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

SUPPLEMENT TO SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 69 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 May 27, 1997, as supplemented on March 6, and April 28, 1998, the Public Service Electric & Gas Company (the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) to clarify certain statements in the NRC's safety evaluation (SE) for Amendment No. 69 to Facility Operating License No. DPR-75 for the Salem Nuclear Generating Station, Unit No. 2. On May 1, 1989, the NRC issued Amendment No. 69 which revised the Technical Specifications (TSs) to establish system operability requirements for the transfer functions of the emergency core cooling system (ECCS) semiautomatic switchover from safety injection to recirculation during a loss-of-coolant accident (LOCA).

The SE for Amendment No. 69 was based on NRC and licensee correspondence dated June 24, and July 17, 1980, January 27, 1983, January 3, 1986 and January 5, 1987. Based on a review of these documents and other material related to the switchover design, the licensee proposed clarifying text for the SE. The licensee explained that the proposed statements were necessary to bring the SE into agreement with the material submitted for the amendment application.

The need for these clarifications arose as a result of an NRC inspection during which the licensee was informed that it was not meeting certain aspects of the SE for Amendment No. 69. The statements in the staff's SE that were identified as not being met were:

1. "...approximately 18 minutes would be available for the operator to perform the necessary switchover manual action..." (Page 2 of the SE)

2. "One of the very early steps in EOP-LOCA-3 is to arm the SJ44 valves so that when the Refueling Water Storage Tank (RWST) low level is reached semi-automatic switchover will occur." (Page 3 of the SE)

3. "The operator is instructed by the emergency procedures to monitor sump water level and ensure that the level is increasing before arming the sump isolation valves." (Page 3 of the SE)

With regard to statement 1 above, the inspectors identified licensee documents which indicated that the time available for completion of the necessary manual actions is less than the 18 minutes specified in the SE. With regard to statement 2, the inspectors found that the entry condition for Emergency Operating Procedure (EOP) No. EOP-LOCA-3 is the RWST low level alarm and, therefore, the step for arming the SJ44 valves is not executed until after the RWST reaches the low level alarm setpoint. This is contradictory to the above statement in the SE which indicates that arming of the SJ44 valves is completed prior to reaching the low level setpoint in the RWST. With regard to statement 3, the inspectors found that the EOP calls for the operators to arm the SJ44 valves upon verification of a certain sump water level. The procedure does not specify that the level must be increasing as is indicated in the SE.

In an effort to address the inspectors' concerns, the licensee reviewed the staff's SE, the references listed in the SE, including the licensee's submittals supporting the amendment request, and other docketed information. As a result of these efforts, the licensee determined that discrepancies existed between the staff's SE and the licensee's submittals for the amendment request. Therefore, the licensee proposed clarifying text for the SE to bring it into agreement with the licensee's submittals and, thereby, resolving the NRC's concerns.

2.0 EVALUATION

In the May 27, 1997 letter, the licensee requested that the statements state that Section 1.0 above be replaced with the following statements, respectively:

1. "...approximately 8.5 minutes (for large break LOCA) would be available for the operator to perform the necessary switchover manual action[s]..."

2. "EOP-LOCA-3 is entered upon receipt of the RWST low level alarm. One of the very early steps in EOP-LOCA-3 is to arm the SJ44 valves upon verification of containment sump level for initiation of semiautomatic switchover"

3. "The operator is instructed by the emergency procedure to monitor the containment sump water level and verify that the appropriate sump water level has been reached prior to arming the containment sump isolation valves."

With regard to the first statement, the licensee stated that only two documents were identified where the times available for operators to perform the necessary manual actions were discussed. These were the licensee's July 17, 1980 and the January 5, 1987 letters. The July 17, 1980, letter indicated that, "...a minimum time of approximately 8.5 minutes is available for the operator to perform the necessary switchover manual actions...." This statement was in reference to the semiautomatic switchover in Modes 1, 2 and 3. The January 5, 1987 letter stated that the amount of time that would be available for completing the manual switchover during Mode 4 is approximately 18.5 minutes. This letter was submitted in response to staff questions related to ECCS switchover in Mode 4. In Mode 4, the semiautomatic switchover is disarmed and manual switchover is assumed. Assumptions and evaluations for manual switchover in Mode 4 are different from those for the semiautomatic switchover in Modes 1, 2 and 3. The Mode 4 LOCA procedure directs operators to inject using a single train and to start

pumps in a controlled manner in order to prevent overpressurization of the reactor coolant system (RCS). This significantly reduces the rate at which the RWST drains down during the injection phase when compared to the Modes 1, 2 and 3 procedure and; therefore, provides more time for the switchover. Licensee calculations for the Mode 4 switchover assumed 7000 gallons per minute of injection while the Modes 1, 2 and 3 calculations assumed 15,000 gallons per minute. For the available RWST inventory of 129,300 gallons, this results in switchover times of approximately 8.5 minutes and 18.5 minutes for the Modes 1, 2 and 3 and Mode 4 scenarios, respectively.

On May 15, 1997, Westinghouse completed a re-evaluation of the RWST drain down for Salem Unit 2. The re-evaluation concluded that for a large break LOCA (LBLOCA), operators would have 9.5 minutes for completing the switchover. This value is consistent with and provides additional margin when compared to the 8.5 minutes discussed in the July 17, 1980, letter. For the LBLOCA, the pressure in the RCS drops below the shutoff head of the residual heat removal (RHR) pumps allowing the RHR pumps to deliver water to the core. The licensee has determined that flow from one RHR pump is sufficient to meet the long term core cooling requirements of the analysis of record. Therefore, for a LBLOCA, the switchover is considered complete when the RHR pump suction is transferred from the RWST to the containment sump. This portion of the switchover is automatically completed when the RWST low level signal is received and the system is armed. The RWST low level signal is provided automatically by the RWST level instrumentation while arming of the system is performed manually, by the operators, upon confirmation of adequate containment sump level. Once these conditions are met, the semiautomatic switchover system will automatically open the sump valves to the RHR pumps and close the RWST valves to these pumps. Therefore, suction to the RHR pumps and continuous flow of ECCS water to the core are both maintained.

The Westinghouse evaluation further identified the safety injection accumulator line small break LOCA (SBLOCA) as the most limiting scenario from an ECCS switchover perspective. In this scenario, the RCS pressure stays above the shutoff head of the RHR pumps. Therefore, these pumps cannot deliver water to the core. Consequently, the switchover procedure in this case includes the additional manual actions of closing Valve SJ69 (the common suction valve from the RWST to the RHR pumps) and aligning the discharge of the RHR pumps to the suction of the high head safety injection (HHSI) and intermediate head safety injection (IHSI) pumps. Closure of Valve SJ69 is required in order to prevent the RWST from draining into the containment sump which would lead to a faster draindown of the RWST and a potential loss of suction source to the IHSI and HHSI pumps. Realignment of the discharge of the RHR pumps into the suction of the IHSI and HHSI pumps is required because the IHSI and HHSI pumps cannot take suction directly from the containment sump. The licensee's calculations show that the switchover procedure for this scenario must be completed in 11.2 minutes to prevent interruption of flow to the core. Despite the longer time available when compared to the LBLOCA scenario, this scenario was determined to be more limiting from an ECCS switchover perspective because of the greater potential for losing ECCS flow to the core. The greater potential is a result of the additional required actions, including the need to manually realign the discharge of the RHR pumps to the suction of the IHSI and HHSI pumps. These actions were not required in the LBLOCA case because the RHR pumps, which automatically realign to the containment sump, can deliver adequate flow to cool the core.

The licensee has confirmed through simulator exercises that operators can complete the manual actions of the switchover, and therefore successfully complete the semiautomatic switchover procedure, within the required times of 8.5 minutes for the LBLOCA and 11.2 minutes for the

accumulator line SBLOCA. The licensee's draindown evaluation and simulator training/verification was reviewed by NRC Region I staff during an NRC inspection which was completed on June 21, 1997. The staff findings for the inspection were documented in Inspection Report 50-272/97-12, 50-311/97-12 dated July 1, 1997. In the inspection report, the staff concluded that the licensee's revised RWST draindown evaluation was acceptable and that the operator action times specified in the revised evaluation were consistent with those provided in the May 27, 1997 letter. The staff further concluded that the measured operating crews critical action times for various loss of coolant accident scenarios were satisfactory.

With regard to statements 2 and 3, the licensee's January 3, 1986, submittal provided the relevant EOPs and proposed changes to those procedures. The submitted EOPs included EOP-TRIP-1, "Reactor Trip or Safety Injection," EOP-LOCA-1, "Loss of Reactor Coolant," and EOP-LOCA-3, "Transfer to Cold Leg Recirculation." The original procedures were provided as Attachments C, D and E, respectively; while proposed changes to EOP-TRIP-1 and EOP-LOCA-3 were provided as Attachments F and G, respectively. The changes to these procedures were proposed to ensure that the containment sump level had reached an appropriate level to support adequate net positive suction head (NPSH) for the RHR pumps prior to realigning the pumps to the sump. To accomplish this, Step 3.11 in EOP-TRIP-1 was revised to have operators verify or take action to ensure that the 21SJ44 and 22SJ44 valves (the sump isolation valves) are disarmed. This replaced the old Step 3.11 which called for dispatching an operator to the valves to locally restore power to them. In addition, Step 3.4.1 was added to EOP-LOCA-3. This step instructed operators to "ARM 21 and 22SJ44 valves for semi-auto switchover..." This step was added immediately following the step which has operators confirm that "containment recirc sump level is greater than 68%." Therefore, if sump level cannot be confirmed, the operators would not arm Valves 21SJ44 and 22SJ44. They would instead perform the contingency actions column of the EOP which instructed them to stop the RHR pumps and transition to EOP-LOCA-5, "Loss of Emergency Recirculation." Additionally, with regard to verification of sump level, the version of EOP-LOCA-3 that was provided with the January 3, 1986, letter clearly instructs operators to verify a sump level. Confirmation of increasing level was not listed. Based on the above information, the licensee's request to replace current statements 2 and 3 with revised statements 2 and 3 is consistent with the January 3, 1986, submittal for Amendment No. 69. In addition, revised statements 2 and 3 and the information provided in the January 3, 1986, submittal provide added assurance of RHR pump protection with respect to NPSH.

The NRC staff has reviewed the documents related to Amendment No. 69 and the ECCS semiautomatic switchover design for Salem Unit 2. The staff finds that the statements proposed by the licensee accurately represent the description of the semiautomatic switchover procedure that was provided in the licensee's submittals. The staff further concludes, based on the above discussion and the findings in NRC Inspection Report 50-272/97-12, 50-311/97-12, that the proposed statements do not invalidate the following conclusions reached in the staff's SE of May 1, 1989: (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 this amendment will not be inimical to the common defense and security nor the health and safety of the public. Therefore, the staff finds the licensee's proposed statements acceptable.

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Date: July 6, 1998

REFERENCES

1. Letter from E. C. Simpson, Public Service Electric and Gas Company, to USNRC, "Corrections to the Technical Specification Amendment 69 Safety Evaluation Report, Salem Generating Station, Unit No. 2, Docket No. 50-311," May 27, 1997.

2. Letter from D. R. Powell, Public Service Electric and Gas Company, to USNRC, "Additional Information for Corrections Amendment 69 Safety Evaluation Report, Salem Generating Station, Unit No. 2, Docket No. 50-311," March 6, 1998.

3. Letter from D. R. Powell, Public Service Electric and Gas Company, to USNRC, "Additional Information for Corrections Amendment 69 Safety Evaluation Report, Salem Generating Station, Unit No. 2, Docket No. 50-311," April 28, 1998.

4. Letter from J. C. Stone, USNRC, to Mr. Miltenberger, Public Service Electric and Gas Company, "Semiautomatic Switchover of ECCS from Injection to Recirculation (TAC NO. 51571)," May 1, 1989.

5. NRC Meeting Summary Distribution, Docket No. 50-311, Salem Nuclear Generating Station Unit 2, "Summary of Meeting on Automatic ECCS Switchover," June 24, 1980.

6. Letter from R. M. Mittl, Public Service Electric and Gas Company, to Director of Nuclear Reactor Regulation, ATTN: Mr. A. Schwencer, LB#3, "Proposed Conceptual Design ECCS Automatic Switchover, Unit No. 2, Salem Nuclear Generating Station, Docket No. 50-311," July 17, 1980.

7. Letter from E. Linden, Public Service Electric and Gas Company, to Director of Nuclear Reactor Regulation, ATTN: Mr. Steven A. Varga (ORB #1), "Request for Amendment to Facility Operating License DPR-70 and DPR-75, Salem Generating Station , Unit No. 1 and 2, Docket Nos. 50-272 and [illegible]1," January 27, 1983.

8. Letter from C. A. McNeill, Jr., Public Service Electric and Gas Company, to Steven A. Varga (NRC), "Semiautomatic Switchover from Injection to Recirculation, Salem Generating Station, Unit No. 2," January 3, 1986.

9. Letter from C. A. McNeill, Jr., Public Service Electric and Gas Company, to Director of Nuclear Reactor Regulation, ATTN: Mr. Vincent S. Noonan (PWR PD#5), "Request for Additional Information," January 5, 1987.

10. Letter from J. C.Linville, NRC, to Mr. L. R. Eliason, Public Service Electric and Gas Company, "NRC Integrated Inspection Report 50-272/97-12, 50-311/97-12, Notice of Violation," July 1, 1997.