May 30, 1990

Docket No. 50-311

Mr. Steven E. Miltenberger
Vice President and Chief Nuclear Officer
Public Service Electric & Gas Company
Post Office Box 236
Hancocks Bridge, New Jersey 08038

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JStone	MThadani	

Dear Mr. Miltenberger:

SUBJECT: INCREASED MAIN STEAM ISOLATION VALVE CLOSURE TIME, SALEM GENERATING STATION, UNIT NO. 2 (TAC NO. 76415)

The Commission has issued the enclosed Amendment No. 91 to Facility Operating License No. DPR-75 for the Salem Generating Station, Unit No. 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated April 4, 1990, and supplemented by letters dated April 12, 1990, April 20, 1990 and May 7, 1990. The May 7, 1990 letter provided information concerning the schedule for resolution of the main steam isolation valve slow closure time and did not increase the scope of the original amendment request and did not affect the staff's original no significant hazards determination.

This amendment increases the allowable closure time of the main steam isolation valves from 5 seconds to 8 seconds until restart from the sixth refueling outage. The amendment for Unit 1 was processed as an emergency technical specification change in accordance with 10 CFR 50.91(a)(5).

A copy of our safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/s/
James C. Stone, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 91 to License No. DPR-75
2. Safety Evaluation

cc w/enclosures:
See next page

[SALEM AMEND 76415]

PDI-2/LA	PDI-2/PM	PDI-2/D
MO'Brien	JStone:bld	WButler
/ /90	5/29/90	5/29/90

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P PDC

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

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Vice President and Chief Nuclear
Officer
Public Service Electric & Gas Company
Post Office Box 236
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License No. DPR-75
2. Safety Evaluation

cc w/enclosures:
See next page

Mr. Steven E. Miltenberger
Public Service Electric & Gas Company

Salem Nuclear Generating Station

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

PUBLIC SERVICE ELECTRIC & GAS COMPANY

PHILADELPHIA ELECTRIC COMPANY

DELMARVA POWER AND LIGHT COMPANY

ATLANTIC CITY ELECTRIC COMPANY

DOCKET NO. 50-311

SALEM GENERATING STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 91
License No. DPR-75

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

   A. The application for amendment filed by the Public Service Electric & Gas Company, Philadelphia Electric Company, Delmarva Power and Light Company and Atlantic City Electric Company (the licensees) dated April 4, 1990, and supplemented by letters dated April 12, 1990, April 20, 1990 and May 7, 1990, 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 set forth in 10 CFR Chapter I;

   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:

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P PDC

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 91 , 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 its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/s/

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects - I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 30, 1990

OFC	PDI-2/LA	PDI-2/PM	OGC	PDI-2/D
NAME	MO'Brien	JStone:bld		WButler
DATE	05/ /90	05/17/90	05/22/90	05/29/90

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Document Name: SALEM AMEND 76415

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 91 , 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 its date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Walter R. Butler

Walter R. Butler, Director
Project Directorate I-2
Division of Reactor Projects - I/II

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 30, 1990

ATTACHMENT TO LICENSE AMENDMENT NO. 91

FACILITY OPERATING LICENSE NO. DPR-75

DOCKET NO. 50-311

Revise Appendix A as follows:

Remove Pages	Insert Pages
3/4 3-29	3/4 3-29
3/4 3-30	3/4 3-30
3/4 7-10	3/4 7-10

TABLE 3.3.5 (Continued)

ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
3. Pressurizer Pressure-Low	
a. Safety Injection (ECCS)	$\leq 27.0^{(1)}/12.0^{(2)}$
b. Reactor Trip (from SI)	≤ 2.0
c. Feedwater Isolation	≤ 7.0
d. Containment Isolation-Phase "A"	$\leq 18.0^{(2)}$
e. Containment Ventilation Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	≤ 60
g. Service Water System	$\leq 49.0^{(1)}/13.0^{(2)}$
4. Differential Pressure Between Steam Lines-High	
a. Safety Injection (ECCS)	$\leq 12.0^{(2)}/22.0^{(3)}$
b. Reactor Trip (from SI)	≤ 2.0
c. Feedwater Isolation	≤ 7.0
d. Containment Isolation-Phase "A"	$\leq 17.0^{(2)}/27.0^{(3)}$
e. Containment Ventilation Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	≤ 60
g. Service Water System	$\leq 13.0^{(2)}/48.0^{(3)}$
5. Steam Flow in two Steam Lines - High Coincident with Tavg --Low-Low	
a. Safety Injection (ECCS)	$\leq 15.75^{(2)}/25.75^{(3)}$
b. Reactor Trip (from SI)	≤ 5.75
c. Feedwater Isolation	≤ 10.75
d. Containment Isolation-Phase "A"	$\leq 20.75^{(2)}/30.75^{(3)}$
e. Containment Ventilation Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	≤ 61.75
g. Service Water System	$\leq 15.75^{(2)}/50.75^{(3)}$
h. Steam Line Isolation	$\leq 10.75^{*}$

* $\leq$13.75 seconds until restart following the sixth refueling outage.

TABLE 3.3-5 (Continued)

ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
6. Steam Flow in Two Steam Lines-High Coincident with Steam Line Pressure-Low	
a. Safety Injection (ECCS)	≤ 12.0(2)/22.0(3)
b. Reactor Trip (from SI)	≤ 2.0
c. Feedwater Isolation	≤ 7.0
d. Containment Isolation-Phase "A"	≤ 17.0(2)/27.0(3)
e. Containment Ventilation Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	≤ 60
g. Service Water System	≤ 14.0(2)/48.0(3)
h. Steam Line Isolation	≤ 8.0*
7. Containment Pressure--High-High	
a. Containment Spray	≤ 45.0
b. Containment Isolation-Phase "B"	Not Applicable
c. Steam Line Isolation	≤ 7.0*
d. Containment Fan Cooler	≤ 40.0
8. Steam Generator Water Level--High-High	
a. Turbine Trip	≤ 2.5
b. Feedwater Isolation	≤ 11.0
9. Steam Generator Water Level --Low-Low	
a. Motor-Driven Auxiliary Feedwater Pumps(4)	≤ 60.0
b. Turbine-Driven Auxiliary Feedwater Pumps(5)	≤ 60.0

* ≤10.0 seconds until restart following the sixth refueling outage.

MAIN STEAM LINE ISOLATION VALVES

LIMITING CONDITION FOR OPERATION

3.7.1.5 Each main steam line isolation valve shall be OPERABLE.

APPLICABILITY: MODES 1, 2 and 3.

ACTION:

MODES 1 - With one main steam line isolation valve inoperable, POWER OPERATION may continue provided the inoperable valve is either restored to OPERABLE status or closed within 4 hours;

Otherwise, be in HOT SHUTDOWN within the next 12 hours.

MODES 2 and 3 - With one main steam line isolation valve inoperable, subsequent operation in MODES 1, 2 or 3 may proceed provided;

a. The isolation valve is maintained closed.

b. The provisions of Specification 3.0.4 are not applicable.

Otherwise, be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.7.1.5 Each main steam line isolation valve shall be demonstrated OPERABLE by verifying full closure within 5 seconds* when tested pursuant to Specification 4.0.5.

* 8 seconds until restart following the sixth refueling outage.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO.91 TO FACILITY OPERATING LICENSE NO. DRP-75

PUBLIC SERVICE ELECTRIC & GAS COMPANY

PHILADELPHIA ELECTRIC COMPANY

DELMARVA POWER AND LIGHT COMPANY

ATLANTIC CITY ELECTRIC COMPANY

SALEM GENERATING STATION, UNIT NO. 2

DOCKET NO. 50-311

1.0 INTRODUCTION

By letter dated April 4, 1990 (Ref. 1), and supplemented by letters dated April 12, 1990 (Ref. 2), April 20, 1990 (Ref. 3), and May 7, 1990 (Ref. 4), Public Service Electric & Gas Company requested an amendment to Facility Operating License No. DPR-75 for the Salem Generating Station, Unit No. 2. The proposed amendment would increase the allowable main steam isolation valve (MSIV) closure time from 5 seconds to 8 seconds until restart from the sixth refueling outage, currently scheduled for the fall, 1991. The May 7, 1990 letter provided information concerning the schedule for developing the corrective actions required to resolve the MSIV closure issues and did not increase the scope of the original amendment request and did not affect the staff's original no significant hazards determination. The amendment for Salem Unit 1 was processed as an emergency technical specification change in accordance with 10 CFR 50.91(a)(5).

2.0 EVALUATION

2.1 Background

The response time of main steam line isolation upon high steam flow in two steam lines coincident with low steam line pressure, high-high containment pressure, and high steam flow in two steam lines coincident with low-low average reactor coolant temperature are specified in Technical Specification (TS) Table 3.3-5 for Salem Units 1 and 2. The surveillance requirements for main steam isolation valves are specified in TS 3/4.7.1.5. The current TS reflect the requirement of MSIV closure time of 5 seconds upon receipt of signal to close MSIVs following a postulated accident.

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In October 1989, Salem Unit 2 MSIVs were stroke tested during a shutdown for maintenance. Three out of four of the valves failed to close within the allowable time of five seconds. A special test of Unit 2 MSIVs performed on March 31, 1990, concluded the potential for a slow closure problem at both Unit 1 and 2 existed. The root cause was not conclusively identified.

By letter dated April 4, 1990 (Ref. 1) and supplemented by letters dated April 12, 1990 (Ref. 2), April 20, 1990 (Ref. 3), and May 7, 1990 (Ref. 4), the Public Service Electric and Gas Company, the licensee for the Salem Units 1 and 2, submitted information regarding the proposed TS Table 3.3-5 and 3/4.7.1.5 which reflected a change in the MSIV closure time of 8 seconds, and the justification for the proposed changes.

2.2 Accident Reevaluation

In support of its proposed TS changes, the licensee has performed a reevaluation of the limiting accident scenarios which rely upon MSIV closure in the safety analyses. The Salem Units 1 and 2 safety analyses which model the steam line isolation include the following events: main steam line break (MSLB), feedline break, steam generator tube rupture (SGTR), and loss of coolant accident (LOCA).

2.2.1 Main Steam Line Break (MSLB) Core Response Limiting Case

To support the proposed increase in MSIV closure time, thermal hydraulic analyses were reanalyzed for the Salem licensing basis steam line break cases. A main steam line isolation time of 12 seconds was assumed in this reanalysis. The results of the licensee's analyses show that the return to power and core condition transients for the case of a double ended steam line break upstream of the steam flow restrictor at hot zero power with offsite power available are much more severe than that calculated for the remaining cases and would result in the lowest calculated departure from nucleate boiling (DNBR). Therefore, the limiting MSLB case for the current Salem licensing basis MSLB analysis will remain limiting for the increased MSIV closure time. The results of the licensee's analysis for the limiting MSLB case associated with 12 second steam line isolation time yielded a minimum DNBR of 2.48, which is greater than the 1.45 DNBR limit, and is acceptable.

2.2.2 Main Feedline Break (MFLB)

Following a main feedline break (MFLB), the reactor coolant system (RCS) will initially undergo a cooldown due to the expulsion of secondary water through the broken feedline. The RCS temperature transient will quickly turn around following the isolation of the main steam lines. An increase in the MSIV closure time will result in additional heat removal from RCS. Hence, the RCS will stabilize at a slightly lower temperature than in the licensing basis MFLB analysis. Thus, the results of a MFLB analysis with increased MSIV closure time are less severe than the results of the licensing basis MFLB analysis.

2.2.3 Steam Generator Tube Rupture (SGTR)

In the licensing basis SGTR analysis, the primary to secondary break flow was assumed to be terminated at 30 minutes after accident initiation. The operator actions to close the MSIV associated with the ruptured steam generator and to terminate the break flow were not explicitly modelled in the analysis. Therefore, there will be no impact of an increase in the MSIV closure time to the thermal hydraulic analysis of the SGTR accident.

2.2.4 Loss of Coolant Accident (LOCA)

In the licensing basis Loss of Coolant Accident (LOCA), the main steam isolation was assumed to occur immediately after the low pressure reactor trip setpoint is reached. As a result of this assumption, the stored energy in the secondary coolant is conservatively greater than what would exist if the analyses modelled main steam isolation when the MSIVs closed with time delay. For the Small Break Loss of Coolant Accident (SBLOCA), the high energy stored in the secondary coolant will reduce the amount of thermal energy to be transferred out from the RCS which maximizes the steam produced in the RCS and minimizes the transient water level in the core. This will result in a more conservative calculation with respect to the core uncovery following a SBLOCA. In the Large Break Loss of Coolant Accident (LBLOCA), the high energy stored in the secondary coolant, as a result of the assumption of instantaneous closure of the MSIVs, will increase the amount of thermal energy to be transferred into the RCS which increases the potential for steam binding to occur in the steam generator tubes during the blowdown phase of the transient. This will prolong the time of blowdown and result in higher peak cladding temperature for this event than would occur if the delayed closure of the MSIVs was modelled. The above assessment supports the conclusion that an increased MSIV closure time will not cause negative effects to the LOCA analysis.

As discussed above, the licensee's reevaluation of the limiting accident scenarios which rely upon MSIV closure supports a total main steam isolation response time of 12 seconds. In order to preserve the safety margin, the licensee proposes an allowable steam line isolation response time of 10 seconds for the signals modelled in the safety analyses. Eight seconds of this response time is being allocated to MSIV stroke time for closing and two seconds of this response time is for the signal processing. The proposed TS Table 3.3-5 and TS 3/4.7.1.5 reflect the above changes. The change of steam line isolation response time from 10.75 seconds to 13.75 seconds upon high steam flow in two steam lines coincident with low-low average reactor coolant temperature on TS Table 3.3-5 is acceptable since it was considered as a backup signal and was not modelled in the Salem licensing basis safety analyses.

2.3 Containment Considerations

The licensee has reanalyzed the limiting case accident scenarios associated with a postulated main steam line break (MSLB) inside containment and evaluated the impact of the MSIV closure time change on containment pressure response and environmental qualification of equipment important to plant safety. The following is the staff's evaluation of the licensee's safety analyses related to these concerns.

2.3.1 Containment Integrity Analysis

The licensee has reanalyzed the consequences of a MSLB with the increased MSIV closure time and calculated the mass and energy releases inside containment to ensure that the peak containment pressure does not exceed the design limit. The pressure and temperature profiles generated by the analyses were used to evaluate environmental qualification of equipment inside containment. The following assumptions and input changes were made in calculating containment response following a MSLB:

(1) Auxiliary feedwater runout flow to a ruptured steam generator was assumed at 2040 gpm.

(2) ESF feedwater control valve closure time was changed from 8 to 10 seconds.

(3) Safety injection delay time of 22 seconds was used in the mass and energy release analysis.

(4) Minimum safety injection (one train) from the high head safety injection pump was assumed.

(5) 4 of 5 containment fan coolers and both trains of containment spray were assumed operable. A 20 second fan cooler actuation delay and a 44 second containment spray delay were assumed consistent with the availability of offsite power.

(6) Constant Moderator Density Coefficient (MDC) of 0.43 delta k/g/cc was used in the analysis (variable moderator feedback methodology was previously used).

The licensee calculated containment pressure and temperature responses for the MSLB based on MSIV closure at 8 seconds. The most limiting cases for the containment pressure criterion are the split breaks at an initial power level of 30% assuming failure of the auxiliary feedwater runout protection equipment or failure of a containment safeguards train. For the failure of the auxiliary feedwater runout protection equipment case, the peak containment pressure as a result of the MSLB was calculated to be 46.9 psia with a 12 second engineered safety features (ESF) steam line isolation response time. For the failure of a containment safeguard case, the peak containment pressure was calculated to be 46.6 psia with a steam line isolation response time of 12 seconds. These calculated peak containment pressures are higher than previous analyzed results but remain within the containment design pressure of 47 psia.

The licensee also analyzed the next most limiting cases for the split breaks at an initial power level of 70% assuming failure of the auxiliary feedwater runout protection or a containment safeguards train. The peak containment pressures were calculated to be 45.7 psia for the runout of auxiliary feedwater case and 46.8 psia for the failure of containment safeguard case. Since the results of these cases at 70% power provide calculated values less than the maximum calculated value at 30% power, the 30% power cases are considered to be the most limiting.

An increase in the allowable MSIV closure time will affect the containment pressure and temperature responses under MSLB accident conditions through changes in the mass and energy release rates because more blowdown through the ruptured main steam pipe from other steam generators goes into the containment. The staff has reviewed the licensee's scoping analysis and finds that the assumptions for the analysis are conservative and acceptable. Since the calculated containment peak pressures are within the design limit, the staff concludes that the licensee's containment integrity analysis is acceptable.

2.3.2 Equipment Qualification

With regard to the effect of the change in the MSIV closure time on the environmental qualification of equipment important to safety, the licensee provided revised pressure and temperature profiles that reflected increases in both pressure and temperature inside containment. However, the licensee stated that the lowest qualified pressure for the affected safety related equipment inside containment is 60 psig, which is above the new peak containment pressure of 46.9 psig. The licensee also stated that although the temperature profile has increased from 264 degrees Fahrenheit (F) to 275 degrees F, a review of all affected equipment indicates that the original qualification test conditions supplemented in a limited number of cases with thermal lag analysis bounds the revised temperature profile. In addition, the licensee has stated that the proposed increase in MSIV closure time has no impact on environmental qualification of equipment outside containment.

The staff has reviewed the applicable information provided by the licensee and finds that the licensee has acceptably addressed environmental qualification concerns.

2.4 Valve Characteristic Considerations

In response to the staff's request via a telecon on April 5, 1990, the licensee submitted Reference 2 to provide additional information relating to main steam line break and its rationale for selecting eight seconds as the proposed allowable MSIV stroke time. It also provided the basis for the licensee's identification of water accumulation as the sole common cause of MSIV slow closure time experienced at the Salem generating station. The Mechanical Engineering Branch (EMEB) was requested to review the information pertaining to valve performance. A telephone conversation

with the licensee was held on April 16, 1990 to discuss the results of EMEB's review of References 1 and 2. The staff indicated that test data at Salem and other utilities with similar MSIV's appeared to support the licensee's conclusion that the delay in closing can be attributed to the water accumulation. The test results also suggested that slow closures are less than eight seconds. However, it should be noted that this conclusion is based on a limited data base that is currently available. The staff indicated that the licensee needs to pursue a permanent solution including analytical evaluations of the parameters affecting MSIV closure time as well as appropriate corrective action.

In response to the staff's request, the licensee submitted letters dated April 20 and May 7, 1990 (References 3 and 4). The licensee stated that an engineering evaluation has been initiated. Completion of a preliminary Design Change Package (DCP) acceptable to the MSIV vendor and cognizant licensee technical and engineering personnel is planned for July 30, 1990. Finalization and approval of the DCP is targeted for the first week of September 1990. The corrective actions will be implemented prior to restart from the Unit 2 sixth refueling outage. The licensee also requested that the proposed TS change to increase MSIV closure time be granted for the interim period before completion of the necessary corrective action. Based on the experience of Salem and other facilities, MSIV's suspected of being affected by water accumulation had closure times less than eight seconds. Therefore, the staff has determined that the licensee's proposed action plan is acceptable.

2.5 Conclusion

Based on the staff evaluation in Section 2.1 thru 2.4 above, the staff concludes that the licensee proposed Technical Specifications Table 3.3-5 and 3/4.7.1.5 are supported by the applicable safety analyses for Salem Unit 2 and therefore, are acceptable until corrective actions are completed during the sixth refueling outage of Unit 2.

2.6 References

1. Letter from S. E. Miltenberger, Public Service Electric and Gas Company to USNRC, "Increase to Allowable MSIV Closure Time Request for Emergency License Amendment," dated April 4, 1990.

2. Letter from S. LaBruna, Public Service Electric and Gas Company to USNRC, "Supplemental Information Increase to Allowable MSIV Closure Time Request for Emergency License Amendment," dated April 12, 1990.

3. Letter from S. LaBruna, Public Service Electric and Gas Company to USNRC, "Supplemental Information Increase to Allowable MSIV Closure Time Request For License Amendment", dated April 20, 1990.

4. Letter from T. Crimmins, Jr., Public Service Electric and Gas Company to USNRC, "Supplemental Information Proposed Increase to Allowable MSIV Closure Time", dated May 7, 1990.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (55 FR 17683) on April 26, 1990 and consulted with the State of New Jersey. No public comments were received and the State of New Jersey did not have any comments.

The staff has 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.

Dated: May 30, 1990

Principal Contributors:

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