



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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ENCLOSURE

SUPPLEMENTAL SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

STATION BLACKOUT RULE (10 CFR 50.63)

PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION UNITS 1&2

DOCKET NOS. 50-352 AND 50-353

1.0 INTRODUCTION

The NRC staff's Safety Evaluation (SE) pertaining to the licensee's initial response to the Station Blackout (SBO) Rule, 10 CFR 50.63, was transmitted to the licensee by letter dated June 3, 1991. The staff found the licensee's proposed method of coping with an SBO to be in conformance with the SBO Rule contingent upon the resolution of several recommendations itemized in the SE. The licensee responded to the staff's SE, and specifically to the recommendations, by letter from G. J. Beck, Philadelphia Electric Company, to the Document Control Desk, U.S. Nuclear Regulatory Commission, dated September 4, 1991, and February 14, 1992. Also, there was a meeting with the licensee and the NRC on April 16, 1992.

2.0 EVALUATION

The licensee's response to the staff's recommendations is evaluated below.

2.1 Condensate Inventory for Decay Heat Removal (SE Section 2.3.1)

SE Recommendation

The licensee should ensure that 138,000 gallons of water per unit is required in each of the two condensate storage tanks (CSTs) during normal plant operating conditions.

Licensee Response

The licensee indicated that actions to ensure that 138,000 gallons of water per unit be maintained in each CST are not necessary and that only the suppression pool inventory will be used for reactor pressure vessel (RPV) makeup and reactor heat removal during an SBO event.

Staff Evaluation

Based on its review, the staff finds the above licensee's response acceptable and, therefore, considers this SE issue resolved.

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2.2 Effects of Loss of Ventilation (SE Section 2.3.4)

2.2.1 Initial Control Room Temperature

SE Recommendation

The licensee should justify the use of a non-conservative initial temperature in the control room heat-up calculations.

Licensee Response

During the meeting held on April 16, 1992, the licensee indicated that a procedure has been established to maintain the control room temperature at 78°F during normal operation.

Staff Evaluation

Based on its review, the staff finds the above licensee's response acceptable and, therefore, considers this issue resolved.

2.2.2 Containment Heat-up

SE Recommendation

For the containment heat-up, the licensee should verify that the conditions assumed for the design basis LOCA are representative of those expected during an SBO event per NUMARC 87-00 Supplemental Questions and Answers.

Licensee Response

The licensee stated that it had verified that the conditions assumed for the design basis LOCA are not only representative of, but bound those expected during an SBO event in accordance with NUMARC guidance. In addition, the Limerick Environmental Qualification Program incorporates a bounding drywell temperature profile of a constant 340°F during the first 6 hours following a LOCA. This bounding drywell temperature profile thus ensures that the required safety-related equipment inside the drywell is not rendered inoperable by the drywell conditions during an SBO event.

Staff Evaluation

Based on its review, the staff finds that the licensee's verification outlined in their submittal is acceptable and, therefore, considers this issue resolved.

2.2.3 Actions to Open Doors

SE Recommendation

The licensee should open the doors to the auxiliary equipment room, RCIC room, and the equipment cabinet doors in the auxiliary equipment room.

Licensee Response

The licensee used a Bechtel standard computer code, with the assumption that no operator actions were required to open doors, in lieu of the NUMARC method to re-perform the temperature transient analyses for the control room and the auxiliary equipment room following an SBO event. The calculated peak temperatures are 105°F and 108°F, respectively. Consequently, the licensee stated that these rooms are not dominant areas of concern. The licensee further concluded that equipment cabinet doors do not need to be opened to ensure equipment operability during an SBO event. The computer code models a single homogenous volume with heat slabs and heat sources using a finite difference technique to solve the appropriate energy equations. In addition, the computer code has been subjected to Bechtel's QA activities and the appropriate time-step size and heat slab modes have been selected for the analysis.

For the RCIC pump room, the licensee stated that it had performed an evaluation which indicated that no operator actions are required to maintain the RCIC pump room bulk air temperature below that which effects equipment operability for 1 hour prior to establishing the AAC-powered ventilation.

Staff Evaluation

Based on its review, the staff finds the licensee's responses acceptable and, therefore, considers this SE issue resolved.

2.2.4 Inverter Operability

SE Recommendation

In addition, the licensee should verify that the NUMARC 87-00, Appendix F, values which the licensee used, bound the manufacturer's recommended operating temperatures for the inverters in the Unit 1 Auxiliary Equipment Room and the Computer Room.

Licensee Response

In response to the staff's concern described in the SE, the licensee stated that the Unit 1 average power range monitor (APRM) inverters are located in the Auxiliary Equipment Room (AER). As discussed above (Section 2.2.3), in its revised heat-up calculation, the licensee predicted that the temperature in the AER reaches a temperature of approximately 108°F in 1 hour at which time AAC-powered ventilation would be restored. Based on this calculation, the licensee concluded that the AER is not a dominant area of concern. With regard to the Unit 1 reactor protection system and computer inverter room, a peak temperature of 131°F was originally calculated using NUMARC 87-00 methodology. The licensee did not re-perform the heat-up calculation with the Bechtel computer code. However, during the April 16, 1992, meeting, the licensee stated that with an SBO event in Unit 2, the ventilation to the inverter room is unaffected because the ventilation is powered from the Unit 1 safeguard power. With an SBO on Unit 1, the ventilation for the inverter room would be restored within 1 hour. The licensee further states that the inverter room temperature would be considerably less than 131°F. The licensee also indicated that the inverter has been designed for continuous operation at 104°F with a mean time between failures of at least 10,000 hours. Using the methodology of NUMARC 87-00, Appendix F, the licensee concluded that the inverters would remain operable throughout the 4-hour SBO event.

Staff Evaluation

Based on its review, the staff finds that the licensee has responded to the staff's concern regarding reasonable assurance of operability for a 4-hour SBO event, and is therefore, acceptable.

2.3 Containment Isolation (SE Section 2.3.5)

SE Recommendation

The licensee should verify that procedure E-10/20 also identifies the action necessary to confirm that containment isolation valves (CIVs) are fully closed, if needed. The valve closure should be confirmed by position indication (mechanical, local, remote, etc.)

Licensee Response

The licensee stated that the Limerick Generating Station (LGS) procedure E-10/20 will be revised to provide guidance for the operators to verify the closure of CIVs.

This procedural revision will be completed within 1 year of receipt of final NRC approval, in accordance with 10 CFR 50.63(c)(3).

Staff Evaluation

Based on its review and the licensee's commitment, the staff finds the licensee's response acceptable and, therefore, considers this SE issue resolved.

2.4 Quality Assurance and Technical Specifications (SE Section 2.6)

SE Recommendation

The licensee has not provided any information on how the plant conforms with the guidance of Regulatory Guide (RG) 1.155, Appendices A and B.

Licensee Response

The licensee states that with the exception discussed below, the equipment that is assumed operational to achieve and maintain safe shutdown of both units during an SBO event is safety-related and is covered by the Licensee's Quality Assurance (QA) program as required by Appendix B to 10 CFR Part 50. The licensee states the equipment that is relied upon during an SBO event, but that is not safety related, will be maintained in accordance with the guidance of RG 1.155, Regulatory Position C.3.5 and Appendix A. The licensee further states that the only non-safety-related equipment relied upon during an SBO event is the 101 and 201 safeguard buses, which will be used to backfeed AC power to the blacked out unit.

Staff Evaluation

The staff finds the licensee's response to be acceptable.

2.5 EDG Reliability Program (SE Section 2.7)

SE Recommendation

It is the staff's position that an emergency diesel generator (EDG) reliability program should be developed in accordance with the guidance of RG 1.155, Section 1.2. Confirmation that such a program is in place or will be implemented should be included in the documentation that is to be maintained by the licensee in support of the SBO submittals.

Licensee Response

The licensee states that the target EDG reliability of 0.95 was selected based on having a nuclear unit average EDG reliability for the last 100 demands greater than 0.95 consistent with NUMARC 87-00, Section 3.2.4. The licensee states that an EDG reliability program will be implemented to monitor and maintain the EDG target reliability of 0.95 utilizing the guidance in

RG 1.155, Regulatory Position C.1.2. If the EDG performance falls below the target reliability level of 0.95, action will be taken as required by the EDG reliability program to restore the affected EDG to the target reliability level.

Staff Evaluation

The staff finds the licensee's commitment to be acceptable.

3.0 Licensee Clarifications

In its letter dated June 3, 1991, the licensee also provided the following clarifications:

3.1 Alternate AC Power Source

3.1.1. Staff Statement

The NRC SE states that instead of using one of the EDGs on the blacked out (BO) unit, the licensee decided to use one of the EDGs on the opposite non-blackened out (NBO) unit as the AAC source.

Licensee Clarification

The licensee states that for the NBO unit, considering the single failure criterion, three EDGs are assumed to be available. The SE statement implies that one of these EDGs from the NBO unit will be dedicated as an AAC source for the BO unit. Actually, we are crediting the excess capacity from the NBO unit as the AAC power source for the SBO unit. We do not rely on any single EDG from the NBO unit as the AAC source for the SBO unit.

Staff Evaluation

The staff finds the use of the excess capacity from more than one of the EDGs on the NBO unit to be acceptable.

3.1.2 Staff Statement

The NRC SE notes that the failure of all four EDGs in the BO unit is a conservative assumption.

Licensee Clarification

The licensee states that the SBO AAC configuration assumes no operable EDGs on the BO unit and three operable EDGs on the NBO unit. The assumption that no EDGs are operable on the BO unit is only an assumption made for the purpose of the analysis.

Staff Evaluation

The staff finds no inconsistency between the statements made between the NRC staff and the licensee. The staff finds the licensee's elaboration to be acceptable.

3.1.3 Staff Statement

The NRC SE states that the staff's assessment of Philadelphia Electric Company's proposed AAC power source indicates that it falls into the minimally capable AAC power source category.

Licensee Clarification

The licensee states that based on a review of the LGS proposed AAC configuration, as discussed above and at the November 15, 1990, meeting regarding the LGS SBO submittal, the licensee has concluded that LGS should be categorized as a fully capable AAC power source design. As concluded in the NRC SE, the NRC staff evaluation of the AAC power source indicates that there is adequate capacity and capability to power the essential loads in the BO unit without requiring any load shedding in the NBO unit. As defined in the NRC SE, although redundant capability is not available, a fully capable AAC source would enable attainment of safe shutdown during an SBO event and recovery from the Main Control Room, as is the case for the LGS. The licensee has concluded that LGS should be categorized as a fully capable AAC power source design.

Staff Evaluation

After further review the staff agrees with the licensee's categorization of having a fully capable AAC power source.

3.2 Reactor Core Isolation Cooling (RCIC) Pump Suction Transfer

Staff SE and Technical Evaluation Report (TER) Statement

The SE and supporting TER state that the licensee will revise the SBO procedure (E-1) so that the operators will no longer be directed to shift the RCIC pump suction to the suppression pool during an SBO event.

Licensee Clarification

The licensee states (see Section 2.1.1 above) that the Condensate Storage Tank (CST) inventory is not required at any time during the assumed 8-hour duration of the SBO event, and no credit for CST inventory has been taken in the SBO analysis.

Staff Evaluation

This issue was discussed under Condensate Inventory (Section 2.1.1). The staff found this to be acceptable.

3.3 Compressed Air

TER Statement

The TER states that an instrument air compressor will operate when the AAC power source is established, and that sufficient compressed air will be available for the air-operated valves needed during an SBO event.

Licensee Clarification

The licensee states that in their submittal dated April 9, 1990, that the AAC power supply is capable of energizing an instrument air compressor and an instrument gas compressor within 1 hour of an SBO event. The licensee also states that the only air-operated valves relied upon during an SBO event are the Automatic Depressurization System (ADS) valves. The licensee further states that gas bottles with Seismic Category 1 supports are provided for long-term operation of the ADS valves. These gas bottles supply the ADS valves with an air supply adequate for 7 days of operation (i.e., see LGS Updated Final Safety Analysis Report, UFSAR, Section 9.3.1.3.2).

The licensee concludes that although the capability for energizing an instrument air and instrument gas compressor within 1 hour of an SBO event exists, sufficient local air supply is available such that reliance upon the availability of an air or gas compressor during an SBO event is not needed.

Staff Evaluation

Based on the licensee's statement, the staff agrees that sufficient local air supply is available such that the licensee does not need to rely upon the availability of an air or gas compressor during an SBO event.

3.4 Load Shedding

Staff SE and TER Statement

The SE and TER conclude that the AAC power source have adequate capacity and capability to power the essential loads in the BO unit without requiring any load shedding in the NBO unit.

Licensee Clarification

The licensee states that there is a number of non-essential loads in the NBO unit that could be shed at the operator's discretion; however, load shedding is not necessary in order to power essential loads in the BO Unit and maintain EDG loading below the continuous rating (i.e., 2850 kw).

Staff Evaluation

The staff accepts the licensee's clarification and finds the clarified statement to be acceptable.

3.5 Electric Cross-Tie

Staff SE Statement

The SE states, "...In addition, there are crossties between the Unit 1 safeguard buses and the Unit 2 safeguard buses..."

Licensee Clarification

The licensee notes that the above mentioned statement implies that there are electrical crossties between units in addition to the 101 and 201 safeguard buses. This is not the case. The electrical connectability between units at LGS is available only via the 101 and 201 safeguard buses.

Staff Evaluation

After further review the staff agrees with the licensee's clarification that the connectability between units is by the safeguard buses 101 and 201 and not by crossties between units. This clarification does not affect the staff's evaluation.

3.6 Class 1E Battery Capacity

Staff SE Statement

The staff's SE states that the Class 1E batteries have sufficient capacity to supply the SBO loads for 4 hours, and that after 1 hour selected battery chargers will be powered. The staff's SE also states that the AAC power source will be available to support the required battery chargers after 1 hour.

Licensee Clarification

The licensee states that these conclusions are not entirely accurate. The licensee states each Class 1E battery bank has sufficient capacity without its

charger to independently supply the required loads for design basis accidents for 4 hours.

Since the SBO loads are a subset of the design basis accident loads, the station battery capacity is sufficient to meet SBO shutdown requirements for 4 hours. The licensee states that a 4 hour battery capacity is necessary at LGS since some electrical divisions are not expected to have their battery chargers powered during an SBO event. The licensee concludes that battery chargers are not required at any time during the assumed 4 hour SBO event; however, at 1 hour into the SBO event, with the AAC power source available, the ability to power selected battery chargers will be available.

Staff Evaluation

The staff accepts the Licensee's clarification that although the AAC source will be available to power selected battery charges, after 1 hour into the SBO event, it will not necessarily be used for this purpose since the batteries are adequate for the 4-hour SBO event without the battery chargers. This does not affect the staff's evaluation.

3.7 SUMMARY AND CONCLUSION

The staff has reviewed the licensee's response to the staff's SE pertaining to the SBO Rule (10 CFR 50.63) in their transmittal letters dated September 4, 1991, and February 14, 1992. Also, there was a meeting between the licensee and the NRC staff on April 16, 1992. The staff has reviewed the licensee's confirmations and commitments and finds them to be acceptable. The licensee's April 16, 1992, meeting with the NRC staff resolved the staff's concerns pertaining to loss of ventilation and inverter operability. This completes our review under TAC Nos. M68561 and M68562.

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