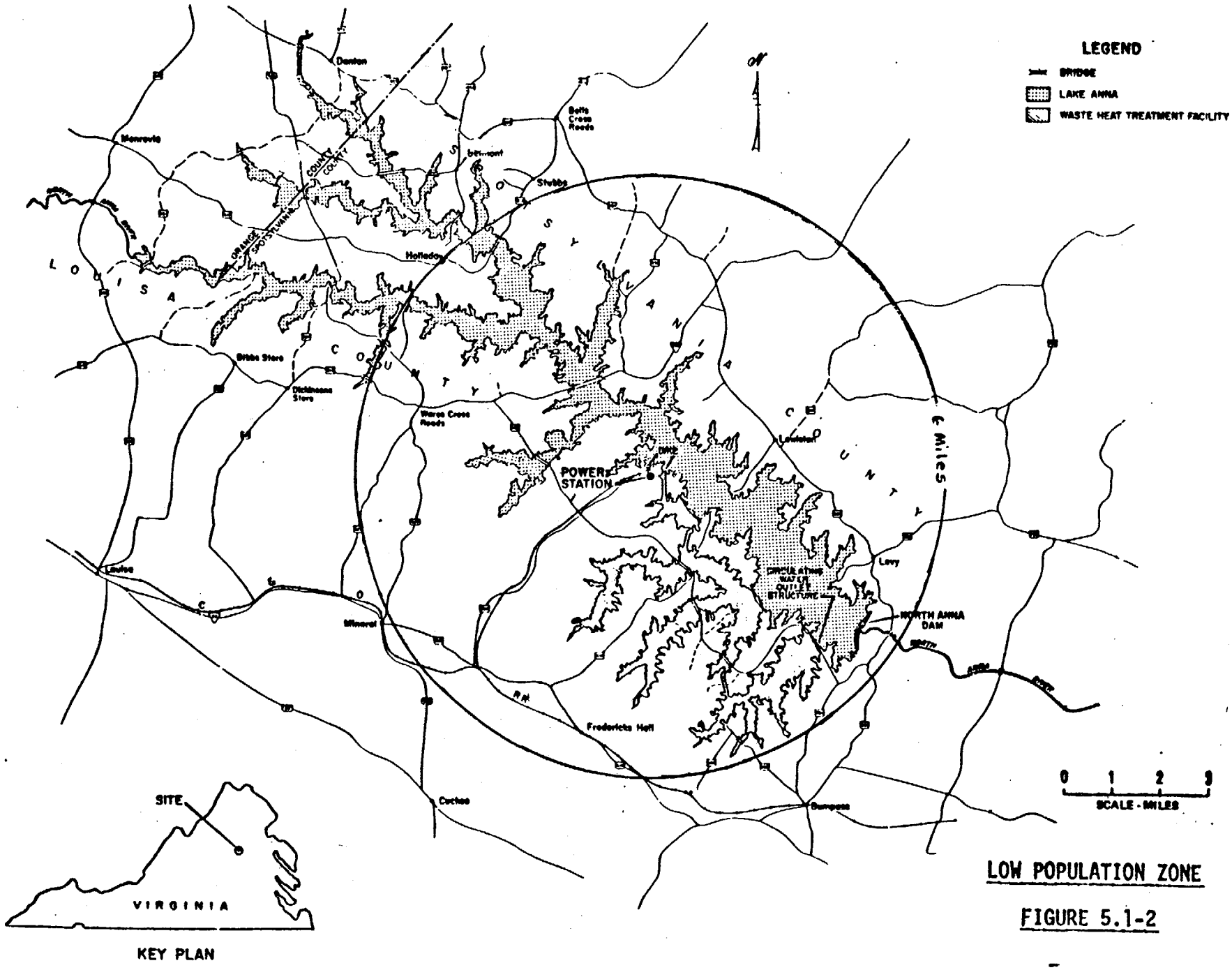
AMENDMENT NO. 36 TO FACILITY OPERATING LICENSE NO. NPF-4

DOCKET NO. 50-338

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page as indicated. The revised page is identified by Amendment number and contains vertical lines indicating the area of change. The corresponding overleaf page is also provided to maintain document completeness.

Pages

5-4



LOW POPULATION ZONE

FIGURE 5.1-2

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The reactor containment building is designed and shall be maintained for a maximum internal pressure of 45 psig and a temperature of 280°F.

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 157 fuel assemblies with each fuel assembly containing 264 fuel rods clad with Zircaloy-4. Each fuel rod shall have a nominal active fuel length of 144 inches and contain a maximum total weight of 1780 grams uranium. The initial core loading shall have a maximum enrichment of 3.2 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 4.1 weight percent U-235.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 48 full 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:

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

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET NO. 50-339

NORTH ANNA POWER STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 16
License No. NPF-7

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

   A. The application for amendment by Virginia Electric and Power Company (the licensee) dated March 6, 1981, as supplemented March 26, 1981, and August 15, 1981 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. NPF-7 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No.16, 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 the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Attachment:
Changes tto the Technical
Specifications

Date of Issuance: January 19, 1982

ATTACHMENT TO LICENSE AMENDMENT

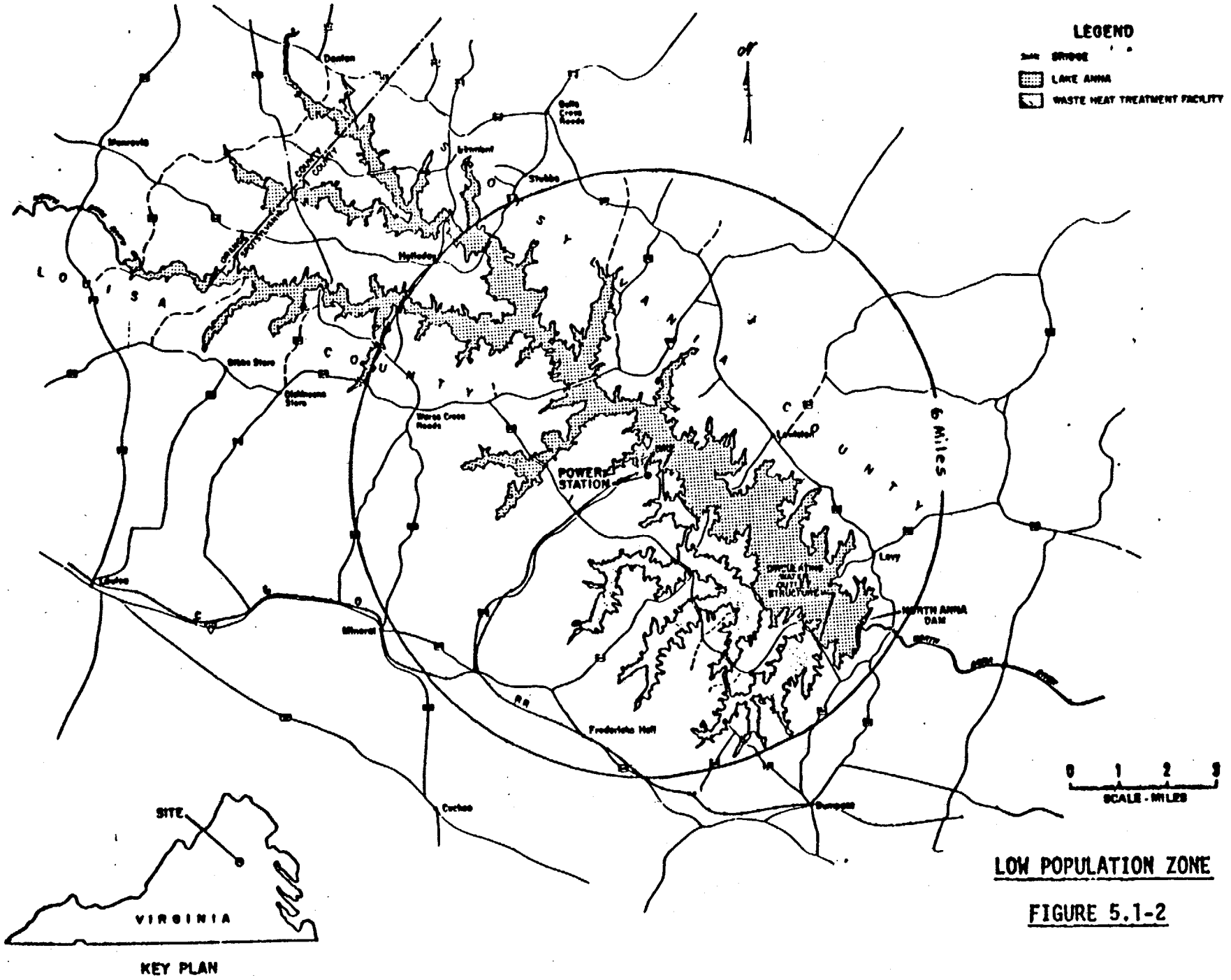
AMENDMENT NO. 16 TO FACILITY OPERATING LICENSE NO. NPF-7

DOCKET NO. 50-339

Replace the following page of the Appendix "A" Technical Specifications with the enclosed page as indicated. The revised page is identified by Amendment number and contains vertical lines indicating the area of change. The corresponding overleaf page is also provided to maintain document completeness.

Pages

5-4



LOW POPULATION ZONE

FIGURE 5.1-2

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 157 fuel assemblies with each fuel assembly containing 264 fuel rods clad with Zircaloy-4. Each fuel rod shall have a nominal active fuel length of 144 inches and contain a maximum total weight of 1780 grams uranium. The initial core loading shall have a maximum enrichment of 3.2 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 4.1 weight percent U-235.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 48 full 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 9957 $\pm$ 10 cubic feet at a nominal T_{avg} of 525°F.

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

SAFETY EVALUATION BY THE OFFICE ON NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NOS.36AND 16TO

FACILITY OPERATING LICENSE NOS. NPF-4 AND NPF-7

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNITS NO. 1 AND NO. 2

DOCKET NOS. 50-338 AND 50-339

Introduction:

By letter dated March 6, 1981 (Serial No. 109) the Virginia Electric and Power Company (the licensee) requested a change to the Technical Specifications (TS) for the North Anna Power Station Units No. 1 and 2. The licensee's request would change the NA-1&2 TS limits for enrichment of new and spent fuel. The licensee's March 6, 1981 letter was supplemented by letters dated March 26, 1981 (Serial No. 195) and August 18, 1981 (Serial No. 495).

The licensee initially proposed to raise the enrichment limit to 4.1 weight percent U-235 with a burnup limit of 45,000 megawatt days per Metric-Ton-Uranium (MWd/MTU). However, the licensee later requested that we approve 4.1 percent U-235 at 38,000 MWd/MTU, which this Safety Evaluation Report (SER) addresses.

On April 29, 1981, we issued Amendments No. 27 and No. 8 to Facility Operating Licensee No. NPF-4 and NPF-7 for NA-1&2 respectively. The SE for these amendments evaluated the safety aspects of storing 4.1 weight percent of U-235 in the new and spent fuel racks. However, the TS limit was set at 3.7 weight percent U-235 until the safety aspects of operating at 4.1 weight percent U-235 could be evaluated.

We have now evaluated the safety aspects of operating with 4.1 weight percent U-235 to 38,000 MWd/MTU with the exception of the effect of fuel failure rates. Until we can complete our review of fuel failure rates, the use of 4.1 weight percent U-235 fuel is based on a burnup to 37,000 MWd/MTU. Other parameters, as discussed below, are evaluated at 38,000 MWd/MTU.

Increases in fuel enrichment and burnup beyond the traditional range covered in the Regulatory Guides and Standard Review Plan could affect the radiological consequences of accidents by changes in the fuel failure rate, changes in the total inventory and mix of radiosotopes in the fuel, the fraction of isotopes accumulated in the fuel-clad gap, iodine spiking behavior, and the effect of fuel rod gas pressure on decontamination factors assumed for fuel handling accidents.

The parameters, as noted above, are discussed below.

Discussion:

CORE FISSION PRODUCT INVENTORY

Changes in enrichment and burnup would affect the total inventory of fission products in the fuel elements, as well as the relative abundance of various isotopes. Based on many years of experience with radiological consequence calculation, the staff's analyses codified in the Regulatory Guides and Standard Review Plan are based on the assumption that the iodine and noble gas isotopes present the radiologically limiting radionuclides. For enrichment/burnup beyond the traditional limits it is necessary to verify that this assumption is valid.

Calculations confirm that the radioiodines and short lived noble gases remain quite constant, but also show an increased core content of other radiologically important nuclides such as Cs-137 or Sr-90. Two types of accidents must be evaluated in light of the changing mix of nuclides: the loss of coolant accident where the release is calculated for leakage through the containment (LOCA), and the accidents for which the leakage bypasses containment and leaks, for instance, through the steam generator.

In the case of the LOCA, the most important mitigating feature is the containment, which would be equally effective for the retention of all fission products. The Surry and North Anna plants have sub-atmospheric containments which will prevent leakage of fission products except for a short pressure spike above atmospheric in case of a large break LOCA. The staff's Safety Evaluation Report (SER) conservatively assumed that the leakage through the containment would continue for one hour. The conservatism in this value is sufficient to accommodate the increase shown in Cs-137 and Sr-90 in the preliminary calculations. For the LOCA pathway which bypasses the containment, the recirculation leakage, these plants have safety grade filters which will filter the effluent prior to release to the environment. The efficiency for filtration of Cs or Sr are greater than that assumed for iodine, by enough margin to account, again, for the calculated core inventory increase.

Therefore, the LOCA can be evaluated for this extension of burnup by traditional methods. The licensee provided results by letters dated March 26, 1981 and August 18, 1981 which showed the noble gas and radioiodine inventories of a core totally fueled with 4.1 weight percent U-235 and burned to the end of the cycle where the batch average discharge burnup would be 38,000 MWd/MTU. The calculation was specific for the North Anna 17 x 17 fuel, but the licensee stated that the minor changes in inventory were representative of both North Anna and Surry. The noble gas inventory was in no case larger than that assumed in the North Anna Final Safety Evaluation Report (FSAR) and therefore the whole body doses from the LOCA are still bounded by the FSAR calculations. However, due to minor differences in radioiodine yields among the fissile nuclides, the calculation showed between 9% and 3% increases in the core content of specific radioiodine isotopes over the FSAR values. The staff's calculation of the thyroid dose at the exclusion area boundary (EAB) reported in the SER was 113 rem; allowing a 9% increase (the value appropriate to I-131) the calculated dose of 123 rem still indicates that the plant is adequately designed against the LOCA and that the dose mitigating features are adequate. The same conclusions apply to Surry; the staff's evaluation of the thyroid dose from the LOCA, 220 rem at the EAB, would still be below the guideline value for the increased inventory.

For other accidents that bypass the containment and release, for instance through the steam generator, the gap content of radionuclides is important and is discussed as follows.

GAP INVENTORY

In considering those accidents where the content and pressure of the rod are important, the staff evaluated whether the traditional gap fraction of volatile radionuclides (10% except Kr-85 which is 30%) remains adequate. The gap fractions of radioactive volatiles are determined mainly by three parameters: The half life, the linear heat generation rate (LHGR) and the burnup (other factors of less importance since the fuel designs have remained relatively unchanged are surface to volume ratio of the pellets and the effective density). The state-of-the-art calculational technique for gap release is embodied in the ANS proposed standard 5.4. The licensee provided calculations using this model which showed that the propensity to release more volatiles into the gap due to burnup was more than compensated by the reduction in LHGR within the high burnup modules. This conclusion is dependent on the proposed fuel management scheme where the high burnup modules are in non-limiting locations, and the burnup limit of 38,000 MWd/MTU. The staff then evaluated whether the gap inventories of modules in limiting locations would exceed the usually assumed 10% value. Since the gap release model is a "best estimate," the peaking factors used to infer a peak LHGR were plant specific technical speficifation maxima, thereby preserving a suitably "conservative" resulting inventory. For all the plants, the traditional release fractions (to the gap) for noble gases remains conservative for first and second cycle fuel. For North Anna, the maximum LHGR is 11.4 KW/ft. and the ANS 5.4 model predicts that 10% release is not exceeded for all iodine isotopes. This assures that thyroid doses calculated on the basis of 10% of each isotope of iodine are still conservative.

More than 10% of the Cs-137 is in the gap for rods of the North Anna peak LHGR no earlier than about 10,000 MWd/MTU. However, for the higher burnup fuel, where the Cs-137 rod content is increased, the LHGR is lower than this maximum. For this species the lower volatility compared to elemental iodine will limit its release.

IODINE SPIKING

The phenomenon of iodine spiking has been considered by the licensee. No changes in the plants' technical specifications are requested for the magnitude of the equilibrium or the "spike" iodine concentration, the surveillance requirements, or the restriction on the total time a plant may operate above the equilibrium concentration. Combined, then, with the lower fraction of radioiodines in the gaps of higher burnup rods, these factors assure that the staff's modeling of the "spiking" in accident calculation remains conservative.

DECONTAMINATION FACTORS

The total pressure of gas in the fuel rods is increased at high burnup. During a fuel handling accident, the higher pressure would cause the bubbles containing the radionuclides to rise more quickly to the pool surface, thereby reducing the time available for diffusion of iodine into the water. The licensee has provided a reanalysis of a decontamination experiment performed by Westinghouse Electric Corporation in 1970 (proprietary). The reanalysis, which was based on a best fit to the data, showed that, at the pressure that would be obtained following high burnup, a decontamination factor of 600 would be appropriate. The staff has independently reviewed the data and has determined that a value that can be supported by more than 90% of the data should be used, especially where extrapolation beyond the range of the experiment is necessary. The staff has concluded that a factor no higher than 300 is justified by the data. However the traditional value of a decontamination factor of 100, will provide additional margin for uncertainties in the experiment and is acceptable for a bubble rise distances in the pool to about 22 feet at 38,000 MWd/MTU batch average at discharge.

FUEL FAILURE RATE

We have assessed information currently available from operation with similar fuel at other Westinghouse plants and we conclude that there is reasonable assurance that an increase in batch average burnup to 37,000 MWd/MTU would impose no significant hazards considerations and would not endanger the public health and safety.

Evaluation:

We conclude, therefore, that the use of 4.1 weight percent U-235 exposed to a burnup of 37,000 MWd/MTU batch average at discharge does not substanially alter the previously calculated consequences of accidents provided the LHGR remains at the value implied by the present Technical Specification on peaking factors. The minor increase in the calculated LOCA dose, due to minor differences in yield of iodines among the fissioning species can be accommodated within the 10 CFR Part 100 guidelines.

Therefore, based on the above, the NA 1&2 TS limits are hereby revised to allow an increase in enrichment for new and spent fuel to 4.1 weight percent U-235.

Environmental Consideration

We have determined that the amendments do not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendments involve an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendments do not involve a significant increase in the probability or consequences of accidents previously considered and do not involve a significant decrease in a safety margin, the amendments do not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: January 19, 1982

Principal Contributors

Jocelyn A Mitchell
Leon B. Engle

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NOS. 50-338 AND 50-339

VIRGINIA ELECTRIC AND POWER COMPANY

NOTICE OF ISSUANCE OF AMENDMENTS TO FACILITY

OPERATING LICENSES

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendments No.36and No.16to Facility Operating License Nos. NPF-4 and NPF-7 issued to the Virginia Electric and Power Company (the licensee) for operation of the North Anna Power Station, Units No. 1 and No. 2 (the facility) located in Louisa County, Virginia. The amendments are effective as of the date of issuance.

The amendments revise the NA-1&2 Technical Specifications to allow an increase in enrichment for new and spent fuel from 3.7 weight percent of U-235 to 4.1 weight percent of U-235.

The application for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendments. Prior public notice of the amendments was not required since the amendments do not involve a significant hazards consideration.

The Commission has determined that the issuance of the amendments will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of the amendments.

For further details with respect to this action, see (1) the application for amendments dated March 6, 1981 as supplemented March 26, 1981, and August 18, 1981 (2) Amendment No. 36 and No. 16 to Facility Operating Licenses No. NPF-4 and NPF-7 and (3) the Commission's related Safety Evaluation. These items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D. C. 20555 and at the Board of Supervisor's Office, Louisa County Courthouse, Louisa, Virginia 23093 and at the Alderman Library, Manuscripts Department, University of Virginia, Charlottesville, Virginia 22901. A copy of items (2) and (3) may be obtained upon request to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Licensing

Dated at Bethesda, Maryland this 19th Day of January, 1982.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing