UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 149 AND 127 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 NUCLEAR GENERATING STATION, UNITS 1 AND 2

DOCKET NOS. 50-272 AND 50-311

1.0 INTRODUCTION

By letter dated May 26, 1992, the Public Service Electric & Gas Company (the licensee) submitted a request for changes to the Salem Nuclear Generating Station, Units 1 and 2, Technical Specifications (TS). The requested changes would increase the shutdown margin limit for Unit 1 cycle 11 and Unit 2 cycle 7; decrease the containment pressure high-high setpoint and allowable value; decrease the service water system response time criteria for containment pressure high signal with loss of offsite power; decrease the containment spray (CS) system response time criteria for a containment high-high pressure signal; change the containment fan cooler unit (CFCU) signal from the containment high-high pressure signal to the containment high pressure signal; and increase the CFCU response time criteria. These changes were necessitated by the discovery of CFCU and CS system response times greater than originally assumed in the Loss of Coolant Accident (LOCA) or Main Steam Line Break (MSLB) analysis, and auxiliary feedwater (AFW) system flow greater than assumed in the MSLB analysis.

The Salem 1 and 2 TS would be revised as follows:

(1) Specification 3/4.1.1.1: Change the SHUTDOWN MARGIN limit from $\geq$ 1.6% $\Delta k/k$ to $\geq$ 1.85% $\Delta k/k$, effective during Unit 1, Cycle 11 and Unit 2, Cycle 7.

(2) Table 3.3-4 (Items 2.c, 3.b.3 and 4.c): Change the containment pressure, high-high setpoint from $\leq$ 23.5 psig to $\leq$ 15.0 psig, and the Allowable Value from $\leq$ 24.0 psig to $\leq$ 16.0 psig.

(3) Table 3.3-5: Change the ESF RESPONSE TIME for:

Item 2.g: Service water system (containment pressure, high signal with loss of offsite power), from $\leq$ 48.0 seconds to $\leq$ 45.0 seconds.

Item 7.a: The containment spray system (containment pressure high-high signal), from ≤ 45.0 seconds to ≤ 33.0 seconds.

Item 7.d: Delete 7.d and add a new item 2.h, which moves the containment fan cooler response time requirements from the containment pressure, high-high signal to the containment pressure, high signal. Change the containment fan cooler response time criterion from ≤ 40.0 seconds to ≤ 45.0 seconds.

2.0 EVALUATION

(1) Impact of Increased Auxiliary Feedwater (AFW) Flow

The increased AFW flow has two principal effects: an increase in primary system cooling following an MSLB event and increased mass in energy release to the containment following a secondary system break. The AFW flow increase can also increase the likelihood of steam generator overfill following any event which initiates AFW.

a. Increased Cooling Effect of Increased AFW Flow

Following a licensing basis MSLB event (calculated assuming hot zero power), increased primary system cooling (caused by greater AFW flow) results in a higher positive reactivity insertion, which in turn can amplify the power, thermal and hydraulic consequences of the event on the nuclear steam supply system (NSSS). To compensate for the higher positive reactivity insertion calculated for the licensing basis MSLB, the MSLB analyses were revised to assume a shutdown margin of 1.85% $\Delta k/k$ in place of the previously assumed 1.6% $\Delta k/k$. The licensee reports that the revised analysis shows a slight increase in peak heat flux and small changes in pressurizer pressure and cold leg inlet temperature. The licensee states that the departure from nucleate boiling ratio (DNBR) would remain greater than applicable limits, and therefore the core response would continue to be within acceptance criteria.

b. Steam Generator Tube Rupture

The licensing basis steam generator tube rupture (SGTR) event in the Salem UFSAR, Section 15, is not sensitive to this change in AFW flow. Therefore, we conclude that the basis for acceptability of Salem operation with regard to SGTR events continues to apply with the increase in AFW flow. We also note that the staff has reviewed and approved the licensee's proposal for upgrading and utilizing existing main steam line radiation monitors to enhance the response to SGTR events.

c. Steam Generator Overfill

In a letter of May 15, 1990, to the licensee, the staff indicated that the licensee had provided information to demonstrate that the Salem units meet the intent of Generic Letter 89-19 in that the Salem steam generator overfill protection system is implemented and the TS include requirements to periodically verify its operability. The letter also indicates the NRC review, if any, will be performed either by inspection or audit. We find that at this time this action adequately addresses the steam generator overfill consideration for increased AFW flow.

(2) Engineering Safety Features Actuation System Instrumentation Setpoints (Table 3.3-4)

The containment responses for a spectrum (size, break locations, and associated single-failures) of primary and secondary breaks inside containment have been reanalyzed to ensure that the worst-case post-accident containment pressure and temperature response profiles do not exceed design limits of the containment structure and safety-related electrical equipment located in containment. The revised analyses reflect use of revised assumptions for the response time of mitigation systems as discussed below. The calculated results of the analyses are bounded by containment design criteria specified in the FSAR and equipment qualification acceptance criteria.

Containment spray provides an iodine removal function in addition to pressure and temperature mitigation functions. New LOCA radiological dose calculations considered the effect of additional spray delay and demonstrated that the additional delay can be accommodated without exceeding dose acceptance criteria. The thyroid 2-hour site boundary offsite dose increases by 1 Rem to 97 Rem, which remains within the 300 Rem Part 100 limit.

The revised analyses described in the submittal are cycle-specific for the Units 1 and 2 cycle 11 and cycle 7 operating cycles. Future analyses will assume a reduced shutdown margin, but will utilize the same minimum ESF response times.

The containment pressure at which the CS system is assumed to actuate in the LOCA/MSLB analyses has been reduced from 25.4 psig to 17.0 psig. The licensee's setpoint calculations indicate that a maximum trip setpoint of 15.85 psig and a maximum allowable value of 16.58 psig are needed to support the analytical limit of 17.0 psig. During the Unit 2 sixth refueling outage and the Unit 1 tenth refueling outage, the setpoint was lowered from 23.5 psig to 15.0 psig, and the allowable value was lowered from 24.0 psig to 16.0 psig, both of which are below the maximum values. These changes support an analytical limit of 17.0 psig, with positive margin relative to the setpoint calculations.

These changes involve a setpoint change. Lowering the setpoint and allowable value requirements for automatic initiation of containment spray is conservative, because spray will initiate earlier in the event of an accident. They do not involve any new system configurations with the potential for changing the initiation of an accident, nor do they introduce any previously unconsidered equipment failure modes. As discussed above, these changes to the TS do not involve an increase in the probability or consequences of an accident previously evaluated and do not create the possibility of a new or different kind of accident from any accident previously evaluated. Therefore, based on the results of the staff's review, these changes are acceptable.

(3) Engineered Safety Features (ESF) Response Times (Table 3.3-5)

During a review of the Salem UFSAR, the licensee identified a discrepancy in the response times for the CFCU and CS system. It was also discovered that the response time testing for the CFCU's and the CS system did not include delays associated with a Loss of Offsite Power (LOOP). The service water TS response time for a containment pressure high signal is 48 seconds. Because the CFCU's rely on increased service water flow, service water response time must be consistent with the CFCU response time requirements.

Based on test data, the CFCU response time exceeded the 35 seconds assumed in the safety analyses, but a reevaluation using 45 seconds showed that the containment pressure and temperature, following a LOCA or MSLB, would remain within acceptable limits. Therefore, the CFCU response time in Table 3.3-5 is being changed to 45 seconds. In addition, the TS incorrectly list the CFCU's under the containment pressure high-high signal. CFCUs are actuated from the containment pressure high signal. Therefore, TS are being revised to reflect this by deleting Item 7.d and adding an Item 2.h for the CFCU response time criterion on Table 3.3-5.

The CS system ESF response time test ends when the spray pump has reached a selected point on its pump curve in recirculation flow (pump discharge valve opening time is considered, but is typically not limiting). The licensing basis safety analyses assumed that it takes an additional 28 seconds for flow to travel through the header and exit the spray nozzles. This assumption was based on input provided to the licensee by a Westinghouse memo dated June 29, 1978. Because the memo does not meet the licensee's present standards for engineering calculations, a Discrepancy Evaluation Form (DEF) was written in accordance with the licensee's Engineering Discrepancy Control process. Recalculation of the spray fluid travel time resulted in an increase from 28 to 47 seconds. This increased time was reported in LER 272/92-002. In order to account for the 47 second travel time, the LOCA/MSLB analyses were reevaluated, increasing the assumed total response for the CS system from 59 to 80 seconds. An 80 second total response time, with 47 seconds allocated to fluid travel time, requires a 33 second ESF response time test criterion. Therefore, 33 seconds is proposed for the CS response time of Table 3.3-5.

These changes involve response time changes. They do not involve any new system configurations with the potential for changing the initiation of an accident, nor do they introduce any previously unconsidered equipment failure modes. As discussed above, these changes to the TS do not involve a significant increase in the probability or consequences of an accident previously evaluated and do not create the possibility of a new or different kind of accident from any accident previously evaluated. Therefore, based on the results of the staff's review, these changes are acceptable.

Containment sprays are also utilized in the large-break LOCA offsite dose analysis to remove elemental and particulate iodine from the containment atmosphere, to help ensure the offsite radiological doses from a postulated accident would meet the requirements of 10 CFR 100. The LOCA dose analysis of record is presented in Section 15.4 of the Salem updated Final Safety Analysis Report (UFSAR). The assumptions of the NRC Safety Guide 4 dose analysis, presented in the UFSAR, do not include a delay in the initiation of iodine removal by spray. The licensee estimates that the increase in the amount of iodine released to the environment as a result of the 80 second delay period following the initiation of the LOCA is 3 curies of Dose Equivalent I-131. The licensee equates this to an increase in the zero to 2-hour site boundary thyroid dose of approximately 1 rem. This would result in a 97 rem thyroid dose, which remains within the 10 CFR 100 limit of 300 rem.

The UFSAR dose analysis is conservative in that it uses the Safety Guide 4 assumption that 10% of total radioiodine inventory is organic, and therefore not available for removal by the CS system. The more current guidance of Regulatory Guide 1.4 assumes that 4% of the radioiodine is organic, which would increase the amount available for spray removal by 6%. The calculated dose remains below the 10 CFR 100 limit of 300 rem and is therefore acceptable.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC 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 (57 FR 37571). 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 impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

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

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