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)

VIRGINIA ELECTRIC AND POWER COMPANY

NORTH ANNA POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-338 AND 50-339

1.0 INTRODUCTION

The NRC staff's Supplemental Safety Evaluation (SSE) pertaining to the responses of the Virginia Electric & Power Company (the licensee) to the staff's Safety Evaluation (SE) pertaining to the Station Blackout (SBO) Rule, 10 CFR 50.63, for the North Anna plant was transmitted to the licensee by letter dated December 6, 1991. The staff's SSE found the licensee's proposed method of coping with an SBO to be acceptable subject to the satisfactory resolution of several open items. The licensee responded to the staff's SSE and, specifically, to the open items by letters from W. L. Stewart, dated February 10 and March 17, 1992.

2.0 EVALUATION

The licensee's responses to the staff's SSE are evaluated below.

2.1 Station Blackout Duration (SSE Section 2.1)

SSE Evaluation: In the SSE, the staff concluded that the SBO duration should be 8 hours (based on an emergency diesel generator (EDG) target reliability of 0.95) rather than 4 hours as calculated by the licensee. The staff concluded that since the proposed alternate AC (AAC) source at North Anna will be available in 1 hour, and can power a full division of safe shutdown equipment, the staff would not expect any significant difference between an 8-hour versus a 4-hour SBO analysis.

Licensee Response: The licensee noted that based on Regulatory Guide (RG) 1.155, Section 1.1.3, the coping duration for North Anna is determined to be either:

8 hours @ 0.95 EDG reliability, or
4 hours @ 0.975 EDG reliability

However, in response to the staff's SE, the licensee had requested a relaxation of the EDG target reliability from 0.975 to 0.95 similar to the relaxation granted for the Dresden and Quad Cities plants. In its SSE, the

staff did not grant this relaxation to North Anna. The licensee stated that it believed the staff had not granted the relaxation for North Anna because the staff interpreted this to be a request for relaxation of both reliability and duration instead of a request for relaxation of only one of the two items.

In response to the staff's SSE, the licensee provided further justification for its requested relaxation of the EDG target reliability. The licensee noted that ESW group determination of Group 4 was borderline (based on an annual frequency of 0.0034) and the SW group determination of Group 2 was also borderline (based on an annual frequency of 0.00337). It was noted if the frequencies were 0.0033, respectively, the ESW classification would be Group 3, and the SW classification would have been Group 1, which would have resulted in a 4-hour coping duration requirement at an 0.95 EDG target reliability.

The licensee also provided justification for its relaxation request based on the characteristics of the SBO diesel generator that will be installed.

The licensee has stated that an EDG reliability program for an EDG target reliability of 0.975 would require separate programs and parameters as compared for the 0.95 reliability program required for the AAC source, and the benefit would be negligible. The licensee also indicated that there may be some problems in installing a diesel fuel oil day tank of sufficient size for an 8-hour coping requirement.

Staff Evaluation: The staff has compared the coping duration parameters and the proposed EDG/AAC configurations at Dresden and North Anna and agrees that the situations are sufficiently similar that a relaxation of the EDG reliability at North Anna is acceptable for the same reasons that the relaxation was granted at Dresden. The staff also notes that had the weather parameters been slightly different at North Anna, no relaxation would be required for the plant to obtain the 0.95 EDG target reliability and 4-hour coping duration. Therefore, the staff finds the 0.95 EDG target reliability and 4-hour coping duration to be acceptable.

2.2 Proposed AAC Power Source (SSE Section 2.2)

SSE Evaluation: In the SSE, the staff found the licensee's proposed addition of a non-safety diesel as an AAC power source to be acceptable. However, the staff stated that the licensee should provide confirmation that the proposed AAC power source meets the other criteria of Appendix B of NUMARC 87-00, specifically items B.8, B.9, B.10, B.11, B.12, B.13, and RG 1.155, Position C.3.3.5.5.

The staff also stated that the licensee should confirm that each day tank will be sized to allow the diesel to run for the SBO duration of 8 hours.

The staff found the use of the existing automatic load sequencing acceptable provided the licensee demonstrates by test that the SBO equipment can be powered from the AAC source within 1 hour.

Licensee Response: The licensee described in detail how the AAC power source will meet the criteria of items B.8 through B.13 of Appendix B of NUMARC 87-00, and stated that the reliability program is in general accordance with RG 1.155, Position C.3.3.5.5. The licensee noted that the day tank, which would be required for 8-hour operation, may be larger than acceptable based on insurance and other considerations, and is not as desirable as using a shorter duration and therefore a smaller tank.

Staff Evaluation: The staff has reviewed the licensee's discussion of how the proposed AAC source will meet the criteria of items B.8 through B.13 of Appendix B of NUMARC 87-00 and finds it acceptable. The staff has accepted the 4-hour coping duration (see Section 2.1 above) so the issue regarding the 8-hour day tank is resolved.

2.3 Effects of Loss of Ventilation (SSE Section 2.6)

2.3.1 Control Room (CR) Complex And Emergency Switchgear Room (ESGR) Complex

SSE Evaluation: In the SSE, the staff stated that based on its review and its concerns discussed in SSE Sections 2.6.a and 2.6.b., the staff had not been able to conclude that the licensee's analyses of the effects of loss of ventilation in the North Anna plant had been resolved. The staff's concerns were based on the initial room temperature used in the heat-up analysis for the CR/ESGR complex, and the absence of a procedural commitment to open the CR cabinet doors after the onset of an SBO.

Licensee's Response: The licensee indicated that the initial temperatures assumed for the CR/ESGR complex were based on Assumption 2.2.1 of NUMARC 87-00, which states that just prior to the event plant equipment is either normally operating or available from a standby state. The air conditioning for the CR/ESGR is accomplished by the CR/ESGR air handling and cooling system. Each unit has two trains of air handling equipment serviced by three air-conditioning chillers (two trains and a spare). Operability of the air-conditioning equipment for the CR/ESGR complex is governed by the Technical Specifications which require that two air-conditioning trains be operable (per unit). Therefore, it is reasonable to assume that CR/ESSGR air conditioning is functioning properly just prior to an SBO event.

In addition, the licensee states that the control of the CR/ESGR area temperature is a function of the setpoint of the chiller chilled water outlet which is held at a constant value. The chillers load and unload to maintain this constant temperature in response to varying CR/ESGR heat load, thereby maintaining a constant area temperature.

The licensee further stated that since there were no specific or stated administrative controls or temperature limits (other than the Technical Specification limit of 120°F) for the CR/ESGR complex, an administrative limit of 90°F for CR temperature will be added to appropriate procedures when the AAC source becomes operable. This limit should assure that in the event of an SBO the temperature rise in the CR/ESGR complex will be less than the Technical Specification limit of 120°F. In addition, appropriate direction will be added to the response procedures to direct the operators to open

cabinet doors within 30 minutes after the onset and identification of an SBO if CR/ESGR cooling has not been restored.

Staff Evaluation: Based on its review, the staff finds the licensee's responses to the above-cited staff concern acceptable, and the SSE issue related to the effects of loss of ventilation in the CR complex and the ESGR complex resolved.

2.3.2 Charging Pump Cubicle

SSE Evaluation: In the SSE, the staff stated that based on its review and its concerns discussed in SSE Section 2.6.c, the staff had not been able to conclude that the licensee's analyses of the effects of loss of ventilation in the North Anna plant had been resolved. The staff's concern was that the equipment operability in the charging pump cubicle had not been properly assessed.

Licensee response: The licensee stated that the charging pump motors are self air cooled with integral ventilation fans mounted on each end of the motor shaft. The configuration of the motor ventilation consists of ductwork bolted directly to the motor frame. Were it not for the resistance offered by the attached ductwork, the motor fans would provide sufficient cooling for the motors.

The licensee further stated that the ductwork is tied into the central exhaust system and the central exhaust fans are normally relied upon to assist the motor fans to provide motor cooling. The charging pump cubicle ventilation is also provided by the motor/central exhaust ventilation system, whereby air is drawn into the cubicle through the manway opening and exhausted through the motor. In the event that a motor is running without the central exhaust fans running, some ventilation is provided to the cubicle and motor by the integral motor fans.

The licensee stated that a sensitivity study on the effects of reduced ventilation flow rates through the motor was performed and determined that even a minimal amount of air being exhausted by the motor was sufficient to maintain cubicle temperatures at their initial assumed values (120°F). In turn, given the performance characteristiics of the integral motor fans (2885 scfm at 1/2 inch H_2O) and a review of ventilation system test data and ductwork layout, it was estimated that the motor fans would be exhausting approximately 1000 scfm until the AAC source energized an emergency bus, or approximately 1500 cfm should only one central exhaust fan be energized. The motor manufacturer (Westinghouse) reviewed these conditions and concluded the motor could be operated continuously without exceeding its design (winding) temperature rise of 8°C, without affecting the motor's qualified life.

Staff evaluation: Based on its review, the staff finds the licensee's responses to the above-cited staff concern acceptable, and the SSE issue related to the effects of loss of ventilation in the charging pump cubicle resolved.

2.3.3 Auxiliary Feedwater Pump House

SSE Evaluation: In the SSE, the staff stated that, based on its review and its concerns discussed in SSE Section 2.6.d, the staff had not been able to conclude that the licensee's analyses of the effects of loss of ventilation in the North Anna plant had been resolved. The staff's concern was that reasonable assurance of equipment operability and the habitability for operator manual actions in the turbine-driven auxiliary feedwater pump (TDAFW) room had not been properly assessed.

Licensee Response: The licensee indicated that an analysis of the TDAFW room was conducted for an 8-hour SBO and the final temperature was calculated to be approximately 129°F. This exceeds the NUMARC limit of 120°F for habitability of personnel and is lower than the limit for equipment operability. However, there are no operator actions required to be performed inside of the TDAFW room. Station abnormal procedures for providing auxiliary feedwater in the event of a loss of AC power requires the operator to go to the motor-driven AFW pump room to manually realign the TDAFW pump in all three steam generators. The manual valves which are manipulated are in the motor-driven pump cubicle.

Staff Evaluation: Based on its review, the staff finds the licensee's responses to the above-cited staff concern acceptable, and the SSE issue related to the effects of loss of ventilation in the TDAFW room resolved.

2.4 Proposed Modifications (SSE Section 2.8)

SSE Evaluation: In the SSE, the staff stated that it considers the 5-year time frame to complete the modifications and procedures as excessive. The licensee should implement the changes within 3 years, or provide a detailed justification as to why a longer time frame is required. The justification should include a detailed schedule of the different phases of the project. Also, the licensee should consider the receipt of this SSE as the starting time, since the staff has accepted the proposed AAC source.

Licensee Response: In its February 10, 1992, submittal, the licensee presented a detailed schedule consisting of seven main phases and provided detailed justification for a 5-year completion schedule. In particular, the licensee noted that the tie-ins to the D, E, and F transfer buses must be properly sequenced since one offsite source to at least one emergency bus is disabled during any transfer outage. Further, only one transfer should be worked per any given outage due to the significant testing required and to minimize operator confusion. The schedule provides for the installation of the AAC diesel prior to the October 1994 Unit 1 outage. The licensee noted that partial compliance can be achieved by the end of the April 1995 Unit 2 refueling outage since bus 1J or 2H can be powered by the AAC source, thus assuring that an SBO on either unit can be mitigated. The final tie-in to the F bus and associated testing (allowing the other division safety buses 1H and 2J to be powered by the AAC source) would be completed by December 1996.

In the March 17, 1992, submittal, the licensee concluded after further study that complete compliance could be obtained by the end of the April 1995 Unit 2 refueling outage.

Staff Evaluation: The staff has reviewed the licensee's proposed procurement, installation and testing schedule and agrees that these activities could not be realistically completed prior to the October 1994 refueling outage. The staff also accepts licensee's rationale that in the interest of safety the tie-in of the AAC source to the transfer buses should be sequenced and carefully coordinated. Thus, the staff finds the licensee's proposed schedule to be acceptable.

2.5 Quality Assurance (QA) and Technical Specifications (TS) (SSE Section 2.9)

SSE Evaluation: In the SSE, the staff recommended that the licensee should verify that the SBO equipment is covered by an appropriate quality assurance (QA) program consistent with the guidance of RG 1.155.

Licensee Response: In response to the above staff concern, the licensee stated that the non-safety systems and equipment being relied upon to meet the requirements of the SBO Rule will be included in a QA program which meets the requirements of RG 1.155 Section 3.5, and Appendices A and B. The inclusion of the SBO equipment in a QA program which governs their associated design, specification, and testing activities in addition to the development and maintenance of a periodic testing program with trending and root cause evaluation should be adequate to assure their proper operation; therefore, there is no need to apply TS to the SBO equipment.

The licensee further stated that its position is further reinforced by the fact that SBO is not considered as a design basis event (DBE). Documentation standards for equipment operability are not to be as rigorous as are typically required to meet the design basis requirements of 10 CFR 50.49, and suitable independence will exist between the SBO equipment and the safety-related systems required to respond to a DBE, such that there is no anticipated potential for common cause failure.

Staff Evaluation: The staff finds the licensee's response pertaining to QA to be acceptable. With respect to the TS, TS for the SBO equipment is currently being considered by the NRC in the context of the Technical Specification Improvement Program. If the staff later determines that TS for the SBO equipment is warranted, the licensee will be notified of the implementation requirements.

2.6 EDG Reliability Program (SSE Section 2.10)

SSE Evaluation: In the SSE, the staff stated that an EDG reliability program should be developed in accordance with the guidance of RG 1.155, Section 1.2.

Licensee Response: In response to the staff's concern, the licensee described its reliability program and stated that it is consistent with the guidelines of NUMARC 87-00, Appendix D. The licensee noted that the resolution of

Generic Issue B-56, Emergency Diesel Generator Reliability, is currently under consideration and review within the NRC and industry. The licensee stated that it will continue to review its reliability program as required, however, it would not make commitments relative to RG 1.155 at this time.

Staff Evaluation: The reliability program described by the licensee appears to follow the guidelines of Generic Issue B-56 which has not been approved by the NRC. Therefore, in the meantime the licensee needs to commit to an EDG reliability program which as a minimum contains the five items of RG 1.155, Section 1.2.

3.0 SUMMARY AND CONCLUSION

The staff has reviewed the licensee's responses to the staff's December 6, 1991, SSE pertaining to the SBO Rule (10 CFR 50.63) for the North Anna Power Station, Units 1 and 2. The staff finds the licensee's responses to be acceptable except that until Generic Issue B-56 is resolved, the licensee is required to implement an EDG reliability program which as a minimum contains the five elements of RG 1.155, Section 1.2.

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Date: June 8, 1992