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NUCLEAR REGULATORY COMMISSION
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ENCLOSURE

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

STATION BLACKOUT SUPPLEMENTAL SAFETY EVALUATION

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

The NRC staff's (the staff) Safety Evaluation (SE) pertaining to the licensee's initial responses to the Station Blackout (SBO) Rule, 10 CFR 50.63, was transmitted to the licensee by letter dated October 25, 1991. The staff found the licensee's proposed method of coping with an SBO to be incomplete. The licensee responded to the staff's SE, by letter from S. LaBruna, Public Service Electric and Gas Company, dated December 30, 1991. Additionally, the staff considered information provided in the licensee's March 19, 1992 response to the staff's SE for the Salem Nuclear Generating Station. The licensee's March 19, 1992 letter contained weather information that was also applicable to the Hope Creek Generating Station.

2.0 EVALUATION

The licensee's responses to each of the staff's recommendations are evaluated below.

2.1 Station Blackout Duration (SE Section 2.1)

SE Recommendation: The licensee should provide site-specific data and analyses to demonstrate that the plant should be in ESW Group "2," otherwise the plant will be placed in ESW Group "4" in accordance with Table 3-2 of NUMARC 87-00, which in turn will place the plant in Group "P2." If the licensee cannot provide site-specific data and analyses to demonstrate that the plant should be in ESW Group "2," then the licensee should change the target EDG reliability from 0.95 to 0.975 in order to be a 4-hour coping plant instead of an 8-hour coping plant.

Licensee Response: The licensee's December 30, 1991, submittal for Hope Creek referenced Report No. NUS-5175 "Estimated Frequency of Loss of Offsite Power Due to Extremely Severe Weather (ESW) and Severe Weather (SW) for Salem and Hope Creek Generating Stations." Subsequent to that submittal, on March 19, 1992, the licensee submitted its response to the staff's safety evaluation for the Salem Nuclear Generating Station and stated that Report No. NUS-5175 had been revised to normalize the conductor height to 30 meters. The following is therefore based on the revised report. The report used Wilmington National

Weather Service (NWS) data to determine the SW and ESW classifications, and provides justification as to why that data is applicable to the Hope Creek (and Salem) plants. The report also used extreme wind data applicable to Delaware Breakwater, Delaware; and Cape May, New Jersey; as representing an extremely conservative upper bounding condition for its ESW classification. The report calculated the estimated frequency of loss of off-site power due to severe weather (SW) equal to 3.69×10^{-3}. For ESW, the report calculates an annual expectancy of a 125 mph (or greater) wind speed equal to 2.02×10^{-6}, based on the site specific data, or 8.06×10^{-4}, based on the Delaware Breakwater/Cape May data. The site specific data results in an SW classification of "2," and an ESW classification of "1." The Delaware Breakwater/Cape May data results in an ESW classification of "2." In either case, the off-site power design characteristic is Group "P1 " requiring a 4-hour coping duration.

Staff Evaluation: The staff has reviewed the licensee's submittal, and finds that it is consistent with the NUREG/CR-4492, NUREG/CR-2639, and NUMARC 87-00 criteria and guidance. We therefore find that this issue has been resolved and that Hope Creek is correctly classified as a 4-hour coping, 0.95 EDG target reliability plant.

2.2 Class 1E Battery Capacity (SE Section 2.2.2)

SE Recommendations: The licensee should reevaluate the battery capacity considering more than one start attempt of the EDGs. The licensee should address the operation of the SBO equipment at the final terminal voltage of 105V and 210V for the 125V and 250V dc batteries, respectively. In addition, the licensee should evaluate the battery capacity when there is no heat available in the battery room.

Licensee Response:

a. For Hope Creek's SBO battery load profile, the diesel generator field flashing load has been considered for the complete first minute (0-1 minute) and also for the complete last minute (239-240 minutes). Hope Creek's Standby Diesel Generators are designed to start and attain rated voltage within 10 seconds of the receipt of the starting signal (Refer to Hope Creek UFSAR section 8.3.1.1.3.10). Following the occurrence of an SBO event, the Hope Creek 125V dc Class 1E batteries have sufficient capacity to allow the diesel to start more than once in the first minute and also start during the last minute of the SBO 4 hour duration.

b. Calculation Nos. E1.4(Q) Rev. 1 and E4.2(Q) Rev. 1 ensure that the minimum voltage reached at the terminals of 250V and 125V dc batteries during SBO duty cycle, as per Calculation Nos. E45.001(Q) and E45.002(Q), will provide adequate operating voltage for the SBO equipment during an SBO coping duration.

c. Hope Creek UFSAR Section 9.4.1.1.4 states that the Control Equipment Room Supply System is designed to maintain the battery room temperature at 77±3°F during normal plant operating conditions. The 125V and 250V battery room temperatures are maintained by safety related thermostatically controlled temperature elements. The setpoints of the temperature elements are 77°F for 125V Class 1E battery rooms and 77±3°F for 250V Class 1E battery rooms. The manufacturer's accuracy is ±1°F. A weekly surveillance program also exists at the Hope Creek station to record the battery room temperatures. The 250V and 125V battery SBO battery calculations, E45.001 (Q) and E45.002(Q) have considered 72°F as the battery electrolyte temperature which is lower than the lowest electrolyte temperature anticipated under normal operating conditions. (Refer to Section 7.2.2 of NUMARC 87-00).

It is also anticipated that during the station blackout event, the electrolyte temperature will increase since the battery will not be floating but will be discharging at a higher rate to supply power to the station blackout loads. NUMARC 87-00, Section 2.7.2 (2) (B) states:

> "Also, the mass of battery electrolyte is sufficient to resist significant temperature drops over a four hour period due to lower battery room temperature since battery cell materials are not efficient thermal conductors. Therefore, a decrease in battery capacity due to temperature decreases in electrolyte under station blackout conditions does not warrant further consideration."

On the pretext of the above considerations, it can be concluded that the Hope Creek 250 Volt and 125 Volt batteries have adequate capacity to supply the station blackout loads for a 4 hour SBO coping period.

Staff Evaluation: We find that the licensee has adequately addressed the staff's concerns pertaining to Class 1E battery capacity and, therefore, this issue is closed.

2.3 Loss of Ventilation (SE Section 2.2.4)

2.3.1 SE Recommendation: Provide and justify that the initial temperatures used in the heat-up calculations are the maximum allowable and that the heat load accurately reflects those during an SBO event.

Licensee Response: In response to the above staff recommendation, the licensee provided the initial wall temperatures together with justifications and heat loads used in the heat-up calculations for the dominant areas of concern (DAC) during an SBO event.

With respect to the initial room temperatures, the licensee indicated that the normal operating temperatures as described in Hope Creek UFSAR were used in the heat-up calculation.

Staff Evaluation: Based on its review of the initial wall temperatures and heat loads, the staff finds them acceptable.

Also, the staff finds that the use of the normal operating temperatures as the initial room temperatures for the heat-up calculation is acceptable. However, the licensee should document the basis for the initial temperatures used in the heat-up analysis for the control room and for the identified dominant areas of concern. Administrative procedures should be established to maintain the control room temperature consistent with the initial control room temperature used in the heat-up analysis. The basis and justification should be included in the documentation that is to be maintained by the licensee in support of the SBO submittals.

2.3.2 SE Recommendation: Discuss the modification/procedure for removing the acoustic ceiling tiles in order to provide sufficient cooling in the control room.

Licensee Response: In response to the above staff concern, the licensee stated that acoustic ceiling tiles will be removed in the control room in order to provide sufficient cooling. In addition, station procedures will be developed to address the number of tiles to be removed and the timeframe for removal.

Staff Evaluation: Based on its review, the staff finds the licensee response acceptable and considers its concern regarding the removal of ceiling tiles in the control room resolved.

2.3.3 SE Recommendation: Describe what was being proposed for reducing the heat load and temperature heat-up in the control equipment room and state which temperature was being considered when performing the assessment of equipment operability in the room.

Licensee Response: In response to the above staff recommendation, the licensee indicated that in order to reduce the heat load and temperature in the control equipment room (5302), several circuits powered by non-Class 1E batteries must be de-energized. (The circuits to be de-energized and their location are provided in the response). The door which opens from the control equipment room to the unoccupied area located on the north wall of the room will be opened. The maximum steady state temperature of 118.3°F calculated with reduced heat load and the door open as described above was used for performing the assessment of equipment operability in this room. In addition, the licensee indicated that station procedures will be developed to address the de-energization of the circuits powered by non-class 1E batteries and to open the door.

Staff Evaluation: Based on its review, the staff finds the licensee's response acceptable and considers its concern regarding the heat load and temperature heat-up in the control equipment room resolved.

2.3.4 SE Recommendation: Demonstrate that all the assumptions made for drywell calculation are conservative and that the assumed initial conditions accurately reflect those expected du.ing an SBO event.

Also, in the SE, the staff reported that the licensee was reassessing its drywell and suppression pool heat-up calculations, and that upon receipt of the licensee's reanalysis, the staff would report its evaluation in a supplement to the SE.

Licensee Response: In the response to the above staff concerns, the licensee indicated that initially Bechtel was contracted to perfo:m the analysis to determine containment response during an SBO event. However, independent review by a different contractor indicated some deficiencies and inaccuracies in Bechtel's calculation (the input file that was used in the Bechtel proprietary computer code was not the Hope Creek Generating Station (HCGS) plant specific data). Consequently, a reanalysis using the most conservative input data to determine the HCGS containment response during an SBO event was performed. The maximum calculated drywell and torus temperatures are 220°F and 185°F respectively. In addition, the licensee provided detailed justification for the input parameters.

Staff Evaluation: Based on its review, the staff finds the licensee's response acceptable and considers the above concerns resolved.

2.3.5 SE Recommendation: Provide procedures for opening the instrumentation and control cabinet doors within 30 minutes of the onset of an SBO in accordance with NUMARC 87-00, Appendix F.5.

Licensee Response: In the response to the staff concern, the licensee indicated that cabinet doors for panels containing SBO equipment that are required to be opened during an SBO event will be opened in accordance with the SBO coping analysis study. Procedures to address this issue will be written by October of 1993 in accordance with 10 CFR 50.63(c)(4).

Staff Evaluation: Based on its review, the staff finds the licensee's response acceptable and considers its concern with regard to the procedures for the operating of the instrumentation an control cabinet doors in the control room resolved.

2.3.6 SE Recommendation: Provide procedures for opening the doors to rooms where the heat-up calculations were performed with the credit taken for opening the area doors.

Licensee Response: In response to the staff's concern, the licensee indicated that the doors, for which credit has been taken, have been identified and will be opened following an SBO. Procedures to address this issue will be written by October of 1993 in accordance with 10 CFR 50.63(c)(4).

Staff Evaluation: Based on its review, the staff finds the licensee's response acceptable and considers its concern with regard to the procedures for opening the room doors resolved.

2.3.7 SE Recommendation: In the SE, the staff reported that the licensee indicated that no heat-up calculation for the main steam tunnel was performed because there is no equipment which is required to be operable during an SBO event. Accordingly, the staff recommended the licensee to verify that there are no valves in the main steam tunnel which need to be operable should containment isolation become necessary.

Licensee Response: In response to the staff concern, the licensee indicated that there is one valve in the main steam tunnel which requires manual operation. Since the motor operated valve will be closed by the local handwheel, environmental qualification for the motor operator and associated cabling is not a concern.

Staff Evaluation: Based on its review, the staff concurs with the licensee that the operability of the valve motor operator and associated cabling is not a concern. However, the licensee should verify that the main steam tunnel is habitable for the operator to perform the required manual operation during an SBO event.

2.4 Containment Isolation (SE Section 2.2.5):

SE Recommendation: The licensee should list the containment isolation valves (CIVs) which are either normally closed or normally open, and fail as-is upon loss of ac power, and cannot be excluded by the criteria given in Regulatory Guide (RG) 1.155; and provide in procedures the actions that must be taken to ensure that the 14 valves cited in the SE can be verified to be closed during an SBO.

Licensee Response and Staff Evaluation: In response, the licensee addressed the staff's concerns in great detail. Based on its review, the staff finds the licensee's response acceptable and considers its concern related to containment isolation resolved.

2.5 Proposed Modifications (SE Section 2.5):

SE Recommendation: The licensee should explain why modifications to the inboard MSIV drain line, drywell sump drain line, and drywell equipment drain lines are no longer required.

Licensee Response: All containment isolation valves required to meet containment isolation capability have been reevaluated. Hope Creek has determined that all valves are accessible and can be closed/verified closed locally. However, the location of the three valves in question pose

challenges to the operator's ability to perform containment isolation. In the case of the main steam drain valve, an access hatch above the valve will be installed to facilitate manual operation. In the case of the drywell floor drain sump discharge valve and the drywell equipment drain sump discharge valve, the downstream air operated valve will be modified to fail closed on loss of air or ac power.

Staff Evaluation: We find that the licensee has adequately addressed the staff's concerns and therefore, this issue is closed.

2.6 Quality Assurance (SE Section 2.6)

SE Recommendation: The licensee should verify that the SBO equipment is covered by an appropriate QA program consistent with the guidance of RG 1.155.

Licensee Response: An equipment list was compiled and this equipment list provides a consolidated listing of electrical, mechanical, instrumentation and control equipment, and components located in the various areas of the plant that are required for coping with an SBO event. The equipment list also identifies the QA category of the equipment. Where non-nuclear safety related equipment has been used for SBO, it has been assigned a QA Requirement of RG 1.155, Appendix A/B.

Staff Evaluation: We find the licensee's response to be consistent with the staff's recommendation and is, therefore, acceptable.

2.7 EDG Reliability Program (SE Section 2.7)

SE Recommendation: The licensee should implement an EDG reliability program which meets the guidance of RG 1.155, Section 1.2. If an EDG reliability program currently exists, the program should be evaluated and adjusted in accordance with RG 1.155. Confirmation that such a program is in place or will be implemented should be included in the documentation supporting the SBO submittals that is to be maintained by the licensee.

Licensee Response: The licensee provided a detailed description of its EDG reliability program and stated that, although a centralized method of capturing and retrieving data important to the EDG does not presently exist at HCGS, all of the information listed in NUMARC 87-00 Rev. 1, Section E.3, is collected, maintained available, and utilized. This program will be adjusted in accordance with RG 1.155 and will be documented in the Hope Creek Coping Analysis Study.

Staff Evaluation: We find the licensee's commitment to adjust its EDG reliability program in accordance with RG 1.155 acceptable.

2.8 Procedural Changes (SE Section 2.4)

The licensee stated that a comprehensive schedule for completion of all procedural changes necessary for Hope Creek to cope with an SBO and the proposed modifications will be completed by March of 199[illegible]. By letter dated March 31, 1992, the licensee submitted its schedule for SBO procedure changes and modifications. The staff finds the licensee's schedule to be acceptable. Therefore this issue is resolved.

3.0 SUMMARY AND CONCLUSION

The staff's SE pertaining to the licensee's initial responses to the SBO Rule, 10 CFR 50.63, was transmitted to the licensee by letter dated December 30, 1991. The staff found the licensee's proposed method of coping with an SBO to be incomplete. The licensee's responses to each of the staff's recommendations have been evaluated in this Supplemental Safety Evaluation (SSE) and found to be acceptable. However, the licensee should (1) document the basis for the initial temperatures used in the heat-up analyses and establish administrative procedures as discussed in this SSE, and (2) verify that the main steam tunnel is habitable for the operator to perform the required manual operations during an SBO event. This SSE documents the NRC's final regulatory assessment of the licensee's proposed conformance to the SBO Rule. Therefore, no further submittals are required. The staff considers the two-year clock for implementation of the SBO Rule in accordance with 10 CFR 50.63 (c)(4) to begin upon receipt by the licensee of this enclosed SSE. Therefore, the licensee should take the necessary actions to ensure complete compliance with the SBO Rule as indicated in the staff's SE and SSE. The analyses and actions required to resolve these concerns should be included with the other documentation to be maintained by the licensee in support of SBO Rule implementation, for possible future NRC audit.

Principal Contributors: N. K. Trehan
D. Shum

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