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

ENCLOSURE

SUPPLEMENTAL SAFETY EVALUATION

BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING STATION BLACKOUT EVALUATION

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

WNP-2

DOCKET NO. 50-397

1.0 INTRODUCTION

The NRC staff's 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 December 30, 1991. The staff found the licensee's proposed method of coping with an SBO for WNP-2 as nonconforming. The licensee was asked to submit a revised response to the SBO Rule which addresses the areas of nonconformance. The licensee responded to the staff's SE, and specifically to the recommendations, by letter from G. E. Sorensen, Washington Public Power Supply System, to the Document Control Desk, U.S. Nuclear Regulatory Commission, dated March 6, 1992. Additional information regarding the containment isolation was transmitted by letters from G. C. Sorensen to the Document Control Desk, dated April 15, 1992, and May 14, 1992.

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 Concern

In the SE, the staff indicated that the guidance of RG 1.155 requires that the emergency diesel generator(EDG) statistics for the last 20 and 100 demands also be calculated. The staff further stated that the results using data from NUMARC 87-00 indicated that WNP-2 belongs to SW Group "2" rather than SW Group "1" as determined by the licensee. The discrepancy does not impact the recommended coping duration and therefore is not an issue.

Licensee Response

The licensee stated that the EDG statistics for the last 20 and 81 demands are 100% and 99%, respectively.

The licensee further stated that the datum of NUMARC 87-00, Table 3.3, relative to snowfall (53 inches) at the WNP-2 site is in error. The licensee stated that they have used site specific data for the "annual expectation" of snowfall as provided in FSAR Table 2.3-1 and Section 2.3.1.1. Fourteen inches of snowfall per FSAR Section 2.3.1.1 was used in the WNP-2 SBO calculation. The licensee also indicated that the greatest recorded snowfall at the Hanford Site was 43.6 inches for the winter of 1915/1916 per FSAR Table 2.3-1 and Section 2.3.1.1. The licensee agreed with the SE statement that the assignment of the SW Group does not impact the recommended coping duration. However, the licensee believes the assignment given in the SE should be corrected.

Staff Evaluation

The staff accepts licensee's statement regarding the EDG statistics for the last 20 and 81 demands.

The staff accepts the licensee's statement regarding snowfall without further analysis since this does not impact the coping duration.

2.2 Class 1E Battery Capacity (SE Section 2.3.2)

In the SE, the staff stated that review of the battery sizing calculations for SBO loads provided by the licensee reveals the following concerns:

1. The licensee needs to verify that the battery room temperature of 74°F as used in the battery capacity calculations is the lowest anticipated electrolyte temperature during normal operation per NUMARC 87-00, Section 7.2.2.

2. The use of battery terminal voltage (210V or 105V) rather than the minimum allowable equipment terminal voltage for dc amperes requirements from the uninterruptible power supply (UPS) is nonconservative. The voltage drop between the battery terminal and constant KW load terminal (i.e. inverter, motors) should be considered.

3. The UPS efficiency of 75% appears to be nonconservative since the UPS load is less than 50% of the UPS rating (15 kVA UPS loaded to 6.48 kVA and 6.72 kVA).

4. The licensee's calculation used higher amperes per positive plate (RT = 143.6A and 147.5A for GN-15 and GN-13, respectively) than the batteries can provide. (Per EXIDE Catalog Sections 51-52, these are 922/7 = 131.71A and 817/6 = 136.7A for GN-15 and GN-13, respectively.)

5. A design margin of 10% to 15% as recommended by IEEE Std. 485 should be used.

SE Recommendation

In the SE, the staff stated that the licensee needs to reevaluate the battery capacity adequacy without stripping the computer loads from the Class 1E battery B2-2 and considering the above listed concerns. The battery capacity verification and any resulting modification should be included in the documentation that is to be maintained by the licensee in support of the SBO submittals and results of this evaluation included in the licensee's revised response to the NRC.

Licensee Response

In response to the SE concerns, the licensee provided the following response:

(1) The temperature of the battery rooms for B1-1 and B1-2 are maintained at 74 ± 1°F by a safety related heating, ventilating, and air conditioning (HVAC) system as described in FSAR Section 9.4.1, and shown in FSAR Figure 9.4-1. The setpoint for the system is established by an Instrument Master Data Sheet which defines the temperatures as 74 ± 1°F.

(2) The 250 volt Class 1E battery (B2-1) is not required to cope with an SBO since the position indication and closure of the required containment isolation valves can be achieved without reliance of this battery. The SBO battery calculation will be revised to acknowledge the increased running current requirements based upon the voltage at the motor terminal at the end of the discharge cycle. The revised calculation may take credit for the lower running current requirements of the inverters and motors early in the discharge cycle. The licensee states that the use of 105 volts at the inverter in establishing the inverter input current is correct in establishing the inverter input current.

(3) The calculation is slightly nonconservative regarding the efficiency of the UPS used. The calculation will be revised to account for this.

(4) The batteries at WNP-2 are primarily an older type GN battery which have a higher 1-minute rating. As the batteries are replaced with new type GN cells, the calculation will be revised accordingly.

(5) A design margin of 10% to 15% per IEEE Std. 485 is to be used for the sizing of new batteries. The requirements of NUMARC 87-00, Section 7.2.2, is to ensure that each plant has adequate battery capacity to support decay heat removal during a station blackout for the required coping duration. This does not require the use of a design margin.

Staff Evaluation

Based on its review, the staff accepts the electrolyte temperature of 74°F since the battery rooms are maintained by a safety related HVAC with setpoint of 74 ±1°F.

However, the licensee should complete the battery calculation and verify that sufficient margin is available to compensate for less than optimum conditions of the battery due to improper maintenance, recent discharge, and inaccuracy in reading discharge characteristics.

The staff will agree with the licensee that the use of 105 volts at the inverter in establishing the inverter input current is correct, provided the battery terminal voltage at the end of discharge cycle minus the voltage drop in interconnecting cable is 105 volts.

2.3 Effects of Loss of Ventilation (SE Section 2.3.4)

2.3.1 High-Pressure Core Spray (HPCS) Diesel and Electrical Equipment Room, HPCS Pump Room, and HPCS Service Water Pump Room (SE Section 2.3.4.1)

SE Recommendation

In the SE, the staff recommended that the licensee should assess and confirm the operability of the equipment at 151°F in the HPCS service water pump room.

Licensee Response

In its original SBO submittal dated April 17, 1989, the licensee stated that the HPCS service water pump room was not provided HVAC during an SBO. In the submittals dated March 30, 1990, the licensee stated that the calculated peak temperature for this room during a 4-hour SBO event was 151°F. It subsequently determined that ventilation would be maintained in the HPCS service water pump room during an SBO. The ventilation will maintain the room temperature below 113°F. This temperature will provide reasonable assurance of operability for SBO equipment located in the HPCS service water pump house. Therefore, the licensee indicated that additional assessment of the operability of SBO equipment located in the pump house is not required.

Staff Evaluation

Based on its review, the staff finds the above licensee response acceptable and, therefore, considers this SE issue related to the effects of loss of ventilation in the HPCS service water pump room resolved.

2.3.2 Inverter Room (SE Section 2.3.4.2)

SE Recommendation

The licensee should reevaluate the temperature rise in the inverter rooms using more conservative inverter efficiencies including the nonsafety

computer loads and reassess the equipment operability in these areas at the revised calculated peak temperatures.

Licensee Response

In its response, the licensee provided the following inverter efficiencies used in the heat-up calculation for an SBO event:

IN-1 (RPS-1 Room)	89%
IN-2 (RPS-2 Room)	75%
IN-3 (RPS-1 Room)	75%
IN-5 (Swgr Room-2)	75%

The licensee indicated that the 75% efficiencies for IN-2, 3, and 5 are consistent with information provided by the vendor for these Elgar inverters when loaded to approximately 50% of full load. The 89% efficiency for IN-1 is also consistent with vendor information for the new Exide Electronics uninterruptable power supply installed in 1989. Based upon the DC link voltage and current data provided in Exide Electronic Manual U2730 5/85, the efficiency for IN-1 was determined to range between 88.8 and 90.9%. For the actual inverter loading an efficiency value of 89% was selected as being adequately conservative. During an SBO, the inverter loads may be less than those assumed in the heat-up calculations (e.g., less than 50% for IN-2 or 3). This would result in a conservative room heatup calculation as the inverter efficiency does not drop off in proportion to decreasing load. In addition, the licensee indicated that the RPS and switchgear room heatup calculations do not take credit for any load shedding of the inverters.

The licensee further stated that it will establish reasonable assurance of operability (RAO) for the inverter for the calculated 117°F SBO temperature. If RAO for this temperature cannot be established, then it will provide administrative controls to ensure that the room temperatures do not exceed 90°F such that the SBO temperature will be maintained below 104°F.

Staff Evaluation

Based on its review and the above cited licensee's commitment, the staff finds the licensee's response acceptable and, therefore, considers this SE issue related to the effects of loss of ventilation in the inverter rooms resolved.

2.3.3 Control Room (SE Section 2.3.4.3)

SE Recommendations

In the SE, the staff recommended that the licensee should:

- Reevaluate the temperature rise in the control room without stripping of the computer loads from the battery B2-1.
- Use the technical specification limit of 85°F as the initial temperature.

- Provide a procedure in accordance with NUMARC 87-00 for opening the control room cabinet doors within 30 minutes.

Licensee Response

Computer load stripping

The licensee indicated that failure to strip the computer loads would result in a continuous addition of 26kW to the control room. These computers are not safety related and no credit is taken for the information they might provide during an SBO. The control room temperature rise has not been reevaluated without load stripping of the computers as it is apparent the 120°F temperature would be exceeded without expensive design modifications.

Use of Technical Specification Control Room Temperature

The licensee indicated that the initial temperature for the WNP-2 analysis is 78°F. Administrative procedures are in place to assure that if the 78°F is exceeded, corrective action will be taken to restore the control room to 75° ±3°F. The licensee further indicated that the control room heat-up calculation was completed. The analysis assumed no opening of doors to surrounding rooms, no removal of control room ceiling panels, and initial temperatures of the metal cabinets and air volume of 104°F and 78°F, respectively. The temperature at 4 hours was determined to be 119.7°F.

Revise Procedure to Provide for Opening of Cabinet Doors

The licensee indicated that the SBO Emergency Operating Procedure, PPM 5.6.1, has been revised to provide for opening of the control room cabinet doors.

Staff Evaluation

Based on its review and provided that the licensee will establish a procedure for stripping the above cited computer loads during a SBO event, the staff finds the above licensee's response acceptable and, therefore, considers this SE issue related to the effects of loss of ventilation in the control room resolved.

2.3.4 Steam Tunnel (SE Section 2.3.4.4)

SE Clarification

In the SE, the staff reported that the licensee calculated a steam tunnel temperature of 169°F using NUMARC 87-00 methodology. The licensee stated that there was no HPCS and reactor core isolation cooling (RCIC) equipment located in the steam tunnel and that main steamline isolation had been provided consistent with NUMARC 87-00, Section 7.2.5, criterion 2. Therefore, the licensee did not identify the steam tunnel as a dominate area of concern (DAC). Based on the above, the staff agreed that the temperature of the steam tunnel was not a concern for the WNP-2 SBO coping analysis.

Licensee Response

The licensee indicated that previous submittals did not identify SBO equipment in the steam tunnel. However, in response to the NRC recommendation regarding containment isolation valves, this had changed, with the potential need to operate MS-V-19 as discussed below. This is a dc powered normally closed (but not locked closed) containment isolation valve located in the steam tunnel. It will be included on the list of valves that may require closure during a SBO.

The licensee further indicated that the steam tunnel temperature for 4-hour SBO using NUMARC 87-00 methodology was found to be 169°F without taking credit for opening of any doors. The valve and valve motor operator 4-hour qualification is in excess of 320°F. Therefore, reasonable assurance of operability is established for MS-V-19.

Staff Evaluation

Based on its review, the staff finds the above licensee's response acceptable and agrees with the licensee that reasonable assurance of operability is established for MS-V-19 during an SBO event.

2.3.5 RCIC Pump Room (SE Section 2.3.4.5)

SE Clarification

In the SE, the staff reported that the licensee did not perform a heat-up calculation for the RCIC pump room during an SBO. The licensee claimed that no analysis of this room would be needed due to the availability of HPCS, which was supported by its dedicated diesel. The licensee, however, stated that both RCIC and HPCS pumps would be available to maintain the RCS inventory, and the RCIC pump would not be shut down. It was the staff's understanding that the licensee would use RCIC until it failed due to high temperature. Since HPCS could support the functions provided by the RCIC pump, the staff concluded that RCIC failure was of no concern.

Licensee Response

Although not required by our SBO response, heat up of the RCIC room was evaluated using the methodology of NUMARC 87-00. The 4-hour temperature is 133°F with the doors closed. For the type of equipment located in the RCIC pump room, the maximum temperature of 133°F provides reasonable assurance of operability of the SBO equipment located in this room.

Staff Evaluation

Based on its review, the staff finds the above licensee's response acceptable and agrees with the licensee that reasonable assurance of operability of the SBO equipment located in the RCIC pump is established.

2.3.6 Containment (SE Section 2.3.4.6)

SE Recommendation

In the SE, the staff recommended that the licensee needs to complete the verification of the containment heat-up analysis during an SBO event and confirm that there is a reasonable assurance of SBO equipment operability at the evaluated temperature in the containment.

Licensee Response

The licensee indicated that the containment heat-up analysis was completed. The peak bulk temperatures in the drywell and wetwell do not exceed 280° and 240°F, respectively. The peak drywell pressures are less than 40 psig and the peak bulk wetwell pressure for the liquid volume is less than 42 psig. These temperatures and pressures are less than the primary containment design parameters and the environmental qualification temperature and pressure. As all of the SBO equipment located in primary containment has been qualified for the loss of coolant accident (LOCA) environment, the requirement for reasonable assurance of operability of NUMARC 87-00 is provided for this equipment. In addition, the licensee indicated that the assumed reactor coolant system leakage used in this analysis was adequate to account for a recirculation pump seal leakage of 18 gpm per pump and a technical specification leakage of 25 gpm.

Staff Evaluation

Based on its review, the staff finds the above licensee's response acceptable and, therefore, considers this SE issue related to the effects of loss of ventilation in the containment during an SBO event resolved.

2.4 Containment Isolation (SE Section 2.3.5)

SE Recommendation

In the SE, the staff recommended that the licensee needed to list the valves identified in the technical evaluation report (TER) attached to the SE in an appropriate procedure and identify the actions necessary to ensure that these valves can be fully closed during an SBO event. The valve closures need to be confirmed by position indication (local, mechanical, remote, process information, etc.).

Licensee Response

With the exception of two valves, the licensee provided detailed justification for exclusion per NUMARC 87-00 for each of the valves identified in the above cited TER. The licensee indicated that the two valves, which are FPC-V-153 and FPC-V-149, will be included in a procedure to establish containment isolation during an SBO event.

Staff Evaluation

Based on its review, the staff concludes that the containment isolation valve design and operation at the WNP-2 plant have met the intent of the guidance described in RG 1.155, therefore, the staff considers this SE issue related to containment isolation resolved.

2.5 Reactor Coolant Inventory (SE Section 2.3.6)

In the SE, the staff stated that if the licensee plans to use the RCIC system for level control, the licensee needs to analyze the effects of the RCIC system on each part of the coping calculations and include the revised coping analysis with the documentation that is to be retained by the licensee in support of the SBO submittal.

Licensee Response

The licensee stated that the coping analyses completed for WNP-2 considered the separate and combined operation of HPCS and RCIC on the considerations for battery capacity, compressed air, containment isolation and loss of ventilation. The licensee also stated that the combined operation of RCIC and HPCS may result in more rapid transfer of water from the condensate storage tanks to the suppression pool, but it will not change the inventory required for an SBO or the amount of condensate available.

Staff Evaluation

Based on its review, the staff finds the licensee's response acceptable.

2.6 Proposed Modifications (SE Section 2.5)

In the SE, staff identified several modifications (replacement of inverters IN-2 and IN-3, design changes to the containment Nitrogen Inverting System, and removal of ceiling panels in the control room). Staff, also, stated that some modifications may be required as a result of the reevaluation of the effects of loss of ventilation and to resolve other open items as identified in the SE.

Recommendation

The licensee should include a full description including the nature and objective of the required modifications in the documentation that is to be maintained by the licensee in support of the SBO submittals.

Licensee Response

The licensee stated that the requirements of SBO were satisfied without the need for design changes associated with the containment Nitrogen Inverting System.

The licensee, further stated, that the control room temperature will remain below 120°F for a 4-hour coping period without removal of ceiling panels. Hence no changes are required.

The licensee stated that the schedule for replacement of the inverters (IN-2 and IN-3) is uncertain at this time. The licensee will provide administrative controls to ensure that the inverter room temperatures do not exceed 90°F and that the SBO temperature will be maintained below 104°F.

Staff Evaluation

The staff accepts the licensee's statement regarding the containment Nitrogen Inverting System, control room ceiling panels and invertor room temperature control.

2.7 Quality Assurance and Technical Specification (SE Section 2.6)

SE Recommendation

The licensee needs to list all equipment that will be used to provide information and/or to support plant coping during an SBO and should verify that all SBO equipment is covered by an appropriate QA program consistent with the guidance of RG 1.155, Appendix A. Furthermore, this verification should be documented as part of the package supporting the SBO Rule response.

Licensee Response

The licensee stated that the SBO coping equipment is identified as Quality Class (QC) I or Quality Class II + except the piping and structural (passive equipment) supports associated with Condensate Storage Tanks (CSTs). The licensee mentioned that QC I equipment conforms to the requirements of 10 CFR Part 50 Appendix B and QC II + coping equipment, except SBO instrumentation coping equipment, will conform to the quality assurance requirements of Appendix R or RG 1.155, Appendix A. The SBO instrumentation coping equipment that is identified as QC II + and is required by RG 1.97 conforms to quality assurance requirements of RG 1.97 for Category 2 equipment. The licensee further mentioned that the CSTs and some of their level instrumentation will be classified as QC II +.

Staff Evaluation Based on its review, staff finds the SE issue resolved.

2.8 EDG Reliability Program (SE Section 2.7)

Recommendation

The licensee should provide confirmation and include in the documentation supporting the SBO submittals that a program meeting as a minimum the guidance of RG 1.155, Position 1.2, is in place or will be implemented.

Licensee Response

The licensee stated that PPM, 1.5.12, "Diesel Generator Reliability Program" was approved by the Plant Operating Committee in January and February 1992 and is now in place. Required changes to PPM 1.3.48, "Root Cause Analysis" were also accomplished in January. Changes to other procedures dealing with operating data logs plant problem reporting and Shift Technical Advisor Duties have been accomplished. The reliability program is designed to maintain the 95% reliability assumed in the establishment of the four hour coping duration. The licensee mentioned that the plant reliability program, includes the five elements listed in Regulatory Guide 1.155, Position 1.2, and also implements NUMARC 87-00, Appendix D.

Staff Evaluation

Based on its review and the licensee's implementation of EDG Reliability Program which includes the five elements listed in RG 1.155, Position 1.2, staff finds the SE issue resolved.

3.0 SUMMARY AND CONCLUSION

The NRC staff's 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 December 30, 1991. The staff found the licensee's proposed method of coping with an SBO for WNP-2 to be nonconforming. The licensee was asked to submit a revised response to the SBO Rule, which addresses the areas of nonconformance. The licensee's responses to each of the staff's recommendations, and clarification presented by the licensee, have been evaluated in this Supplemental Safety Evaluation (SSE), and found to be acceptable contingent upon the licensee's verification of adequacy of Class 1E batteries. The staff considers the 2-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 the 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 this SSE. The documentation of the analyses and actions required to resolve this concern should be included with the other documentation to be maintained by the licensee in support of the SBO Rule implementation, for possible future NRC audit.

Principal Contributors: A. Pal
D. Shum

Date: June 26, 1992

This completes our actions under TAC M68626. Should you have any questions, please contact me.

Sincerely,

William M. Dean, Project Manager
Project Directorate V
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosure:
As stated

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