WOLF CREEK
NUCLEAR OPERATING CORPORATION

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U. S. Nuclear Regulatory Commission
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Reference: Letter dated January 16, 1992, from W. D. Reckley, NRC, to B. D. Withers, WCNOC
Subject: Docket No. 50-482: Response to Request For Additional Information on the Station Blackout Analysis for the Wolf Creek Generating Station

Gentlemen:

The purpose of this letter is to submit Wolf Creek Nuclear Operating Corporation's (WCNOC) response to a Request For Additional Information contained in the Reference. The response to each of the Reference's recommendations are presented in the Attachment.

If you have any questions concerring this matter, please contact me or Mr. S. G. Wideman of my staff.

Very truly yours,

Forrest T. Rhodes
Vice President
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FTR/aem

Attachment

cc: A. T. Howell (NRC), w/a
R. D. Martin (NRC), w/a
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W. D. Reckley (NRC), w/a

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Response to Request for Additional Information
On The Station Blackout Analysis For
Wolf Creek Generating Station

1) Sections 2.1 and 2.2 - Tornado Frequency

2.1 Recommendation - For the reasons stated above, the licensee needs to change the EDG reliability target from 0.95 to 0.975 in order to remain a 4-hour SBO coping duration plant. The EDG target reliability change should be included in the documentation supporting the SBO submittals that is to be maintained by the licensee. Alternatively, the licensee needs to change the coping duration to 8 hours and reevaluate the plant for an 8-hour coping duration.

2.2 Recommendation - The licensee needs to conform to the 4-hour coping duration by increasing the EDG reliability target from 0.95 to 0.975. Otherwise, the licensee needs to reevaluate the plant for an 8-hour coping duration and submit the supporting analyses for NRC review.

Response:

As provided in NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," Part 1.C of Section 3.2.1, the expected frequency of tornadoes with windspeeds greater than or equal to 113 miles per hour is to be determined using site specific data. This value is used as a factor in an expression for calculating the estimated frequency of loss of off-site power due to severe weather.

Nuclear Safety Analysis, using site specific data from NUREG/CR-4461 and the National Severe Storms Forecast Center, performed three calculations regarding the annual expected frequency of tornadoes (intensity levels f2 and greater) per square mile. The results of these calculations have been documented in an NSA Calculation Package, Document Control No. SR-88-001 Rev. 0. In each case, the calculation included all years for which data was provided. The calculation values are shown in the following table:

Region	Source	Area (sq. mi.)	Annual Frequency (/m2)
125 nautical miles around Burlington	NSSFC	64,918.2	0.0001909
State of Kansas	NUREG CR-4461	82,264	0.0002265
5 deg. box centered on 37.5 deg. North and 97.5 deg. West	NUREG CR-4461	94,663.8	0.0003282

These numbers were derived from the calculation included as Attachment II. Additionally, updated Safety Analysis Report (USAR) Section 2.3 states that the average annual snowfall for Wolf Creek Generating Station (WCGS) is between 10 and 20 inches, whereas Table 3.3 of NUMARC 87-00 states this value as 20 inches, the upper limit.

Based on the most conservative of the resultant annual frequencies (.0003282 per square mile), the following value for 'f' is derived from Part 1C of NUMARC 87-00.

$f = (1.3 \times 10^{-4}) * h1 + b * h2 + (1.2 \times 10^{-2}) * h3 + C * h4.$

$f = (1.3 \times 10^{-4}) (20) + (12.5) (.0003282) + (1.2 \times 10^{-2}) (.23) + 0.$

$f = 2.6 \times 10^{-3} + 4.1 \times 10^{-3} + 2.76 \times 10^{-3} + 0.$

$f = 9.46 \times 10^{-3} = .00946$

From Table 3-4 of NUMARC 87-00, this places WCGS in severe weather (SW) Group 2. This along with the extremely severe weather (ESW) classification of Group 1 and independence of offsite power classification of Group I 1/2 results in an offsite power design characteristic of 'P1'. WCGS will therefore remain a 4 hour SBO coping duration plant with an EDG reliability target of 0.95.

2) Section 2.2.2 - Battery Capacity

2.2.2 Recommendation - The licensee should describe the load profile, method and assumptions (e.g., temperature correction factor, design margin, aging factor) which were used to determine that the battery capacity is adequate for 4 hours. If the calculation package provides this information, the licensee should provide the package for the staff review.

Response:

The worst case equipment load profile for the Class IE batteries, as shown by USAR Tables 8.3-2 and 8.3-3, was extended from 200 minutes to 240 minutes (see following tables). This load profile is conservative for a SBO because the increased load at 139, 199, and 239 minutes would not be expected to occur. The 200 minute load profile for Battery Sets 1 and 4 yields a battery demand of 737 amp-hour, which increases to 885 amp-hour for 240 minutes. Similarly, Battery Sets 2 and 3 have a 200 minute battery demand of 333 amp-hour, which increases to 400 amp-hour for 240 minutes. The IEEE correction factor for 60 deg. F electrolyte temperature is 1.11. Also, an aging factor of 1.25 is used as the original battery design criteria used a de-rating factor of 80% of rated capacity.

TABLE 1

Battery Set 1 and 4 Load Profile (NCX-1650)

Service	Load/Duration						
	0-1 min	1-139 min	139-140 min	140-199 min	199-200 min	200-239 min	239-240 min
D-G field flashing	*34A	--	*34A	--	*34A	--	*34A
Class IE ac switchgear C.B. Operation	*52A	--	*52A	--	*52A	--	*52A
Indicating lights and control circuits	67A	67A	67A	67A	67A	67A	67A
Instrumentation	72A	72A	72A	72A	72A	72A	72A
Reactor Trip SWGR control	* 8A	--	* 8A	--	* 8A	--	* 8A
Inverters	68A	68A	68A	68A	68A	68A	68A
Control room lighting	7A	7A	7A	7A	7A	7A	7A
D-G Control Panel	*27A	5A	*27A	5A	*27A	5A	*27A
Load Shedder & Emerg. load sequencer	*84A	1A	*84A	1A	*84A	1A	*84A
Total amperage	298	220	298	220	298	220	298
Power (amp-min)	298	30,360	298	12,980	298	8,580	298

200 min Demand = 44,734 amp-min (737 amp-hour)

240 min Demand = 53,112 amp-min (885 amp-hour)

* The loads for the five operations are sequenced at different times within a one-minute period and therefore cannot be considered additive loads. The total one minute load at any instant is less than 84 amperes.

TABLE 2

Battery S[illegible]ad 3 Load Profile (NCX-490)

Service	Load/Duration					
	0-1 min	1-139 min	139-140 min	140-199 min	199-200 min	200-240 min
Inverters	68A	68A	68A	68A	68A	68A
Misc. indicators pwr. and controls, incl.Aux. turbine-driven feedwater valve	32A	32A	32A	32A	32A	32A
Total amperage	100	100	100	100	100	100
Power (amp-min)	100	13,800	100	5,900	100	4,000

200 min Demand = 20,000 amp-min (333 amp-hour)

240 min Demand = 24,000 amp-min (400 amp-hour)

WCGS has four sets of Class 1E batteries. Battery Sets 1 and 4 have an 8 hour rating of 1650 amp-hours and Battery Sets 2 and 3 have an 8 hour rating of 900 amp-hours. The 8 hour battery capacities are interpolated to a 4 hour life, using 3 hour and 5 hour catalog data from Gould, yielding 1386 amp-hours for Battery Sets 1 and 4 and 756 amp-hours for Battery Sets 2 and 3.

Battery Sets 1 and 4 (Amp-Hour)

a. Worst case SBO demand = 885 X 1.11 X 1.25 = 1228 amp-hour
b. 1386 (capacity)/1228 (demand) = 1.128 design margin

Battery Sets 2 and 3 (Amp-Hour)

a. Worst case SBO demand = 400 X 1.11 X 1.25 = 555 amp-hour
b. 756 (capacity)/555 (demand) = 1.362 design margin

In conclusion, ample design margins in the original sizing calculations allows sufficient storage battery capacity to supply emergency power for an additional 40 minutes without shedding battery loads. Design margins, under worst case SBO conditions, are still 1.128 and 1.362, respectively. These continue to conform to the original design intent of a minimum design margin of 1.1.

3) Section 2.2.3 - Air Operated Valves

2.2.3 Recommendation - The licensee should ensure the habitability of the areas where valves will be manually operated during an SBO event.

Response:

The safety-related air operated valves are listed in Table 9.3-2 of the USAR. Of these safety-related valves only those controlling the steam generator atmospheric relief and those controlling the turbine-driven auxiliary feedwater pump discharge are required to remove decay heat. The auxiliary feedwater pump steam supply valves (AB-HV-05 and AB-HV-06) fail open on a loss of air supply, which ensures steam supply to the auxiliary feedwater turbine. The turbine discharge valves and steam generator atmospheric relief valves have a backup compressed gas supply.

The backup compressed gas supply consists, in part, of four 25 cubic feet accumulators. This system is a safety-related backup supply of compressed gas (USAR Section 9.3). The system is locally and passively connected to the auxiliary feedwater discharge valves and steam generator relief valves. If the normal air supply drops below 100 psig the accumulator valve will open providing backup compressed gas.

The backup compressed gas system is designed to provide an eight hour supply of compressed gas. The eight hour supply is based on 20 minute cycling of the auxiliary feedwater valves and 10 minute cycling of the steam generator relief valves. The backup compressed gas system is capable of providing gas to the air operated valves needed for decay heat removal for eight hours. This is twice the required coping duration following a station blackout event.

In conclusion, there is a safety related backup compressed gas supply system available to ensure air operated valve control for decay heat removal for the four hour coping duration, thus manual operation of the valves upon loss of the primary air supply is not necessary.

4) Section 2.2.4 - Loss of Ventilation

2.2.4 Recommendation - The licensee should provide the detailed information of the heat-up calculations as requested by the staff.

Response:

The areas conditioned by Heating Ventilation and Air Conditioning (HVAC) units have been evaluated to determine the impact due to loss of ventilation. The results of this evaluation are included as Attachment III and show that WCGS can cope 4 hours with a loss of HVAC units. An independent calculation (GK-MW-004) was also performed which confirmed the results of this analysis for the Control Room. The equipment cabinet doors and corridor doors to be opened are included in plant operations procedure EMG C-0 'Loss of All AC Power'.

5) Section 2.5 Quality Assurance and Technical Specifications

2.5 Recommendation - The licensee should verify that the SBO equipment is covered by an appropriate QA program consistent with the guidance of RG 1.155. This evaluation should be documented as part of the documentation supporting the SBO rule/response.

Response:

Upon identification of any non safety-related equipment or systems that are required to meet the requirements of 10 CFR 50.63, QA shall develop a Special Scope QA Program to meet the requirements of Regulatory Guide 1.155 Appendix A.

6) Section 2.6 - Emergency Diesel Generator (EDG) Reliability Program

2.6 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. If the 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 that is to be maintained by the licensee in support of the SBO submittals.

Response:

Monitoring of EDG reliability at WCGS is performed in accordance with administrative procedure ADM 01-244, "Emergency Diesel Generator Reliability Monitoring Program". This procedure evaluates EDG start attempts to determine if a failure has occurred and compares failures in the last 20, 50 and 100 demands with trigger values as described in NUMARC 87-00, Appendix D. Escalating corrective actions are required based on the number of trigger values reached following a failure. This procedure meets the guidance of Regulatory Guide 1.155, Position 1.2.