August 27, 1990

Docket Nos. 50-272
and 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

Dear Mr. Miltenberger:

SUBJECT: REVISION OF END-OF-CYCLE NEGATIVE MODERATOR TEMPERATURE COEFFICIENT TECHNICAL SPECIFICATIONS, SALEM GENERATING STATION, UNIT NOS. 1 AND 2 (TAC NOS. 76050/76051)

The Commission has issued the enclosed Amendment Nos. 113 and 94 to Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Generating Station, Unit Nos. 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated February 22, 1990 and supplemented by letter dated May 29, 1990. The May 29, 1990 supplemental letter did not increase the scope of the original amendment request and did not affect the staff's original no significant hazards determination.

These amendments modify TSs Section 3.1.1.4 for Unit 1 and 3.1.1.3 for Unit 2 for (1) the most negative moderator temperature coefficient (MTC) limiting condition for operation (LCO), (2) the associated surveillance requirement, and (3) the affected basis.

You are requested to notify the Commission, in writing, when the enclosed amendments have been implemented.

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. 113 to License No. DPR-70
2. Amendment No. 94 to License No. DPR-75
3. Safety Evaluation

cc w/enclosures:
See next page

[SALEM TAC NO. 76050/76051]

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Docket File
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MO'Brien	MFranovich	JStone:ln	Bachmann	WButler
8/7/90	8/8/90	8/8/90	8/15/90	8/21/90

For JS

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

August 27, 1990

Docket Nos. 50-272
and 50-311

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

Dear Mr. Miltenberger:

SUBJECT: REVISION OF END-OF-CYCLE NEGATIVE MODERATOR TEMPERATURE COEFFICIENT TECHNICAL SPECIFICATIONS, SALEM GENERATING STATION, UNIT NOS. 1 AND 2 (TAC NOS. 76050/76051)

The Commission has issued the enclosed Amendment Nos. 113 and 94 to Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Generating Station, Unit Nos. 1 and 2. These amendments consist of changes to the Technical Specifications (TSs) in response to your application dated February 22, 1990 and supplemented by letter dated May 29, 1990. The May 29, 1990 supplemental letter did not increase the scope of the original amendment request and did not affect the staff's original no significant hazards determination.

These amendments modify TSs Section 3.1.1.4 for Unit 1 and 3.1.1.3 for Unit 2 for (1) the most negative moderator temperature coefficient (MTC) limiting condition for operation (LCO), (2) the associated surveillance requirement, and (3) the affected basis.

You are requested to notify the Commission, in writing, when the enclosed amendments have been implemented.

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

Sincerely,

James C. Stone

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

Enclosures:
1. Amendment No. 113 to
License No. DPR-70
2. Amendment No. 94 to
License No. DPR-75
3. Safety Evaluation

cc w/enclosures:
See next page

cc:

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Public Service Commission of Maryland
Engineering Division
ATTN: Chief Engineer
231 E. Baltimore Street
Baltimore, MD 21202-3486

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. 50-272

SALEM GENERATING STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 113
License No. DPR-70

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 February 22, 1990, and supplemented by letter dated May 29, 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-70 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 113 , 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 to be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

James C. Stone

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

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 27, 1990

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 113 , 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 to be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/s/ J. Stone for

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

Attachment:
Changes to the Technical Specifications

Date of Issuance: August 27, 1990

PDI-2/LA	PDI-2/GE	PDI-2/PM	OGC	PDI-2/D
MO'Brien	for MFranovich	JStone:ln	RBachmann	For WButler
8/7/90	8/8/90	8/8/90	8/15/90	8/27/90

ATTACHMENT TO LICENSE AMENDMENT NO. 113

FACILITY OPERATING LICENSE NO. DPR-70

DOCKET NO. 50-272

Revise Appendix A as follows:

Remove Pages	Insert Pages
3/4 1-5	3/4 1-5
3/4 1-5a	3/4 1-5a
B 3/4 1-2	B 3/4 1-2

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

3.1.1.4 The moderator temperature coefficient (MTC) shall be:

a. Less positive than 0 delta k/k/°F for the all rods withdrawn, beginning of cycle life (BOL), hot zero THERMAL POWER condition.

b. Less negative than -4.4×10^{-4} delta k/k/°F for the all rods withdrawn, end of cycle life (EOL), RATED THERMAL POWER condition.

APPLICABILITY: Specification 3.1.1.4.a - MODES 1 and 2* only#
Specification 3.1.1.4.b - MODES 1, 2 and 3 only#

ACTION:

a. With the MTC more positive than the limit of 3.1.1.4.a, above, operations in MODES 1 and 2 may proceed provided:

1. Control rod withdrawal limits are established and maintained sufficient to restore the MTC to less positive than 0 delta k/k/°F within 24 hours or be in HOT STANDBY within the next 6 hours. These withdrawal limits shall be in addition to the insertion limits of Specification 3.1.3.6.

2. The control rods are maintained within the withdrawal limits established above until a subsequent calculation verifies that the MTC has been restored to within its limit for the all rods withdrawn condition.

3. A Special Report is prepared and submitted to the Commission pursuant to Specification 6.9.2 within 10 days, describing the value of the measured MTC, the interim control rod withdrawal limits and the predicted average core burnup necessary for restoring the positive MTC to within its limit for the all rods withdrawn condition.

b. With the MTC more negative than the limit of 3.1.1.4.b, above, be in HOT SHUTDOWN within 12 hours.

---

*With K_{eff} greater than or equal to 1.0

#See Special Test Exception 3.10.3

SURVEILLANCE REQUIREMENTS

4.1.1.4 The MTC shall be determined to be within its limits during each fuel cycle as follows:

a. The MTC shall be measured and compared to the BOL limit of Specification 3.1.1.4.a, above, prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.

b. The MTC shall be measured at any THERMAL POWER and compared to -3.7×10^{-4} delta k/k/°F (all rods withdrawn, RATED THERMAL POWER condition) within 7 EFPD after reaching an equilibrium boron concentration of 300 ppm. In the event this comparison indicates the MTC is more negative than -3.7×10^{-4} delta k/k/°F, the MTC shall be remeasured, and compared to the EOL MTC limit of specification 3.1.1.4.b, at least once per 14 EFPD during the remainder of the fuel cycle.

3/4.1.1.4 MODERATOR TEMPERATURE COEFFICIENT (MTC) (Continued)

The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.

The most negative MTC value equivalent to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the FSAR analysis to nominal operating conditions. These corrections involved: (1) a conversion of the MDC used in the FSAR analysis to its equivalent MTC, based on the rate of change of moderator density with temperature at RATED THERMAL POWER conditions, and (2) subtracting from this value the largest differences in MTC observed between EOL, all rods withdrawn, RATED THERMAL POWER conditions, and those most adverse conditions of moderator temperature and pressure, rod insertion, axial power skewing, and xenon concentration that can occur in normal operation and lead to a significantly more negative EOL MTC at RATED THERMAL POWER. These corrections transformed the MDC value used in the FSAR analysis into the limiting MTC value of -4.4×10^{-4} delta k/k/°F. The MTC value of -3.7×10^{-4} delta k/k/°F represents a conservative value (with corrections for burnup and soluble boron) at a core condition of 300 ppm equilibrium boron concentration and is obtained by making these corrections to the limiting MTC value -4.4×10^{-4} delta k/k/°F.

The surveillance requirements for measurement of the MTC at the beginning and near the end of the fuel cycle are adequate to confirm that the MTC remains with its limits since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.

3/4.1.1.5 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 541°F. This limitation is required to ensure 1) the moderator temperature coefficient is within its analyzed temperature range, 2) the protective instrumentation is within its normal operating range, 3) the P-12 interlock is above its setpoint, 4) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and 5) the reactor pressure vessel is above its minimum RT_{NDT} temperature.

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. 94
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 February 22, 1990, and supplemented by letter dated May 29, 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:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 94 , 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 to be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

James C. Stone

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

Attachment:
Changes to the Technical Specifications

Date of Issuance: August 27, 1990

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 94 , 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 to be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/s/ J. Stone for

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

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 27, 1990

PDI-2/LA	For PDI-2/GE	PDI-2/PM	OGC	For PDI-2/D
MO'Brien	MFranovich	JStone	RBachmann	WButler
8/7/90	8/8/90	8/8/90	8/15/90	8/27/90

ATTACHMENT TO LICENSE AMENDMENT NO. 94

FACILITY OPERATING LICENSE NO. DPR-75

DOCKET NO. 50-311

Revise Appendix A as follows:

Remove Pages	Insert Pages
3/4 1-4	3/4 1-4
3/4 1-5	3/4 1-5
B 3/4 1-2	B 3/4 1-2

MODERATOR TEMPERATURE COEFFICIENT

LIMITING CONDITION FOR OPERATION

3.1.1.3 The moderator temperature coefficient (MTC) shall be:

a. Less positive than 0 delta k/k/°F for the all rods withdrawn, beginning of cycle life (BOL), hot zero THERMAL POWER condition.

b. Less negative than -4.4×10^{-4} delta k/k/°F for the all rods withdrawn, end of cycle life (EOL), RATED THERMAL POWER condition.

APPLICABILITY: Specification 3.1.1.3.a - MODES 1 and 2* only#
Specification 3.1.1.3.b - MODES 1, 2 and 3 only#

ACTION:

a. With the MTC more positive than the limit of 3.1.1.3.a, above, operations in MODES 1 and 2 may proceed provided:

1. Control rod withdrawal limits are established and maintained sufficient to restore the MTC to less positive than 0 delta k/k/°F within 24 hours or be in HOT STANDBY within the next 6 hours. These withdrawal limits shall be in addition to the insertion limits of Specification 3.1.3.6.

2. The control rods are maintained within the withdrawal limits established above until a subsequent calculation verifies that the MTC has been restored to within its limit for the all rods withdrawn condition.

3. In lieu of any other report required by Specification 6.9.1, a Special Report is prepared and submitted to the Commission pursuant to Specification 6.9.2 within 10 days, describing the value of the measured MTC, the interim control rod withdrawal limits and the predicted average core burnup necessary for restoring the positive MTC to within its limit for the all rods withdrawn condition.

b. With the MTC more negative than the limit of 3.1.1.3.b, above, be in HOT SHUTDOWN within 12 hours.

*With Keff greater than or equal to 1.0

#See Special Test Exception 3.10.3

MODERATOR TEMPERATURE COEFFICIENT

SURVEILLANCE REQUIREMENTS

4.1.1.3 The MTC shall be determined to be within its limits during each fuel cycle as follows:

a. The MTC shall be measured and compared to the BOL limit of Specification 3.1.1.3.a, above, prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.

b. The MTC shall be measured at any THERMAL POWER and compared to -3.7×10^{-4} delta k/k/°F (all rods withdrawn, RATED THERMAL POWER condition) within 7 EFPD after reaching an equilibrium boron concentration of 300 ppm. In the event this comparison indicates the MTC is more negative than -3.7×10^{-4} delta k/k/°F, the MTC shall be remeasured, and compared to the EOL MTC limit of specification 3.1.1.3.b, at least once per 14 EFPD during the remainder of the fuel cycle.

BASES

3/4.1.1.3 MODERATOR TEMPERATURE COEFFICIENT (MTC) (Continued)

The MTC values of this specification are applicable to a specific set of plant conditions; accordingly, verification of MTC values at conditions other than those explicitly stated will require extrapolation to those conditions in order to permit an accurate comparison.

The most negative MTC value equivalent to the most positive moderator density coefficient (MDC), was obtained by incrementally correcting the MDC used in the FSAR analysis to nominal operating conditions. These corrections involved: (1) a conversion of the MDC used in the FSAR analysis to its equivalent MTC, based on the rate of change of moderator density with temperature at RATED THERMAL POWER conditions, and (2) subtracting from this value the largest differences in MTC observed between EOL, all rods withdrawn, RATED THERMAL POWER conditions, and those most adverse conditions of moderator temperature and pressure, rod insertion, axial power skewing, and xenon concentration that can occur in normal operation and lead to a significantly more negative EOL MTC at RATED THERMAL POWER. These corrections transformed the MDC value used in the FSAR analysis into the limiting MTC value of -4.4×10^{-4} delta k/k/°F. The MTC value of -3.7×10^{-4} delta k/k/°F represents a conservative value (with corrections for burnup and soluble boron) at a core condition of 300 ppm equilibrium boron concentration and is obtained by making these corrections to the limiting MTC value -4.4×10^{-4} delta k/k/°F.

The surveillance requirements for measurement of the MTC at the beginning and near the end of the fuel cycle are adequate to confirm that the MTC remains with its limits since this coefficient changes slowly due principally to the reduction in RCS boron concentration associated with fuel burnup.

3/4.1.1.4 MINIMUM TEMPERATURE FOR CRITICALITY

This specification ensures that the reactor will not be made critical with the Reactor Coolant System average temperature less than 541°F. This limitation is required to ensure 1) the moderator temperature coefficient is within its analyzed temperature range, 2) the protective instrumentation is within its normal operating range, 3) the P-12 interlock is above its setpoint, 4) the pressurizer is capable of being in an OPERABLE status with a steam bubble, and 5) the reactor pressure vessel is above its minimum RT_{NDT} temperature.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NOS. 113 AND 94 TO FACILITY OPERATING

LICENSE NOS. DPR-70 AND DPR-75

PUBLIC SERVICE ELECTRIC & GAS COMPANY

PHILADELPHIA ELECTRIC COMPANY

DELMARVA POWER AND LIGHT COMPANY

ATLANTIC CITY ELECTRIC COMPANY

SALEM GENERATING STATION, UNIT NOS. 1 AND 2

DOCKET NOS. 50-272 AND 50-311

1.0 INTRODUCTION

By letter dated February 22, 1990 (Ref. 1) and supplemented by letter dated May 29, 1990 (Ref. 2), Public Service Electric and Gas Company (PSE&G) requested an amendment to Facility Operating License Nos. DPR-70 and DPR-75 for the Salem Generating Station, Unit Nos. 1 and 2. The proposed amendments would change the Technical Specifications (TSs) by modifying (1) the most negative moderator temperature coefficient (MTC) limiting condition for operation (LCO), (2) the associated surveillance requirement (SR), and (3) the affected basis. The May 29, 1990 supplemental letter did not increase the scope of the original amendment request and did not affect the staff's original no significant hazards determination. The supplement provided additional information on the safety analysis assumptions used in the licensee's original amendment request.

2.0 EVALUATION

2.1 Background

The purpose of the MTC LCO and MTC SR is to ensure that the most negative MTC at end-of-cycle (EOC) remains within the bounds of the safety analysis, in particular, for those transients and accidents that assume a constant value of the moderator density coefficient (MDC) of 0.43 delta-K per gm/cc. The SR involves an MTC measurement at any thermal power within 7 effective full power days (EFPDs) after reaching an equilibrium primary coolant boron concentration of 300 ppm. After corrections are made, the measured value is compared to the all rods out (ARO), hot full power (HFP) core condition SR limit. In the event that the measured MTC is more negative than the SR limit, then the MTC must be remeasured and compared with the EOC MTC LCO value at least once per every 14 EFPDs during the remainder of the cycle. The LCO and SR values for the most negative MTC are conservative (less negative) with respect to the value of the MTC (actually moderator density coefficient (MDC) which is simply related to the MTC) which is used in the safety analysis.

For the high discharge burnup cores used for Salem Units 1 and 2, PSE&G anticipates that the measured value of the MTC near EOC will result in an MTC that will be more negative than the SR limit. This will then require PSE&G to make MTC measurements once every 14 EFPDs until the EOC. Failure to meet the SR MTC does not necessarily mean that either the most negative MTC that occurs near EOC would be exceeded or that the safety analysis MTC would be exceeded. The additional MTC measurements, if needed to comply with the SR, would be an undue burden for the Salem plants.

PSE&G proposes to change the Salem Unit 1 LCO (3.1.1.4(b)) most negative MTC value from -38 pcm/°F to -44 pcm/°F and the Salem Unit 2 LCO (3.1.1.3(b)) most negative MTC value from -40 pcm/°F to -44 pcm/°F, where a pcm is equal to a reactivity of 10^{-5}. The SR for Salem Unit 1 (4.1.1.4(b)) would be changed from -29 pcm/°F to -37 pcm/°F; the SR for Salem Unit 2 (4.1.1.3(b)) would be changed from -31 pcm/°F to -37 pcm/°F. These changes would change the difference between the SR and the EOC LCO MTC values by about 2 pcm/°F. The SR and EOC LCO MTC values would still be bounded by the Salem Units 1 and 2 safety analysis value of the MTC of -52.6 pcm/°F, which is used for maximum negative reactivity feedback analyses. These changes apply to the current and future reload cycles for Salem Units 1 and 2 and are supported by an evaluation provided in a Westinghouse report (Ref. 3) submitted by Reference 1.

The staff's review of these proposed changes to the most negative MTC LCO, SR, and associated basis follows.

2.2 Methodology

The current method used to determine the most negative MTC is described in the Westinghouse Standard Technical Specifications (STS) in Basis Section 3/4.1.1.3 (Ref. 4). The method is based on incrementally correcting the conservative MDC used in the safety analysis to obtain the most negative MTC value or, equivalently, the most positive MDC at nominal HFP core conditions. The corrections involve subtracting the incremental change in the MDC, which is associated with a core condition of all rods inserted (ARI), to an ARO core condition. The MTC is then equal to the MDC times the rate of change of moderator density with temperature at rated thermal power conditions. This STS method of determining the most negative MTC LCO value results in an ARO MTC which is significantly less negative than the MTC used in the safety analysis and may even be less negative than the best estimate EOC ARO MTC for extended burnup reload cores. This has the potential for requiring the plant to be placed in a hot shutdown condition by Technical Specification 3.1.1.4 for Salem Unit 1 and 3.1.1.3 for Salem Unit 2, even though substantial margin to the safety analysis MDC exists. This problem with the current STS method is caused by adjusting the MDC from a HFP ARI to a HFP ARO condition in defining the most negative MTC. The HFP ARI condition is not allowed by TSs on control rod positions for allowable power operation in which the shutdown banks are completely withdrawn from the core and the control banks must meet rod insertion limits (RIL).

In Reference 3 Westinghouse provides an alternative method for adjusting the safety analysis MDC to obtain a most negative MTC. This method is termed the Most Negative Feasible (MNF) MTC. The MNF MTC method seeks to determine the conditions for which a core will exhibit the most negative MTC value that is consistent with operation allowed by the TSs. For example, the MNF MTC method would not require the conversion assumption of the ARI HFP condition but would require the conversion assumption that all control rod banks are inserted the maximum amount permitted by the TSs. Westinghouse uses the MNF MTC method to determine EOC MTC sensitivities to those design and operational parameters that directly impact the MTC in such a way that the sensitivity to one parameter is independent of the assumed values for the other parameters. The parameters considered with this MNF MTC method include:

(1) soluble boron concentration in the coolant
(2) moderator temperature and pressure
(3) control rod insertion
(4) axial power shape
(5) transient xenon concentration

The MNF MTC approach uses this sensitivity information to derive an EOC ARO HFP MTC LCO value based on the safety analysis value of the MDC.

This MNF MTC method has, according to Westinghouse, a number of advantages over the previous method for determining the most negative MTC LCO value. The MNF MTC will be sufficiently negative so that repeated MTC measurements from a 300 ppm core condition to EOC would not be required. The MNF MTC method does not change the safety analysis moderator feedback assumption. The safety analysis value of MDC is unchanged. The MNF MTC method is a conservative and reasonable basis to assume for an MTC value of a reload core and is consistent with plant operation defined by other TSs. Finally, the MNF MTC method retains the SR on MTC at the 300 ppm core condition to verify that the core is operating within the bounds of the safety analysis.

Westinghouse determined the sensitivity of the above parameters on the EOC MTC for five different reload designs representative of future Salem Units 1 and 2 reloads. These reload designs included fuel designs, discharge burnups, and cycle lengths, which are typical of those expected for Salem Units 1 and 2. The soluble boron concentration was not used in the sensitivity analysis because the EOC HFP ARO MTC TS value is assumed to be at 0 ppm of boron, the definition of EOC, and because the most negative MTC occurs at 0 ppm of boron in the coolant.

The sensitivity study did not include the radial power distribution which can vary under normal operation and can affect the MTC. The operational activities that affect the radial power distribution do so through the movement of control rods and activities that affect the xenon concentration. The allowed changes in the radial power distribution are implicitly included in the MTC sensitivity to control rod insertion and xenon concentration.

In Reference 3 Westinghouse states that the SR MTC value would be obtained in the same manner as currently described in the STS Bases. The SR MTC value is obtained from the EOC HFP ARO MTC value by making corrections for burnup and boron at a core condition of 300 ppm of boron.

The staff has reviewed the assumptions and basis for the MNF MTC method described above and concludes that they are acceptable because they will result in conservative most negative MTC LCO and SR values that could result from allowed operation of Salem Units 1 and 2 from nominal conditions and because the MTC measurement at 300 ppm of boron core condition will assure, using the SR value of MTC, that the safety analysis MDC will not be exceeded.

2.3 Salem Units 1 and 2 Accident Analysis MDC Assumption

Westinghouse uses an MDC for performing accident analyses. For events sensitive to maximum negative moderator feedback, a constant value of the MDC of 0.43 delta K/gm/cc is assumed throughout the analysis. For HFP and full flow nominal operating conditions, the temperature and pressure are 577.9°F and 2250 psia, respectively. At these conditions the MTC, equivalent to the MDC of 0.43 delta K/gm/cc, is -52.6 pcm/°F. We will refer to this MTC as the safety analysis MTC. Based on its review, the staff concludes that the evaluation of the MTC from the MDC is acceptable because it conforms to the relationship of MTC to MDC, that is, the MTC is equal to the MDC times the rate of change of density with temperature at the nominal pressure and temperature of the coolant at rated thermal power conditions.

2.4 Sensitivity Results

Salem Units 1 and 2 TS 3.2.5 provide the LCO values of the Departure from Nucleate Boiling (DNB) parameters; reactor coolant system average temperature (T_{avg}) and pressurizer pressure. The minimum allowable pressurizer pressure is 2205 psia (2220 psia indicated) and a maximum allowable T_{avg} is 582.0°F. These values of the minimum pressurizer pressure and maximum T_{avg} were also assumed for the safety analysis. The current nominal design T_{avg} for Salem Units 1 and 2 is 577.9°F so that the safety analysis represents a 4.1°F maximum allowable increase in T_{avg} nominal conditions. The current nominal design pressure is 2250 psia so that the safety analysis represents a 45 psi maximum allowable decrease from nominal pressurizer pressure. Based on these maximum allowed system variations, a maximum allowable limit is placed on the moderator density variation. Using the sensitivity of the MTC to temperature and pressure, derived from the analysis of the five reload designs, Westinghouse obtained for Salem Units 1 and 2 a bounding delta MTC (a proprietary value) associated with these maximum allowable coolant temperature and pressure deviations from nominal conditions.

Salem Unit 1 TS 3.1.1.4 and Salem Unit 2 TS 3.1.1.3 require an ARO configuration in the evaluation of the MTC. TS 3.1.3.4 requires that all shutdown banks be withdrawn from the core during normal power operation (that is, while in Modes 1 and 2). TS 3.1.3.5 limits control bank insertion by Rod Insertion Limits (RIL) in Modes 1 and 2. All control rods can be inserted at hot zero power (HZP) coincident with a reactor trip. In general, greater control rod insertion results in a more negative MTC assuming that all other parameters are held constant. However, greater control rod insertion will also cause a reduction in core power and T_{avg} which causes the MTC to become more positive. This effect is more pronounced at lower power with the positive change being more important than the negative change in the MTC. Based on this line of reasoning, Westinghouse determined that the most negative MTC configuration will occur at HFP with control rods inserted to the RIL. Westinghouse analyzed five reload core designs, using a bounding value of Control Bank D insertion at HFP with no soluble boron in the coolant. This analysis gave for Salem Units 1 and 2 a bounding delta MTC (a proprietary value) associated with the control bank inserted to the RIL.

The axial power shape produces changes in the MTC caused primarily by the rate at which the moderator is heated as it flows up the core, with the MTC sensitivity to extremes of axial power shapes being small. This effect can be correlated with the axial flux difference (AFD), which is the difference in the power in the top half of the core minus the power in the lower half of the core. Salem Units 1 and 2 TSs include limits on the AFD. Westinghouse determined that the more negative the AFD the more negative the MTC. Westinghouse analyzed four reload designs and determined the sensitivity of the MTC to AFD. This analysis gave for Salem Units 1 and 2 a bounding delta MTC (a proprietary value) for an assumed bounding value of AFD.

Although no TSs limits exist on either the xenon distribution and concentration, the axial xenon distribution is effectively limited by TSs limits on the AFD. The physics of the xenon buildup and decay process limits the xenon concentration. The effect of xenon axial distribution is quantified in the effect of the axial power shape on the MTC, as discussed previously. The effect of the overall xenon concentration on the MTC needs to be evaluated separately. Westinghouse determined that the MTC became more negative with no xenon in the core. Therefore, Westinghouse analyzed the five reload core designs at EOC HFP ARO with no xenon present. This analysis gave for Salem Units 1 and 2 a delta MTC (a proprietary value) for the xenon concentration factor.

All of the delta MTCs described above are summed to provide a total delta MTC for Salem Units 1 and 2 based on the allowed deviations of the various factors from nominal values.

The staff has reviewed the discussion and analysis of the primary factors of the MNF MTC method and concludes that the results obtained are acceptable because approved methods and conservative assumptions were used to generate the results.

2.5 Salem Units 1 and 2 EOC MTC TS Value

Using the total delta MTC obtained with the MNF MTC method, Westinghouse determined that the Salem Units 1 and 2 safety analysis MTC of -52.6 pcm/°F should be increased by the total delta MTC plus an additional amount for conservatism. The resulting EOC HFP ARO MTC for Salem Units 1 and 2 is -44 pcm/°F. This value replaces the current TSs value. Thus, determination that an MTC for the EOC HFP ARO reload core is less negative than -44 pcm/°F provides assurance that the safety analysis MTC remains bounding.

Westinghouse also performed an analysis to determine the SR value of the ARO reload core at 300 ppm of boron. Analysis of reload cores similar to Salem Units 1 and 2 future reload designs resulted in a conservative value of 7 pcm/°F to bound the expected difference in MTCs between the 300 ppm of boron core condition to EOC. Thus, the SR MTC value is -37 pcm/°F compared to the present TSs values for Salem Units 1 and 2.

The staff has reviewed this determination of the most negative MTC LCO and SR and concludes that they are acceptable.

2.6 Safety Analysis Impact of MNF MTC Approach

Changes in the parameters discussed previously could take place during a transient to make the MTC more negative than allowed during normal operation. The most adverse conditions seen in the affected transient events will not result in a reactivity insertion that would invalidate the conclusions of the FSAR accident analyses. Thus, the MDC used as a basis for the MNF MTC TS will not change. The reload safety analysis process will include verification that the MDC safety analysis value remains valid. The staff concludes that this verification process for the safety analysis MDC is acceptable.

2.7 Conclusions

Based on the review discussed above, the staff concludes that the proposed changes to the most negative MTC Technical Specification, the Surveillance Requirement MTC value at or near a 300 ppm of boron core condition, and associated basis for Salem Units 1 and 2 are acceptable for the following reasons:

1. The most negative feasible MTC method considered the important factors affecting the MTC and the limits on these factors.

2. Approved computer codes and methods (in some cases updated versions) were used in the analysis.

3. The MTC measurement at or near 300 ppm of boron will provide assurance that the MTC at EOC HFP ARO conditions will be less negative than the safety analysis MTC.

4. Future reloads for Salem Units 1 and 2 will be analyzed to confirm the most negative MTC Technical Specification at EOC and the Surveillance Requirement on MTC at a core condition of 300 ppm of boron.

5. Future reloads for Salem Units 1 and 2 will be analyzed to confirm the applicability of the safety analysis value of the MDC.

2.8 References

1. Letter (LCR-90-01) from S. LaBruna (PSE&G) to USNRC, dated February 22, 1990.

2. Letter (additional information LCR-90-01) from S. LaBruna (PSE&G) to USNRC, dated May 29, 1990.

3. "Safety Evaluation Supporting a More Negative EOL Moderator Temperature Coefficient Technical Specification for the Salem Units 1 and 2," WCAP-12451 (proprietary), WCAP-12452 (nonproprietary), November 1989.

4. "Standard Technical Specifications for Westinghouse Pressurized Water Reactors," NUREG-0452, Revision 4, issued Fall 1981.

3.0 ENVIRONMENTAL CONSIDERATION

These amendments involve 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 amendments involve 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 the amendments involve no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental assessment need be prepared in connection with the issuance of the amendments.

4.0 CONCLUSION

The Commission made a proposed determination that the amendments involve no significant hazards consideration which was published in the Federal Register (55 FR 21978) on May 30, 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 the amendments will not be inimical to the common defense and security nor to the health and safety of the public.

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Dated: August 27, 1990