November 22, 1983

Distribution
Docket File
NRC PDR
Local PDR
H Denton
OELD
ORB 1
D Eisenhut
C Parrish
D Fischer
SECY
L J Harmon
E Jordan
J Taylor
T Barnhart (8)
W Jones
D Brinkman
ACRS (10) GRAY Files
OPA CMiles R Diggs

Docket Nos. 50-272
and 50-311

Mr. Richard A. Uderitz, Vice President -
Nuclear
Public Service Electric and Gas Company
Post Office Box 236
Hancocks Bridge, New Jersey 08038

Dear Mr. Uderitz:

The Commission has issued the enclosed Amendment No. 55 to Facility Operating License No. DPR-70 and Amendment No. 22 to Facility Operating License No. DPR-75 for the Salem Nuclear Generating Station, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications in response to your application transmitted by letter dated December 3, 1982.

These amendments increase the maximum reload fuel enrichment from 3.5 weight percent U-235 to 4.05 weight percent U-235.

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

Sincerely,

Donald Fisher, Project Manager
Operating Reactors Branch No. 1
Division of Licensing

Enclosures:
1. Amendment No. 55 to DPR-70
2. Amendment No. 22 to DPR-75
3. Safety Evaluation

cc w/enclosures:
See next page

cp 11/15/83

8312080184 831122
PDR ADOCK 05000272
P PDR

OFFICE	ORB#1	ORB#1	ORB#1	AD/OR	OELD	D:DL	
SURNAME	CParrish	DFischer;ef	SVarga	GLainas		DEisenhut	
DATE	10/14/83	10/26/83	10/26/83	10/27/83	10/ /83	10/ /83	

NRC FORM 318 (10/80) NRCM 0240 **OFFICIAL RECORD COPY** ☆ U.S. GPO 1983—400-247

cc: Mark J. Wetterhahn, Esquire
Conner and Wetterhahn
Suite 1050
1747 Pennsylvania Avenue, NW
Washington, D. C. 20006

Richard Fryling, Jr., Esquire
Assistant General Solicitor
Public Service Electric and Gas Company
P.O. Box 570 - Mail Code T5E
Newark, New Jersey 07101

Gene Fisher, Bureau of Chief
Bureau of Radiation Protection
380 Scotch Road
Trenton, New Jersey 08628

Mr. John M. Zupko, Jr.
General Manager - Salem Operations
Public Service Electric and Gas Company
P. O. Box E
Hancock Bridge, New Jersey 08038

Mr. Dale Bridenbaugh
M.H.B. Technical Associates
1723 Hamilton Avenue
San Jose, California 95125

Leif J. Norrholm, Resident Inspector
Salem Nuclear Generating Station
U. S. Nuclear Regulatory Commission
Drawer I
Hancocks Bridge, New Jersey 08038

Richard F. Engel
Deputy Attorney General
Department of Law and Public Safety
CN-112
State House Annex
Trenton, New Jersey 08625

Richard B. McGlynn, Commissioner
Department of Public Utilities
State of New Jersey
101 Commerce Street
Newark, New Jersey 07102

Mr. Edwin A. Liden, Manager
Nuclear Licensing and Regulation
Public Service Electric and Gas Co.
Post Office Box 236
Hancocks Bridge, New Jersey 08038

Regional Radiation Representative
EPA Region II
26 Federal Plaza
New York, New York 10007

Mr. R. L. Mittl, General Manager -
Nuclear Assurance and Regulation
Public Service Electric and Gas Company
Mail Code T16D - P.O. Box 570
Newark, New Jersey 07101

Regional Administrator - Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pennsylvania 19406

Lower Alloways Creek Township
c/o Mary O. Henderson, Clerk
Municipal Building, P.O. Box 157
Hancocks Bridge, New Jersey 08038

Mr. Alfred C. Coleman, Jr.
Mrs. Eleanor G. Coleman
35 K Drive
Pennsville, New Jersey 08070

Mr. R. A. Uderitz
Public Service Electric and Gas Company

cc: Carl Valore, Jr., Esquire
Valore, McAllister, Aron and
Westmoreland, P.A.
535 Tilton Road
Northfield, New Jersey 08225

June D. MacArtor, Esquire
Deputy Attorney General
Tatnall Building
P. O. Box 1401
Dover, Delaware 19901

Harry M. Coleman, Mayor
Lower Alloways Creek Township
Municipal Hall
Hancocks Bridge, New Jersey 08038

Mr. Charles P. Johnson
Assistant To Vice President - Nuclear
Public Service Electric and Gas Company
P. O. Box 570
80 Park Plaza - 15A
Newark, New Jersey 07101

Mr. David Wersan
Assistant Consumer Advocate
Office of Consumer Advocate
1425 Strawberry Square
Harrisburg, Pennsylvania 17120

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

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
PHILADELPHIA ELECTRIC COMPANY
DELMARVA POWER AND LIGHT COMPANY
ATLANTIC CITY ELECTRIC COMPANY

DOCKET NO. 50-272

SALEM NUCLEAR GENERATING STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 55
License No. DPR-70

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

   A. The application for amendment by Public Service Electric and Gas Company, Philadelphia Electric Company, Delmarva Power and Light Company and Atlantic City Electric Company (the licensees) dated December 3, 1982, 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. DPR-70 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 55 , 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

Steven A. Varga

Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 22, 1983

ATTACHMENT TO LICENSE AMENDMENT NO.55

FACILITY OPERATING LICENSE NO. DPR-70

DOCKET NO. 50-272

Revise Appendix A as follows:

Remove Pages	Insert Pages
5-4	5-4
5-5	5-5

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The reactor containment building is designed and shall be maintained for a maximum internal pressure of 47 psig and an air temperature of 271°F.

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 193 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 143.7 inches and contain a maximum total weight of 1766 grams uranium. The initial core loading shall have a maximum enrichment of 3.35 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 4.05 weight percent U-235

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 53 full length and no part 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 4.1 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 12,811 $\pm$ 100 cubic feet at a nominal T_{avg} of 576.7°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY

5.6.1 The new and spent fuel storage racks are designed and shall be maintained with a nominal 21 inch center-to-center distance between new fuel assemblies and a nominal 10.5 inch center-to-center distance between spent fuel assemblies placed in the storage racks to ensure a k_{eff} equivalent to $\leq$ 0.95 with the storage pool filled with unborated water. The k_{eff} of $\leq$ 0.95 includes a conservative allowance of 2.2% $\Delta k/k$ for uncertainties.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 124'8".

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1170 fuel assemblies. Each assembly is limited to 4.05 weight percent U-235.

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

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
PHILADELPHIA ELECTRIC COMPANY
DELMARVA POWER AND LIGHT COMPANY
ATLANTIC CITY ELECTRIC COMPANY

DOCKET NO. 50-311

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No.22
License No. DPR-75

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

   A. The application for amendment by Public Service Electric and Gas Company, Philadelphia Electric Company, Delmarva Power and Light Company and Atlantic City Electric Company (the licensees) dated December 3, 1982, 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. DPR-75 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 22, 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

Steven A. Varga

/Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 22, 1983

ATTACHMENT TO LICENSE AMENDMENT NO. 22

FACILITY OPERATING LICENSE NO. DPR-75

DOCKET NO. 50-311

Revise Appendix A as follows:

Remove Pages	Insert Pages
5-4	5-4
5-5	5-5

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The reactor containment building is designed and shall be maintained for a maximum internal pressure of 47 psig and an air temperature of 271°F.

5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The reactor core shall contain 193 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 143.7 inches and contain a maximum total weight of 1766 grams uranium. The initial core loading shall have a maximum enrichment of 3.35 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 4.05 weight percent U.235.

CONTROL ROD ASSEMBLIES

5.3.2 The reactor core shall contain 53 full length and no part 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 4.1 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 12,811 ± 100 cubic feet at a nominal T_{avg} of 581.0°F.

5.5 METEOROLOGICAL TOWER LOCATION

5.5.1 The meteorological tower shall be located as shown on Figure 5.1-1.

5.6 FUEL STORAGE

CRITICALITY

5.6.1 The new and spent fuel storage racks are designed and shall be maintained with:

a. A k_{eff} equivalent to less than or equal to 0.95 when flooded with unborated water, which includes a conservative allowance of 2.2% delta k/k for uncertainties.

b. A nominal 21 inch center-to-center distance for new fuel storage racks and 10.5 inch center-to-center distance for spent fuel storage racks.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 124'8".

CAPACITY

5.6.3 The fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1170 fuel assemblies. Each assembly is limited to 4.05 weight percent U-235.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO.55 TO FACILITY OPERATING LICENSE NO. DPR-70

AND AMENDMENT NO. 22 TO FACILITY OPERATING LICENSE NO. DPR-75

PUBLIC SERVICE ELECTRIC AND GAS COMPANY,
PHILADELPHIA ELECTRIC COMPANY,
DELMARVA POWER AND LIGHT COMPANY, AND
ATLANTIC CITY ELECTRIC COMPANY

SALEM NUCLEAR GENERATION STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-272 AND 50-311

Introduction

By letter from E. A. Liden to S. A Varga dated December 3, 1982, Public Service Electric and Gas Company has requested an amendment to Facility Operating License DPR-70 for Salem Unit 1 and DPR-75 for Salem Unit 2. This proposed change will increase the maximum reload fuel enrichment from 3.5 weight percent U-235 to 4.05 weight percent U-235. The submittal includes analyses of the effects of the higher enrichment on the criticality aspects of both the new and spent fuel racks at the Salem Units. Evaluation of higher enriched fuel when used in the reactor will be done on a cycle specific basis. Each reload safety evaluation compares the cycle specific core peaking factors, kinetics parameters, and other appropriate safety margins to the assumptions and input values used in the current accident analyses thus confirming that the cycle design ensures adherence to the plant operating limitations given in the Safety Limits, Reactivity and Power Distribution sections of the Technical Specifications. These amendments do not request any changes of operating limitations, safety limits, reactivity, or power distributions for the reactor core that are currently set forth in the Technical Specifications, thereby assuring that all safety margins will be retained. The higher enrichment will allow extension of operation to an eighteen month cycle.

Criticality Analysis Methods

The criticality aspects of the storage of 4.05 weight percent fuel in both the new and spent fuel racks have been analyzed using the KENO-IV Monte Carlo computer code for reactivity determination with neutron cross sections generated by the AMPX code package. These codes have been benchmarked against a set of 27 critical experiments in the range of pellet diameters, water-to-fuel ratios and U-235 enrichments that encompasses the Salem design. This benchmarking led to the conclusion that the calculational model is capable of determining the multiplication factor (k_{eff}) of the new and spent fuel racks to within 1.3 percent with a 95 percent probability at the 95 percent confidence level.

New Fuel Storage Rack Analysis

The criticality of fuel assemblies in the new fuel storage rack is prevented by maintaining a minimum separation of 21 inches between assemblies. Although new fuel is normally stored in a dry configuration, the NRC acceptance criteria for new fuel storage is that there is a 95 percent probability at a 95 percent confidence level (including uncertainties) that k_{eff} of the fuel assembly array will be; (1) no greater than 0.95 when fully loaded and flooded with unborated water and (2) no greater than 0.98 under conditions of optimum moderation if higher reactivities can be attained at achievable moderation conditions other than full density unborated water.

In addition to the calculational method uncertainty mentioned previously, uncertainties and biases due to mechanical tolerances such as stainless steel thickness, cell inner diameter, center-to-center spacing, and asymmetric assembly position are included either by using worst case initial conditions or by performing sensitivity studies to obtain the appropriate values. Credit is taken for the neutron absorption in the full length stainless steel angle irons at the corners of each fuel assembly.

Using these methods and assumptions, the nominal k_{eff} of the new fuel storage racks fully flooded with unborated water is calculated as 0.9189. Adding the appropriate uncertainties and biases yields a value of 0.9343 for the multiplication factor. This meets our acceptance criterion of 0.95. Physically achievable water densities which could be caused by fire fighting operations such as sprinklers or fog nozzles are considerably too low (much less than 0.01 gm/cc) to yield k_{eff} values higher than full density water, and boiling between cells is prevented by the rack design. In addition, events such as the inadvertent drop of an assembly between the outside periphery of the rack and the pit wall would not cause a criticality accident because of the double contingency principle. This states that it is unnecessary to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Therefore, for accidents such as this, the absence of water in the new fuel storage pit can be assumed since assuming its presence would be a second unlikely event. Without water, any postulated assembly drop accident would result in a k_{eff} value very much less than our acceptance criterion of 0.98 for accidents. We, therefore, conclude that fuel assemblies of the Westinghouse 17x17 design having enrichments no greater than 4.05 weight percent may be stored in the Salem new fuel racks.

Spent Fuel Storage Rack Analysis

The criticality of fuel assemblies in the spent fuel storage rack is prevented by maintaining a minimum separation of 10.5 inches between assemblies and by inserting the neutron absorber, Boral, between assemblies. Although spent fuel is normally stored in borated pool water containing approximately 2000 ppm boron, the NRC acceptance criterion for spent fuel storage is that there is a 95 percent probability at a 95 percent confidence level (including uncertainties) that k_{eff} of the fuel assembly array will be less than 0.95 when fully flooded with unborated water.

In addition to the calculational method uncertainty mentioned previously, uncertainties and biases due to mechanical tolerances, thermal conditions, and B_4C particle self-shielding are included either by using worst case initial conditions or by performing sensitivity studies to obtain the appropriate values. Credit is taken for the neutron absorption in full length structural materials and in solid materials added specifically for neutron absorption. However, for conservatism, the minimum poison loading is assumed in these cases.

Using these methods and assumptions, the nominal k_{eff} of the spent fuel racks fully flooded with unborated water is calculated as 0.9222. Adding the appropriate uncertainties and biases yields a value of 0.944 for the multiplication factor. This meets our acceptance criterion of

0.95. Postulated events such as the inadvertent drop of an assembly between the outside periphery of the rack and the pool wall would not cause a criticality accident because of the double contingency principle. In other words, for accident conditions, the presence of soluble boron in the storage pool can be assumed and would result in a k_{eff} value very much less than our acceptance criterion of 0.98 for accidents. We, therefore, concluded that fuel assemblies of the Westinghouse 17x17 design having enrichments no greater than 4.05 weight percent may be stored in the Salem spent fuel pool.

Decay Heat Load

We have reviewed the licensee's submittal from the standpoint of decay heat load and spent fuel pool cooling capability, and conclude that the increased enrichment of the fuel produces a negligible addition to the total decay heat production profile. Thus we conclude that the existing spent fuel pool cooling system is capable of handling the increased heat load.

Summary

Based on our review, which is summarized above, we conclude that any number of Westinghouse design 17x17 fuel assemblies of maximum enrichment no greater than 4.05 weight percent U-235 may be stored in the new and spent fuel racks of Salem Units 1 and 2. Our conclusion is based on the following:

1. The criticality calculations were performed with state-of-the-art models and methods.
2. Uncertainties have been accounted for.
3. Postulated accidents have been considered.
4. The multiplication factor, including uncertainties, meets our acceptance criteria for this quantity.

Also, the proposed changes to section 5 of the Salem Units 1 and 2 Technical Specifications adequately accounted for the reload fuel enrichment increase and are, therefore, acceptable.

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 this amendment.

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

Date: November 22, 1983

Principal Contributor:
L. Kopp