

July 25, 2000

Mr. Harold W. Keiser  
Chief Nuclear Officer & President  
Nuclear Business Unit  
Public Service Electric & Gas  
Company  
Post Office Box 236  
Hancocks Bridge, NJ 08038

SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NO. 2, ISSUANCE OF  
AMENDMENT RE: MOVABLE INCORE DETECTORS (TAC NO. MA8640)

Dear Mr. Keiser:

The Commission has issued the enclosed Amendment No. 212 to Facility Operating License No. DPR-75 for the Salem Nuclear Generating Station, Unit No. 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated April 10, 2000.

This amendment modifies the requirements contained in the Salem Unit No. 2 TS regarding the operation of the movable incore detector system. The revision represents a one-time change to allow use of the movable incore detector system for measurement of core peaking factors with less than 75% and greater than or equal to 50% of the detector thimbles available. PSE&G submitted this request in response to degradation of the movable incore detector system, and allows continued operation of Salem Unit No. 2 through the remainder of Cycle 11.

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

Sincerely,

**/RA/**

Robert J. Fretz, Project Manager, Section 2  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket No. 50-311

Enclosures: 1. Amendment No. 212 to  
License No. DPR-75  
2. Safety Evaluation

cc w/encls: See next page

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PUBLIC SERVICE ELECTRIC & GAS COMPANY

PHILADELPHIA ELECTRIC COMPANY

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ATLANTIC CITY ELECTRIC COMPANY

DOCKET NO. 50-311

SALEM NUCLEAR GENERATING STATION, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 212  
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 10, 2000, 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. 212, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. The license amendment is effective as of its date of issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

***/RA by V. Nerses for/***

James W. Clifford, Chief, Section 2  
Project Directorate I  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical  
Specifications

Date of Issuance: July 25, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 212

FACILITY OPERATING LICENSE NO. DPR-75

DOCKET NO. 50-311

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages

3/4 2-6

3/4 2-7

3/4 2-10

3/4 3-42

Insert Pages

3/4 2-6

3/4 2-7

3/4 2-10

3/4 3-42

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 212 TO FACILITY OPERATING LICENSE NO. DPR-75  
PUBLIC SERVICE ELECTRIC & GAS COMPANY  
PHILADELPHIA ELECTRIC COMPANY  
DELMARVA POWER AND LIGHT COMPANY  
ATLANTIC CITY ELECTRIC COMPANY  
SALEM NUCLEAR GENERATING STATION, UNIT NO. 2  
DOCKET NO. 50-311

## 1.0 INTRODUCTION

By letter dated April 10, 2000, the Public Service Electric & Gas Company (PSE&G or the licensee) submitted a request for changes to the Salem Nuclear Generating Station, Unit No. 2, (Salem 2) Technical Specifications (TSs). The requested changes would reduce the number of required in-core detectors necessary for continued operation for the remainder of Cycle 11.

## 2.0 BACKGROUND

The Salem 2 Movable Incore Detection System (MIDS) contains a total of 58 instrumentation thimbles in the core. TS 3.3.3.2.a requires that at least 75% of the detector thimbles (44 thimbles) be operable with a minimum of two detector thimbles per quadrant when performing a flux map to ensure compliance with the peaking factor requirements of TSs 3.2.2 and 3.2.3. The surveillance requirements (SRs) of TS Sections 4.2.2.2.d.1.b and 4.2.3.1.b require that the peaking factors must be determined to be within limits at least once per 31 effective full power days. Due to the increase in incore detector thimble failures at Salem 2 during Cycle 11 thus far, PSE&G has proposed a change which will allow plant operation with the number of operable detector thimbles reduced to a minimum of 50%. To compensate for the increased uncertainty when the number of operable detector thimbles is reduced, the measurement uncertainty for  $F_{\Delta H}$ ,  $F_{xy}$ , and  $F_Q$  will be increased whenever the number of detectors is between 29 and 43 ( $\geq 50\%$  and  $< 75\%$ ). Changes are also proposed to TS 3.3.3.2 to clarify the requirements for the number of detector thimbles required per core quadrant when the number of available detector thimbles is less than 75%.

At the completion of maintenance activities during the last outage, nine incore detector locations were inaccessible. Four additional locations were found to be inaccessible during the first Cycle 11 flux map. Between 45 and 47 detector's locations were available for the flux maps between map 1 taken on May 28, 1999, and map 13 taken on January 3, 2000. For Map

14 taken on January 31, 2000, only 44 detector locations were available. Since that time either 44 or 45 locations have been available. PSE&G is concerned with meeting the 75% criterion of TS 3.3.3.2.a since detector availability may further degrade through the remainder of Cycle 11. Failure to have at least 44 thimbles accessible would result in a forced shutdown due to the inability to determine the peaking factors per the requirements of TSs 3.2.2 and 3.2.3.

### 3.0 EVALUATION

Essentially all pressurized water reactor (PWR) TSs contain a requirement for operability of 75% of the incore detector locations for mapping of the core power distribution and for peaking factor determination. On a number of occasions, for various reasons, failures of detector thimbles in operating PWRs have approached or exceeded 25%, and relaxation of the 75% requirement has been permitted for the remainder of the affected operating cycle.

In-core detector data is used to calculate power peaking factors which are used to verify compliance with fuel performance limits. As the number of inoperable detector segments increases, the uncertainties in the power distribution calculation increase. The requirement for maintaining 75% of the detector thimbles available provides for a reasonable number of failures of the incore detectors while encouraging licensees to strive for maintaining the system as near to 100% available as possible. The proposed TS changes allow continued use of the movable incore detector system with less than 75% of the thimbles available if the measurement error allowance due to incomplete flux mapping is increased. The licensee submitted an analysis performed by the vendor, Westinghouse, which assessed the impacts of a reduction to a minimum of 29 of the 58 movable detector thimbles for Salem 2 Cycle 11. The analysis indicated that additional uncertainties of 1% for  $F_{\Delta H}$ ,  $F_{xy}$ , and  $F_Q$  are appropriate when the number of instrumented assemblies is reduced from 44 to 29. The additional uncertainties should be applied linearly from below 75% to greater than 50% detector thimble locations. The Westinghouse analysis assumed random deletion of the thimbles. If the thimbles were systematically deleted from use, the analysis and the calculated peaking factor uncertainties would not apply. Thus, there is an additional requirement that when the number of detector locations is less than 75%, there should be a minimum of two thimbles available per quadrant, where the quadrant includes both horizontal-vertical quadrants and diagonally bounded quadrants (eight quadrants in all). A statistical analysis was performed that showed that this requirement improves the ability to distinguish between random and systemic thimble deletion events and establishes the bounds of applicability of the peaking factor uncertainties.

The licensee has provided the results of core maps for Cycle 11. These show that currently there is approximately 8% margin in  $F_{\Delta H}^N$  to the TS limit, approximately 6.5% margin in  $F_{xy}$  to the TS limit and approximately 23% margin to the  $F_Q^N$  to the TS limit. Since the unit does not load follow and the peaking factors normally tend to decrease with burnup, we would expect the margin to increase from now until the end of the cycle. The Nuclear Regulatory Commission (NRC) staff's review of the data from the Cycle 11 flux maps indicates that the margin to limit is increasing for each of the peaking factors measured.

Another safety concern relating to degradation of incore mapping ability is the ability to detect anomalous conditions in the core. One of these is inadvertent loading of a fuel assembly into an improper position. Since this is a loading problem, it is not of concern for the remainder of the operating cycle. Furthermore, the NRC staff reviewed the Cycle 11 startup physics test results, which showed very good agreement between predictions and measurements. This

good agreement gives more assurance that the core is operating as designed. Other anomalous conditions are conceived to produce either an axial or radial effect, which would cause either a change in quadrant tilt ratio or axial offset ratio. These parameters are monitored by the excore detectors and would help identify problems not fully detectable with reduced incore mapping capability.

The NRC staff's review of the suitability of operation of the Salem 2 reactor for the remainder of Cycle 11 with a reduced number of movable incore thimbles locations to as few as 50% indicated adequate margin exists at this time in Cycle 11 and sufficiently increased uncertainty allowances have been made to ensure that TS peaking factor limits will be met. In addition, there are adequate supplemental indicators of anomalous conditions to preclude an unsafe condition from escaping detection in the absence of full incore detector mapping capability.

### 3.1 Technical Specification Changes

TS SR 4.2.2.2.b and SR 4.2.2.3 - The change adds a footnote which states that, for Cycle 11, when the number of available movable incore detector thimbles is  $\geq 50\%$  or  $< 75\%$  of the total, the 5% measurement uncertainty would be increased to  $[5\% + (3-T/14.5)(1\%)]$  where T is the number of available thimbles. These changes are acceptable because adequate margin exists at this time in Cycle 11 and sufficiently increased uncertainty allowances have been made to ensure that TS peaking factor limits will be met. In addition, there are adequate supplemental indicators of anomalous conditions to preclude an unsafe condition from escaping detection in the absence of full incore detector mapping capability.

TS SR 4.2.3.2 - The change adds a footnote which states that, for Cycle 11, when the number of available movable incore detector thimbles is  $\geq 50\%$  or  $< 75\%$  of the total, the 4% measurement uncertainty would be increased to  $[4\% + (3-T/14.5)(1\%)]$  where T is the number of available thimbles. This change is acceptable because adequate margin exists at this time in Cycle 11 and sufficiently increased uncertainty allowances have been made to ensure that TS peaking factor limits will be met. In addition, there are adequate supplemental indicators of anomalous conditions to preclude an unsafe condition from escaping detection in the absence of full incore detector mapping capability.

TS 3.3.3.2 - The change adds a footnote which states that for Cycle 11 with greater than 50% and less than 75% detector thimbles available, can be considered OPERABLE provided the peaking factor uncertainties are appropriately adjusted. In addition, a minimum of four thimbles per quadrant must be available for each of the four horizontal-vertical quadrants and the four diagonally bounded quadrants (eight individual quadrants in total). This proposed change is necessary in order to remain within the bounds of applicability of the evaluation and is, thus, acceptable.

### 3.2 Staff's Conclusion

Based on the staff's evaluation in Section 2.0 above, the staff concludes that the proposed TS changes are acceptable. These changes are for the remainder of Cycle 11 only.



### 3.3 Comments from Members of the Public

On May 22, 2000, the NRC issued a notice in the *Federal Register*, and a proposed finding that the amendment involves a no significant hazards consideration. By letter dated June 13, 2000, Mr. Norm Cohen, representing the UNPLUG Salem Campaign, requested that the NRC deny PSE&G's license amendment request. Mr. Cohen's letter stated two primary objections: (1) the movable incore detector system is degraded, and is "an indicator that additional degradation of other systems is under way inside the [reactor] core area," therefore, the plant should be ordered to immediately shut down to repair the system; and (2) by allowing PSE&G to operate Salem Unit 2 "with a degraded safety system" the NRC sends the message that "it is acceptable to cut corners on safety."

As previously stated, the movable incore detector system is used for mapping of the core power distribution, and is also used to calculate power peaking factors in order to verify compliance with fuel performance limits. On occasion, the NRC has allowed relaxation of the 75% availability requirement stated in most TSs, and has permitted plants to operate for the remainder of the affected cycle. The movable incore detector system does not provide any automatic control or reactor protective functions, and as the number of inoperable detectors increases, measurement uncertainties in power distribution calculations slightly increase. This condition, however, does not automatically serve as an indicator of further degradation of other systems in the reactor core. The staff has determined that the proposed change is acceptable because adequate margin exists at this time in Salem Unit 2's operating cycle, and that additional allowances will be made to ensure that TS peaking factor limits will continue to be met. In addition, there are other indicators of abnormal conditions in the reactor core available to prevent unsafe operation of Salem Unit 2 in the absence of full incore detector mapping capability. Therefore, PSE&G's request for the remainder of the Salem Unit 2 operating cycle is acceptable, and the amendment involves no significant hazards consideration.

### 4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State official was notified of the proposed issuance of the amendment. The State official had no comments.

### 5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC 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 the amendment involves no significant hazards consideration, and there has been one public comment on such finding (65 FR 33378). The NRC staff has reviewed and addressed these comments in its Safety Evaluation. Accordingly, the 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 the amendment.

## 6.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 7.0 REFERENCES

1. Letter from M. B. Bezilla, Public Service Electric & Gas Company, to NRC dated April 10, 2000.

Principal Contributor: M. Chatterton

Date: July 25, 2000

Public Service Electric & Gas  
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