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

SUPPLEMENTAL SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

STATION BLACKOUT RULE (10 CFR 50.63)

OMAHA PUBLIC POWER DISTRICT

FORT CALHOUN STATION, UNIT 1

DOCKET NO. 50-285

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 November 1, 1991. The staff found the licensee's proposed method of coping with an SBO to be acceptable, subject to the satisfactory resolution of several recommendations which were itemized in the staff's SE. The licensee responded to the staff's SE, and specifically to the recommendations, by letter from W. G. Gates, Omaha Public Power District, to the Document Control Desk, U.S. Nuclear Regulatory Commission dated December 11, 1991. Also, there was a teleconference between representatives of the licensee and the NRC staff on November 26, 1991.

2.0 EVALUATION

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

2.1 Station Blackout Duration (SE Section 2.1):

SE Recommendation: After analyzing all the data in the licensee's submittal, the staff finds that the licensee should evaluate the plant for an 8-hour coping duration, or lower the minimum required coping duration from 8 hours to 4 hours by choosing an EDG target reliability of 0.975, instead of 0.95. If the EDG reliability selected is 0.975, confirmation of this should be provided to the NRC and included in the documentation supporting the response to the SBO rule. Retention of the 0.95 EDG reliability would result in a conclusion of nonconformance to the SBO rule and would require that the licensee revise and resubmit its SBO response based on a plant coping capability analysis of 8 hours.

Licensee Response:

For the determination of the extreme severe weather (ESW) classification, the licensee noted that the NRC had used equation 2.4.1 (NBS Building Science Series 118, Reference 1) whereas the licensee used the approximate equation 2.4.2. The licensee stated that either equation results in a return wind speed of less than once in 1000 years (ESW 2).

During a phone conversation between the licensee and the NRC on November 26, 1991, the use of Zo of 0.05 meters in the calculation of the wind speed using equation 2.4.1 was discussed. The NRC staff questioned if 0.05 meters was an appropriate value for Zo. The licensee had subsequent conversations with the author of References 1 and 2, Mr. Emil Simiu, and he stated that the industry used 0.05 meters because it was "average." He further stated that the industry typically used equation 2.4.2 because it was more simple to use and that the margin for error was appropriately 1 percent to 2 percent between the two equations. After a description of the terrain at Fort Calhoun Station, Mr. Simiu suggested that an appropriate value for Zo would be appropriately 0.03 meters if using equation 2.4.1.

The licensee also stated that the terrain around Fort Calhoun Station varies from snowy surfaces during the winter to low grass and/or fallow-like fields during the other seasons (the tallest field crop, located approximately one mile from the plant site, is corn). The licensee referenced a document entitled "Wind Effects on Structures" (Reference 2) and stated that according to Table 2.2.1 of that document, the surface roughness length (Zo) for terrains similar to Fort Calhoun varies from 0.01 meter to 0.04 meter. This is validated using similar analogies. Therefore, the value of Zo = 0.05 meters is conservative for Fort Calhoun Station.

The licensee concludes that even using the more restrictive and conservative calculational method endorsed by SAIC, the correct ESW group is 2. Therefore, selecting a diesel generator target reliability of 0.95 and a ESW group 2 correctly places Fort Calhoun Station in the 4-hour coping duration for a station blackout event.

Staff Evaluation:

The staff's SE evaluation was based on the equations of the NBS Building Science Series 118. One of the factors of this equation is the roughness length (Zo) which may vary from 0.03m to 0.10m. Using a value of 0.05 for this factor, the staff's consultant calculated an extreme wind speed of 107.67 MPH which equated to a return period of slightly greater than once in 1000 years (ESW 2). However, considering the statistical accuracy of the measurements and assumptions used in the calculation formula, the staff's consultant and the staff concluded that realistically, and for conservatism, a value of once in 1000 years (ESW 3) was appropriate. The licensee has now provided information indicating that the Zo value used for the calculation is conservative. Therefore, after further review of the analysis and calculations provided by the licensee, the staff finds the ESW "2" classification to be acceptable. This results in a 4-hour coping duration and 0.95 reliability target for Fort Calhoun.

2.2 Class 1E Battery Capacity (SE Section 2.2.2):

SE Recommendation: The licensee needs to consider an aging factor of 1.25 in its battery capacity calculations, and verify that the batteries will have sufficient capacity for 4 hours to power the required SBO loads. The licensee

also needs to verify that the Appendix R lighting adequately replaces the emergency lighting. All information resulting from the above actions should be included in the documentation supporting the SBO submittal that is to be maintained by the licensee.

Licensee Response:

The licensee states that the station batteries will be replaced during the 1992 refueling outage. Therefore, the battery capacity calculations will be revised to include the 1.25 aging factor for the new battery characteristics.

The licensee also states that in 1989, a plant walkdown was performed to determine if the existing DC emergency lighting is sufficient to allow operation's personnel to bring the plant to a safe hot shutdown condition in the event of a control room fire (Appendix R, Section J). Another walkdown in 1990 was performed by plant operators and training personnel to identify the areas which need to be illuminated in case of a Station Blackout. The recommendations resulting from both walkdowns were incorporated into modification MR-FC-89-061.

The licensee concluded that this modification, which was implemented in 1990, has upgraded the DC emergency lighting throughout the plant. The licensee will also reverify that emergency lighting that will be available during an SBO event is adequate to perform the required actions. This documentation will be maintained by the licensee in support of the SBO submittals.

Staff Evaluation:

The staff finds the licensee's actions pertaining to the emergency lighting and its commitment to replace the batteries to be acceptable.

2.3 Compressed Air and Main Steam Room Habitability (SE Sections 2.2.3 and 2.3.6):

SE Recommendation, Compressed Air: The licensee should verify that the locations from which the AFW flow-control valves and the ADV valves that are to be locally operated are habitable during SBO conditions, and should include the relevant information in the documentation to be maintained by the licensee in support of the SBO submittals.

SE Recommendation, Main Steam Room: The licensee needs to perform a heat-up calculation to verify habitability for the operator to modulate the ADV while maintaining communication with the control room during an SBO event. The relevant information should be included with the documentation to be maintained by the licensee in support of the SBO submittals.

Licensee Response:

In the response to the above staff's concerns, the licensee indicated that the ADV and AFW flow control valves are located in the same room and in close proximity to each other. The licensee also stated that heat-up calculations will be completed and maintained to verify the habitability of the areas where ADV and AFW flow control valves are located. The above information will be included in documentation maintained by the licensee in support of the SBO submittals.

Staff Evaluation:

Based on its review and the licensee's commitment, the staff finds the licensee's response acceptable and considers the above cited issues resolved.

2.4 Effects of Loss of Ventilation (Control Room SE Section 2.3.2):

SE Recommendation: The licensee should use an initial temperature for SBO control room heat-up calculation no lower than that allowed by the TS or the administrative procedures. Also, the licensee needs to verify that the control room heat generation rate includes the heat loads generated by the operators. The relevant information should be included with the documentation to be maintained by the licensee in support of the SBO submittals.

Licensee Response:

In their response to the above staff concerns, the licensee stated that administrative controls will be implemented to ensure corrective actions are taken if the control room initial temperature used in the heat-up calculation is exceeded. In addition, the licensee indicated that the control room heat generation rate used in the calculation does include the heat loads generated by the control room operators.

Staff Evaluation:

Based on its review and the licensee's commitment, the staff finds the licensee's response acceptable and considers the above concerns with regard to the effects of loss of ventilation in the control room, during an SBO event, resolved.

2.5 Reactor Coolant Inventory (SE Section 2.5):

SE Recommendation: The licensee should verify by calculation and confirm to the NRC staff, that there is sufficient RCS inventory to maintain that the core is covered during a 4-hour SBO event. The calculation should be included with the other documentation that is to be retained by the licensee in support of the SBO submittals.

Licensee Response:

The licensee stated that it reviewed the calculations that were performed to calculate the RCS inventory at the end of the 4-hour coping period and finds the results consistent with the previously reported data. The calculations were performed on a "best estimate" basis, consistent with Regulatory Guide (RG) 1.155, "Station Blackout" requirements, using the CENTS computer code. The CENTS code is the latest in reactor system simulation codes developed by Combustion Engineering. The CENTS code incorporates a flexible nodal arrangement with state of the art algorithms for two phase media.

The licensee also stated that the code accounts for downcomer effects and pump seal leakage effects. The downcomer (cold leg) volume varies due to elevation and pressure effects from the steam generator and pump loop seal. The dynamic effects are calculated by CENTS which indicates sufficient inventory at the end of the 4-hour coping period to maintain that the core is covered with water. The licensee further states that the leakage rates for the reactor coolant pump seals were conservatively assumed to be 25 gpm which is very high for the Combustion Engineering/Byron Jackson seal design. The final resolution of Generic Issue 23, "Reactor Coolant Pump Seal Failure" is being jointly resolved by the Combustion Engineering Owners Group, of which the licensee (OPPD) is a task participant.

The licensee concludes, after review of the RCS coping calculations, that sufficient inventory exists to ensure the core remains covered during a 4-hour SBO event and that no modifications are required.

Staff Evaluation:

The licensee used the CENTS computer code to perform their calculation. The CENTS code is not an approved code, however, the staff feels that the licensee has provided assurance that sufficient inventory exists to cope with a 4-hour SBO. The staff feels that the licensee has adequately addressed the staff's concerns pertaining to reactor coolant inventory. The licensee's response is acceptable, however, the licensee should maintain this documentation in the SBO submittal for future audit/verification.

2.6 Proposed Procedures and Training (SE Section 2.6):

SE Statement: The staff neither received nor reviewed the affected procedures. The staff considers these procedures to be plant-specific actions concerning the required activities to cope with an SBO. It is the licensee's responsibility to revise and implement these procedures, as needed, to mitigate an SBO event and to assure that these procedures are complete and correct, and that the associated training needs are carried out accordingly.

Licensee Response:

The licensee stated that a Station Blackout coping procedure (EOP-07) was implemented in 1990. Other applicable plant procedures will be reviewed and revisions will be made (if necessary) to comply with the SBO Rule.

The licensee further stated that operators have been trained on procedure EOP-07, and that additional training will be provided if other plant procedures are revised to comply with the SBO Rule.

Staff Evaluation:

The staff finds that the licensee has adequately addressed the staff's concerns and these clarifications pertaining to procedures and training are acceptable.

2.7 Quality Assurance and Technical Specifications (SE Section 2.8):

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, Appendix A. Confirmation that such a program is in place or will be implemented should be included as part of the documentation supporting the SBO Rule response.

Licensee Response:

The licensee replied that (1) a majority of the SBO equipment is currently in the Fort Calhoun Station (FCS) QA Program, (2) utilizing the guidance of RG 1.155, an evaluation will be performed to ensure SBO equipment is included in the FSC QA Program, as appropriate, and (3) this information will be included with the documentation maintained by the licensee in support of the SBO Rule.

Staff Evaluation:

We find the licensee's commitment to the staff's recommendation to be acceptable.

2.8 EDG Reliability Program (SE Section 2.9):

SE Recommendation: It is the staff's position that an 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 stated that an EDG reliability program is being developed and will be implemented to meet the requirements of RG 1.155, Section 1.2. This program will be included in the documentation maintained by the licensee in support of the SBO submittals.

Staff Evaluation:

We find the licensee's commitment to be acceptable.

3.0 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 letter of December 11, 1991. Also, there was a teleconference between representatives of the licensee and the NRC staff on November 26, 1991. The licensee provided detailed answers to all the staff's recommendations. The licensee's December 11, 1991, letter committed to implement the staff's recommendations by November 1993. The staff has reviewed the licensee's confirmations and commitments and find them to be acceptable.

REFERENCES

1. NBS Building Science Series 118, "Extreme Wind Speeds at 129 Stations in the Contiguous United States," Emil Simiu, et. al., March 1979.

2. "Wind Effects on Structures," Second Edition. 1986, authored by Emil Simiu and Robert H. Scanlon, and published by John Wiley & Sons, ISBN, 0-471-86613-X.

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