June 6, 1990

Docket Nos. 50-338
and 50-339

DISTRIBUTION
See attached sheet

Mr. W. L. Stewart
Senior Vice President - Nuclear
Virginia Electric and Power Company
5000 Dominion Blvd.
Glen Allen, Virginia 23060

Dear Mr. Stewart:

SUBJECT: NORTH ANNA UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS RE: FUEL ENRICHMENT (TAC NOS. 69798 AND 69799)

The Commission has issued the enclosed Amendment Nos. 127 and 111 to Facility Operating License Nos. NPF-4 and NPF-7 for the North Anna Power Station, Units No. 1 and No. 2 (NA-1&2). The amendments revise the Technical Specifications (TS) in response to your letter dated September 30, 1988, as supplemented August 18, 1989.

The amendments increase the allowable enrichment of fuel assemblies irradiated at NA-1&2 to 4.3 weight percent U-235.

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. 127 to NPF-4
2. Amendment No. 111 to NPF-7
3. Safety Evaluation

cc w/enclosures:
See next page

OFC	LA:PD22	PM:PD22	D:PD22	OGC	SRXB	
NAME	DMiller	LEngle:jkd:	HBerkow	BMB	R.Jones	
DATE	5/14/90	5/15/90	5/16/90	5/15/90	5/15/90	

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Document Name: AMEND NA 69798/69799

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1/1

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DATED: June 6, 1990

AMENDMENT NO. 127 TO FACILITY OPERATING LICENSE NO. NPF-4-NORTH ANNA UNIT 1
AMENDMENT NO. 111 TO FACILITY OPERATING LICENSE NO. NPF-7-NORTH ANNA UNIT 2

Docket File
NRC & Local PDRs
PDII-2 Reading
S. Varga, 14/E/4
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
G. Hill (8), P1-137
Wanda Jones, P-130A
J. Calvo, 11/F/23
ACRS (10)
GPA/PA
OC/LFMB
M. Sinkule, R-II

cc: Plant Service list

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. 127
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, as supplemented August 18, 1989, 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. 127 , 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 issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Herbert N. Berkow, Director
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: June 6, 1990

ATTACHMENT TO LICENSE AMENDMENT NO. 127

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.

Page

5-4

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 4.3 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

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

DOCKET NO. 50-339

NORTH ANNA POWER STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 111
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, et al., (the licensee) dated September 30, 1988, as supplemented August 18, 1989, 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. 111 , 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 issuance and shall be implemented within 30 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Herbert N. Berkow, Director
Project Directorate II-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: June 6, 1990

ATTACHMENT TO LICENSE AMENDMENT NO. 111

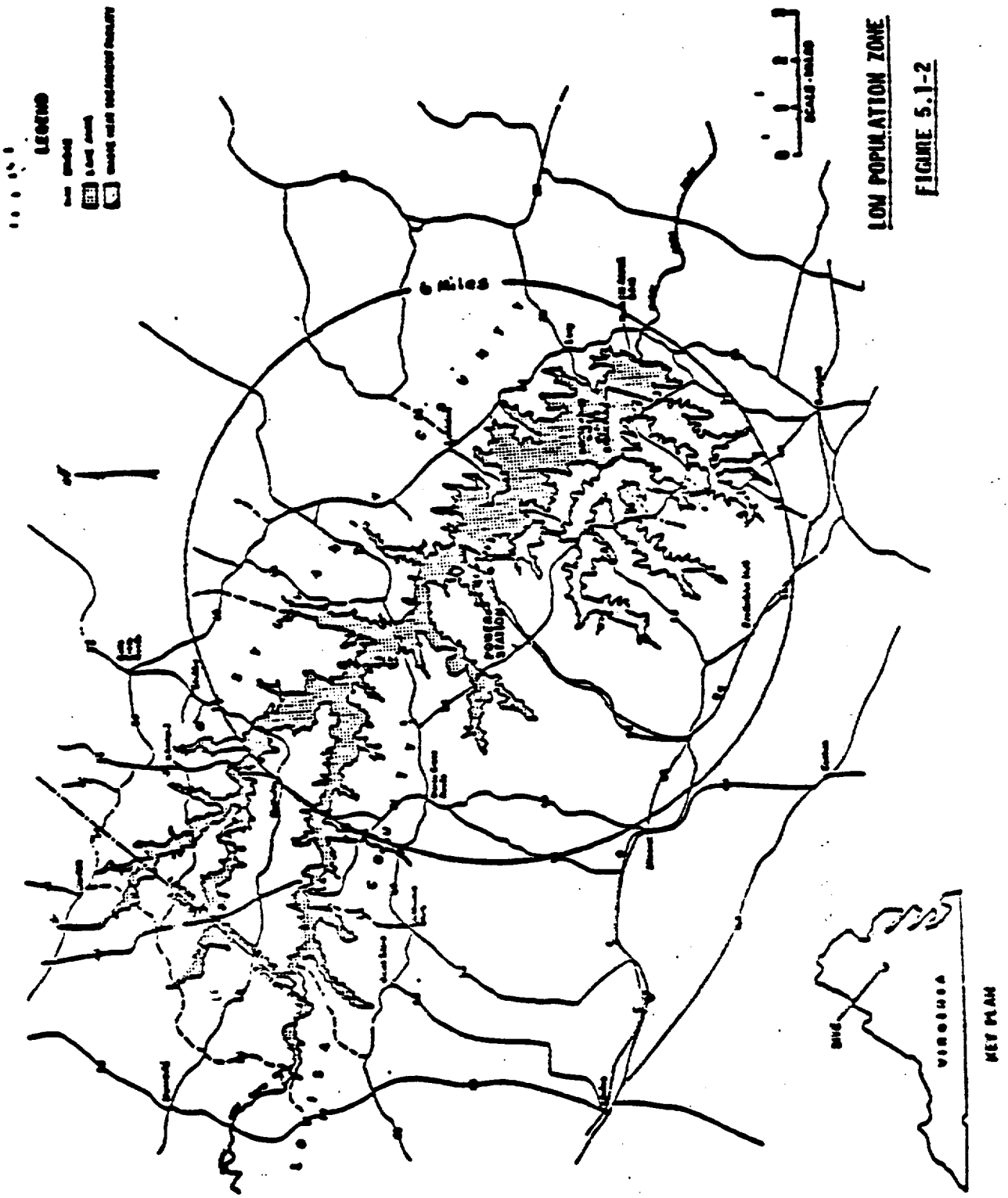
TO FACILITY OPERATING LICENSE NO. NPF-7

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.

Page

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 4.3 weight percent U-235.

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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 OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 127 AND 111 TO

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

VIRGINIA ELECTRIC AND POWER COMPANY

OLD DOMINION ELECTRIC COOPERATIVE

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

DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

By letter dated September 30, 1988, as supplemented August 18, 1989, 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 (NA-1&2). The proposed change would increase the allowable enrichment of fuel assemblies irradiated at NA-1&2 to 4.3 weight percent (w/o) U-235. An increase in the current NA-1&2 Technical Specifications (TS) limit of 4.1 w/o U-235 to 4.3 w/o U-235 would allow an increase in batch average discharge burnup to levels approaching the currently licensed limit of 45,000 Megawatt Days per Metric Ton Uranium (MWD/MTU). The enrichments currently used limit the batch average burnup to a value from 38,000 MWD/MTU to 42,000 MWD/MTU depending on the number of fuel assemblies loaded each cycle. An increase in the enrichment limit would result in significant fuel cost cycle savings and enhance fuel management plans to increase batch average discharge burnups.

The safety impact for operation of NA-1&2 with high burnup fuel was previously addressed by the licensee in letters to the NRC dated December 4, 1980, March 6 and 26, 1981 and July 24, 1981. By letter dated April 9, 1984, the NRC approved operation of NA-1&2 to a batch discharge of 45,000 MWD/MTU. A generic impact of extended burnup on the design and operation of Westinghouse fuel was addressed in WCAP-10125-P-A, "Extended Burnup Evaluation of Westinghouse Fuel," dated December 1985. In addition, the NRC made an independent assessment of the environmental and economic impacts of the use of extended burnup fuel in light water power reactors. This assessment was dated February 1988 and entitled "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors," Pacific Northwest Laboratory, NUREG/CR-3009. The overall findings of NUREG/CR-3009 were that no significant adverse effects would be generated by increasing the present batch-average burnup level to values of 50,000 MWD/MTU or above, as long as the maximum rod average burnup of any rod is no greater than 60,000 MWD/MTU. Since the findings of these evaluations provided in NUREG/CR-3009 concerning the impact of extended burnup fuel are valid for an enrichment of 4.3 w/o U-235, and since the NA-1&2 spent fuel storage facility is currently licensed to 4.3 w/o U-235 (NA-1&2 Amendment Nos. 61 and 45 issued

December 21, 1984), the license's submittal addresses only the impact of increased enrichment on the requirements for the currently approved new fuel storage racks at NA-1&2.

The specific 10 CFR Part 50 Appendix A General Design Criteria for new fuel storage facilities are listed in Section 9.1.1 of the Standard Review Plan (NUREG-0800). Since no physical modifications are being made to the current NA-1&2 new fuel racks, the licensee's analysis only addresses the impact of the increased enrichment on the requirement of subcriticality under normal and postulated abnormal rack conditions (General Design Criterion 62). The highest effective multiplication factor (K-effective)* allowable by Section 9.1.1 of NUREG-0800 for all conditions is less than 0.95 fully flooded and 0.98 for optimum low density moderation.

The August 18, 1989 letter provided additional information concerning the licensee's environmental assessment of extending the current limits on enrichment. The additional information did not alter in any way the staff's initial determination of no significant hazards consideration as noticed in the Federal Register on November 16, 1988 (53 FR 46163).

2.0 DISCUSSION

The new fuel storage area at NA-1&2 consists of nine parallel rows of storage racks with a total capacity of 126 fuel assemblies. Each storage location consists of a square 9 inch (inside measure) stainless steel box, 165 inches tall with walls 1/8 inch thick. The storage area walls and floor are concrete. A steel grating at the top prevents accidental placement of an assembly between storage cans. The storage area is normally dry.

The computer modeling of the storage racks was performed in three-dimension (3-D) to minimize unnecessary conservatism and uncertainty. All K-effective calculations were performed with the Monte-Carlo program KENO V.a within the SCALE package. The SCALE package automatically processes cross sections through NITAWL and BONAMI to create a set of resonance self-shielded cross sections for use by KENO. This code is widely used for nuclear criticality analysis and is acceptable. Because all calculations for this analysis were made using a discrete pin representation, no spatial self shielding was performed prior to the KENO execution. The cross section set chosen was the 27 group ENDF/B-IV data contained in the SCALE package. Sufficient neutron histories were run for each case to limit the statistical uncertainties in the K-effective to less than 0.4% delta K/K.

The base condition for the analysis consisted of a fully loaded storage area of 126 fresh 4.3 w/o U^{235} enriched assemblies centered nominally in the storage cans. Fuel assembly dimensions and material data are provided below:

*K-effective is the ratio of neutrons from fissions in each generation to the total number lost by absorption and leakage in the preceding generations. To achieve criticality in a finite system, K-effective must equal 1.0.

NORTH ANNA 17 X 17 FUEL ASSEMBLY DATA

Fuel Enrichment	--	4.3 w/o U^{235}
Assembly Pitch	--	8.466 in.
Pellet Diameter	--	0.3225 in.
Diametral Gap	--	0.0065 in
Clad Thickness	--	0.0225 in
Clad O.D.	--	0.3740 in.
Pellet Material	--	95% th. dens. UO_2
Clad Material	--	Zircaloy-4
Fuel Rod Pitch	--	0.4960 in.
Active Fuel Length	--	144.0 in.
Fuel Rods/Assembly	--	264
Guide Tubes/Assembly	--	25
Guide Tube Material	--	Zircaloy-4
Guide Tube O.D.	--	0.482 in.
Guide Tube I.D.	--	0.450 in.

Several fuel assembly and rack components have been neglected in this model for simplicity and conservatism. Assembly top and bottom nozzles (SS-304), grids (Inconel), sleeves (SS-304), and all storage rack structural materials other than the storage can itself were modeled as void or moderator regions. These omissions are all conservative from a criticality standpoint because steel and Inconel are both strong neutron absorbers. The air regions in the storage area were modeled as water vapor at 10^{-8} gram per cubic centimeter (g/cc).

Normal air humidity variations from dry conditions to heavy fog can result in water densities ranging from 0 to .0025 g/cc. In addition, fire or a pipe break can result in flooding of the storage area by foam or water of many possible densities. To allow for these conditions, the air regions in the storage area were assigned water densities ranging from 10^{-6} g/cc to 0.998 g/cc.

Eccentric assembly positioning or a seismic event can lead to small assembly pitch changes. Assuming the rack does not deform leads to a maximum pitch change for any two assemblies of ±0.57 inches. Although any pitch changes are likely to be random, the effect of pitch reduction on K-effective has been conservatively determined by reducing the pitch of all the storage locations by 0.5 and 1.0 inch.

A dropped assembly could result in the fuel being compacted within the storage cell. To conservatively model this accident, the fuel pellet diameter of all assemblies in the rack was increased 10%. Calculations were performed assuming no change in assembly height and with a change in assembly height which preserves the total fuel volume (both at 95% theoretical density UO_2) The compaction effect was determined at two moderator densities. In the compaction model the fuel was assumed to contact and radially expand the clad (i.e., clad thickness was preserved).

The results of the analysis for the worst-case normal configuration (including humidity changes and pitch changes) showed that K-effective is 0.572. When all uncertainties (95/95) are statistically combined and added, the result is 0.587.

The results of the analysis for the worst-case abnormal configuration (worst-case normal configuration plus maximum difference caused by accident condition) showed that K-effective is 0.884. When all uncertainties (95/95) are statistically combined and added, the result is 0.914.

3.0 EVALUATION

The results discussed above indicate that for a fuel enrichment of 4.3 w/o U^{235}, the NA-1&2 new fuel storage area meets the criticality limit of K-effective less than 0.95 fully flooded and 0.98 for optimum low density moderation, the criticality specifications set forth in the Standard Review Plan (NUREG-0800) and the requirements of 10 CFR Part 50 Appendix A General Design Criteria 62. Finally, the safety analysis approved in the NA-1&2 Amendments No. 61 and 45 issued December 21, 1984 provide the same assurance for spent fuel.

4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact have been prepared and published in the Federal Register on June 6, 1990 (55 FR 23154). Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of these amendments will not have a significant effect on the quality of the human environment.

5.0 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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

Date: June 6, 1990

Principal Contributor:
Leon Engle