



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NOS. 194 AND 177 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, UNIT NOS. 1 AND 2

DOCKET NOS. 50-272 AND 50-311

1.0 INTRODUCTION

By letter dated January 31, 1997, as supplemented by letters dated March 14, April 8, and April 28, 1997, the Public Service Electric & Gas Company (the licensee) submitted a request for changes to the Salem Nuclear Generating Station, Unit Nos. 1 and 2, Technical Specifications (TSs). The requested changes would change Technical Specification (TS) 3.4.3, "Relief Valves," for Salem Unit 1, and TS 3.4.5, "Relief Valves," for Salem Unit 2, to ensure that the automatic capability of the power operated relief valves (PORVs) to relieve pressure is maintained when these valves are isolated by closure of the block valves. The letters dated April 8 and 28, 1997, contained supplementary and clarifying information that did not expand the scope of the April 4, 1997 (62 FR 16199), Federal Register notice.

2.0 DESCRIPTION

In response to the Westinghouse Nuclear Safety Advisory letter (NSAL), NSAL 93-013, the licensee has determined that an inadvertent Safety Injection (SI) actuation at power could cause the pressurizer to become water solid and pressurizer safety valves lifting with water relief if the automatic operation of the PORVs is not made available for reactor coolant system depressurization early in the transient. The Salem pressurizer safety valves are not designed to relieve water. Thus, the water relief has the potential to cause the pressurizer safety valves to fail in the open position.

In the course of the review of the licensee's January 31, 1997 application, the NRC Staff noted that the pressurizer PORVs were not designed to "safety related" standards and thus could not be credited for mitigation of the inadvertent SI actuation at power incident when the PORV is operating in the automatic mode. In response to this observation, the licensee proposed an

upgrade of PORVs as described in the March 14, 1997 and April 8, 1997 supplements, to eliminate the possibility that a single active failure of a PORV component could prevent the mitigation of the inadvertent SI actuation at power incident. In addition, because the licensee relied upon reactor operator action to assure that the PORV Block Valves are open in the event of an SI actuation at power incident, the NRC staff requested additional information regarding reactor operator performance. The licensee provided additional information regarding reactor operator performance in the licensee's letter dated April 8, 1997.

3.0 EVALUATION

The existing electrical and control system associated with the automatic operation of the PORVs is designed to control grade standard without protection from single failures. In order to take credit for the PORVs' automatic function for mitigating the inadvertent SI actuation event, the licensee in letters dated March 14, 1997 and April 8, 1997 proposed modification to the PORV circuitry to eliminate single failure vulnerabilities in the PORV circuitry and upgrade circuitry to qualify the PORVs as safety-related.

3.1 Upgrade of PORV Circuitry

A PSE&G analysis determined that, although in the event of an inadvertent SI at power, credit could be taken for unblocking one PORV to mitigate the consequences of the event, it could not be ascertained that only manual cycling of the PORV(s) would ensure maintaining reactor coolant system (RCS) pressure below the pressurizer safety relief valve setpoint in all cases. Furthermore, the PSE&G analysis demonstrated better reliability from automatic operation of the PORVs to mitigate the consequences of an inadvertent SI at power event. Therefore, PSE&G proposed a number of modifications to the PORV circuitry to eliminate single failure vulnerabilities and upgrade the PORV control system to qualify as safety-related.

The proposed modifications to the PORV circuitry are intended to: 1) eliminate the non-safety-related controller, PC455K, from the valve control circuitry and relocate the PORV circuitry into the protection racks from the control racks; 2) separate the PORV control channels such that failure of any one channel or power supply will render, at most, one PORV inoperable; 3) replace each high pressure Hagan comparator (2PC455A, 2PC456A, 2PC457A, and 2PC474C) with a dual Hagan comparator; 4) remove comparators 2PC455E, 2PC457E, and 2PC474B and replace comparators 2PC456E and F with a single channel comparator since functions of these comparators will be performed by the dual comparators described in 3); 5) add four overhead annunciators to indicate a PORV unsafe condition; and 6) add new bistable test switches.

The NRC staff concludes that the above modifications to the PORV circuitry will eliminate single failure vulnerabilities, qualify the PORVs in accordance with IEEE Standard 279, and that the upgraded circuitry qualifies the PORVs as safety-related.

3.2 PORV Performance

PSE&G evaluated the capacity of the PORV air accumulators and concluded that the current accumulators are sufficient to operate the PORVs for about 45 minutes which is sufficient time for the operators to manually terminate the inadvertent SI actuation at power transient. The licensee has stated that the inadvertently actuated SI flow could be terminated within 25 minutes into the transient using plant Emergency Operating Procedures (EOPs) and during this event the PORVs will experience approximately 220 full strokes. In the January 31, 1997 application, the licensee indicated that each PORV with two dedicated air accumulators can perform 305 full stroke open and close operations in the event that the normal supply of air is unavailable. After 305 full strokes, the PORVs will be able to perform an additional 486 50% strokes. In the April 28, 1997 supplement, the licensee indicated that a reanalysis of the PORV air supply indicated that approximately 350 PORV strokes would be available (145 full strokes and 205 partial [50%] strokes). The revised PORV performance assessment is acceptable in that more than 220 valve strokes would be available assuming that the normal air source is unavailable. The licensee further indicated that the relieving capacity of a 50% stroke is essentially equivalent to a full stroke and is considered as equivalent for the purpose of determining the adequacy of PORV availability. The licensee has concluded that the PORVs will function adequately under these operating conditions.

Endurance tests performed with five different trims (with different trim materials) on one PORV at Wyle Laboratories demonstrated that: 1) after 2000 consecutive operations, there were no packing leaks nor packing gland adjustments required; 2) there was no diaphragm failure; and 3) the solenoid valve withstood 10,000 operations without any loss of function.

The staff concludes that the PORV performance is acceptable with regard to its expected performance in the mitigation of the inadvertent SI actuation at power event.

3.2 Reactor Operator Performance

The licensee has re-analyzed the inadvertent SI at power event based on the use of EOPs to make PORVs available by opening their associated block valve within 10 minutes into the transient. This assumption has been validated by simulator test results which indicate that the operators have been successful in accomplishing this procedure within seven to nine minutes. The Salem operators are trained for these EOPs.

With regard to operator performance, in those instances where licensees consider temporary or permanent changes to the facility which eliminate operator actions, where prior credit for operator actions was taken, the staff has relied on the guidance provided in Generic Letter (GL) 91-18, and ANSI/ANS 58.8, "Time Response Design Criteria for Safety Related Operator Actions," 1984 (ANSI-58.8), for evaluating such changes. While ANSI-58.8 supplies estimates of reasonable response times for operator actions, the standard does allow licensees to use time intervals derived from independent sources.

The NRC Staff reviewed specific operator actions and the times required for these actions. The licensee stated the operator is expected to act within about 10 minutes to open at least one pressurizer PORV by opening its associated block valve, which precludes the potential for steam or water relief through the pressurizer safety valve. The licensee noted that to perform this action, the operator depresses a bezel button. In addition, the licensee stated that the range of times for operating crews to perform the required manual action was seven to nine minutes.

With regard to procedural guidance for required actions, the licensee submitted plant procedure EOP-TRIP-1, step 23, which documented the required local manual actions. The licensee pointed out that after the PORV block valve is opened, the bezel indication light will illuminate, thus indicating that this step has been successfully completed.

The licensee stated that operator training to carry out the required actions included knowledge-based training (control room manipulation is a license-basis critical time) and skill-based training (PORV manipulation is performed on the Salem site-specific simulator).

The NRC staff reviewed the ability to recover from plausible errors in performance of manual actions associated with PORV block valve manipulations, and the expected time required to make such a recovery. The licensee's evaluation did not consider the possibility of performance errors or the likelihood of recovering from such errors given the timeframe (i.e., 10 minutes) allotted to accomplish the manual action; however, given the time assumed for operator action, it is likely that recovery from an error in performance would be achieved.

The staff finds the previously discussed information acceptable in that it is consistent with ANSI-58.8 and Generic Letter 91-18.

3.3 Technical Specifications

The licensee proposed TSs regarding PORVs would assure the operability of the PORVs for their automatic and manual operating function. Also, the proposed TSs are consistent with the recommendation of Generic Letter 90-06, "Resolution of Generic Issue 70, 'PORV and Block Valve Reliability,' and 94, 'Additional LTOP [Low Temperature Overpressure Protection] Protection for PWRs' [Pressurized Water Reactors]," dated June 25, 1990, and therefore acceptable. The proposed TS bases provide clarifications of the safety-related function to be performed by the PORVs including the use of the automatic function of the PORVs to mitigate an inadvertent actuation of SI event. We have reviewed the licensee's submittal and find the proposed changes acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the New Jersey State official was notified of the proposed issuance of the amendments. In an April 15, 1997, telephone conversation with the State official, Mr. R. Pinney, noted that the licensee's proposed TS Bases for the PORV TSs did not conform to the format suggested by the NRC staff's Standard Technical Specifications (STS).

The requirements regarding the content of the TSs are contained in 10 CFR 50.36 (Title 10 of the Code of Federal Regulations, Part 50, Section 36), "Technical specifications." In Subsection (a) of 10 CFR 50.36, licensees are required to provide, "A summary statement of the bases or reasons for such specifications...but [they], shall not become part of the technical specifications." While the NRC staff requires the TS Bases to be technically accurate, the licensee is free to otherwise change the Bases without prior NRC approval.

5.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact have been prepared and published in the Federal Register on May 9, 1997 (62 FR 25675). Accordingly, based upon the environmental assessment, the staff has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

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

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