Nebraska Public Power District

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NSD920964
September 15, 1992

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Subject: Followup Response to Recommendations on Station Blackout, 10CFR50.63
Cooper Nuclear Station
NRC Docket 50-298, DPR-46
TAC No. M68534

Reference: 1) Letter from R. B. Bevan, USNRC, to G. R. Horn, NPPD, dated June 30, 1992, "Supplemental Safety Evaluation - Station Blackout Rule Cooper Nuclear Station (TAC No. M68534)"

2) Letter from G. R. Horn to USNRC, dated August 11, 1992, "Followup Response to Recommendations on Station Blackout"

3) Simiu, Emil and Michael J. Changery, et.al., "Extreme Wind Speeds at 129 Stations in the Contiguous United States", NBS Building Science Series 118, U. S. Dept. of Commerce, Issued March 1979.

4) Letter from G. R. Horn, NPPD to the USNRC Document Control Desk, "Followup Response to Recommendations on Station Blackout - Cooper Nuclear Station", NSD920243, Attachment 1, (Calculation NEDC 92-023), dated February 27, 1992.

Gentlemen:

By letter dated June 30, 1992 (Reference 1) the Nuclear Regulatory Commission forwarded its Supplemental Safety Evaluation (SSE) on Station Blackout for the Cooper Nuclear Station (CNS) based on previous submittals from the Nebraska Public Power District (NPPD) regarding 10 CFR 50.63. NRC concerns in the SSE centered on the CNS plant-specific weather data evaluation and the resultant selection of a minimum allowable emergency diesel generation (EDG) target reliability of 0.95.

In a letter from G. R. Horn to the USNRC dated August 11, 1992 (Reference 2), the District responded to the stated concerns in the SSE. Using the available fastest-minute wind speed values from the CNS weather database, the District re-evaluated the SBO weather classifications for CNS. The updated evaluation again led to the conclusion that 0.95 is the appropriate minimum target EDG reliability for CNS.

The District's August 11 submittal was discussed in a telephone conversation between NRC staff and NPPD personnel on September 3, 1992. The NRC concerns focused on the CNS fastest-minute wind speed data that were used in the submittal. (The latest CNS data, a set of 36 monthly extreme values of wind from

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1989 through 1991, had been used in the August 11 submittal). The NRC staff had questions whether this dataset would be large enough to accurately depict long term extreme wind speeds and capture outlying behavior.

In response to the most recent NRC questions identified in the telephone conference, the District has evaluated the NBS 118 (Reference 3) fastest-mile wind speed data for Omaha as applied to CNS. Extreme wind speeds for a number of U.S. weather stations are documented in NBS 118. NPPD calculation NEDC 92-132 was generated which uses the Omaha data from NBS 118, (a 42-year database), the methodology from NBS 118 and standard NUMARC 87-00, Revision 1, techniques to determine the CNS severe weather (SW) and extremely severe weather (ESW) classifications. A brief description of how the District determined the SW and ESW classifications for CNS are located in the Attachment to this letter. The Omaha information was derived from a large database and is considered conservative for CNS. Application of the Omaha data to CNS provides further confidence in the determination that CNS is a 'P1' plant, and that the appropriate minimum allowable target EDG reliability for the Station is indeed 0.95. The evaluation further supports the conclusions reached in the District's August 11 (Reference 2) submittal.

The Omaha fastest-mile wind speeds for the period 1936 to 1977 have been extracted from NBS 118 and are included in NEDC 92-132. Page 162 of NBS 118 (Reference 3) provides the predicted extreme wind values and their corresponding return periods for Omaha. The Extreme Value Type 1 Distribution is appropriate for application to CNS. This was demonstrated in the District's submittal of February 27, 1992 (Reference 4) and has been accepted by the NRC, as documented in the SSE. The technical methodology used in this submittal is similar to the approach employed by the Omaha Public Power District (OPPD) in its SBO evaluation for the Ft. Calhoun plant. OPPD used Omaha weather data to establish an EDG reliability of 0.95 for Ft. Calhoun, using an approach which has been accepted by the NRC.

The Omaha fastest-mile data from NBS 118, a 42-year database, confirm the District's earlier conclusion, which was based on 36 monthly extreme wind values from the CNS plant-specific meteorological database. While the Omaha data yield a more conservative ESW category result, the CNS plant-specific data and the Omaha data lead to the same conclusion insofar as the EDG target reliability is concerned.

Previous evaluations using the CNS plant-specific weather data have indicated that there is ample conservatism in the EDG target reliability determination for CNS. Application of the 42-year Omaha database to CNS confirms previous statements by the District to this effect and provides further evidence regarding the appropriateness of the 0.95 EDG target reliability value.

Based on the above discussions, and results of the NPPD calculation (NEDC 92-132) CNS falls in weather classifications ESW2 and SW2. While the newest calculation using Omaha data determines a more conservative ESW classification for CNS (ESW2), CNS still remains a P1 plant using NRC accepted guidance of NUMARC 87-00, Revision 1. For an SBO coping duration of 4-hours, and a P1 weather plant, it follows that the target EDG reliability is 0.95.

With the resolution of these additional concerns, and in conjunction with previous District submittals and commitments, the District satisfies the SBO rule, and concludes that 0.95 is the appropriate target EDG reliability for CNS under 10 CFR 50.63.

If there are any additional questions, or concerns, please call.

Sincerely,

G. R. Horn
Nuclear Power Group Manager

GRH/tja:sbo-fol
Attachment

cc: NRC Regional Administrator
Region IV
Arlington, TX

NRC Resident Inspector Office
Cooper Nuclear Station

Attachment to
NSD920964
September 15, 1992

SUMMARY OF WEATHER CLASSIFICATION CALCULATIONS USING NBS 118

ESW CATEGORY

> Using the power law technique, Eqn. 2.4.2 of NBS 118,

$$(1) \quad \frac{U(10)}{U(z)} = \frac{1}{(z/10)^{\alpha}}$$

where $\alpha = 1/7$ and $z = 30$ meters, the transmission line height. Conservatively, the NUMARC 87-00, Revision 1, cutoff criteria are assumed to apply at the transmission line height. It is necessary to transpose these criteria to the 10-meter elevation, the common recording height for the Omaha data in NBS 118. Substitution into Equation (1) gives the sustained-wind transposition factor between the 30-meter and 10-meter elevations:

$$\frac{U(10)}{U(z)} = 0.85475$$

Equation 2.4.6 of NBS 118 is next used calculate the appropriate transposition factor when using the fastest-mile data:

$$(2) \quad \frac{U_{fm}(10)}{U_{fm}(z)} = \frac{U(10)}{U(z)} * \left(1 + \frac{(z-10)}{10} * 0.02\right)$$

$$= 0.85475\ (1 + 2 * 0.02)$$

$$= 0.88894$$

Consistent with NUMARC 87-00, Revision 1, we use $U_{fm} = 125$ mph @ $z = 30$ meters. This yields

(2a) $U_{fm}(10) = 0.88894 * 125 = \underline{111.1}$ mph

as the appropriate ESW evaluation criterion at the 10-meter elevation. From the Omaha data, page 162 of NBS 118 (Reference 3), interpolation gives the return period:

$$\bar{N} = 1652 \text{ years.}$$

The expected frequency of occurrence of the 125-mph wind at 30-meters follows directly, i.e.

$$e = \frac{1}{\bar{N}} = 0.00061 < 0.001$$

▸ Alternatively, use the logarithic law of NBS 118 (Eqn. 2.4.1).

$$(3) \quad \frac{U(10)}{U(z)} = \frac{\ln(10/z_o)}{\ln(z/z_o)}, \text{ where}$$

z = 30 meters and the relative roughness $z_o = 0.05$ consistent with past work for CNS. (Based on the 12/11/91 OPPD submittal the CNS and Ft. Calhoun terrains are similar, and the use of $z_o = 0.05$, the preferred SAIC approach, is conservative for both plants).

Substitution into Equation (3) yields

$$\frac{U(10)}{U(z)} = 0.82826$$

Using Eqn. (2) as before for the fastest-mile data,

$$\frac{U_{fm}(10)}{U_{fm}(z)} = 0.82826 * 1.04 = 0.86139$$

With $U_{fm}(z) = 125$ mph @ 30 meters, this gives

(3a) $U_{fm}(10) = 0.86139 * 125 = 107.67$ mph.

Interpolation from page 162 of NBS 118 (Reference 3) for a Type 1 distribution gives the return period:

$\bar{N} = 1052$ years.

It follows that;

$$e = \frac{1}{\bar{N}} = 0.00095 < 0.001$$

Using NUMARC 87-00, Revision 1, Table 3-1, for either case CNS is in Category ESW2 based on the Omaha (fastest-mile) data.

Table 3-1*

EXTREMELY SEVERE WEATHER GROUPS (ESW)

ESW Group	Annual Windspeed Expectation ≥ 125 mph
1	$e < 3.3 \times 10^{-4}$
2	$3.3 \times 10^{-4} \leq e < 1 \times 10^{-3}$
3	$1 \times 10^{-3} \leq e < 3.3 \times 10^{-3}$
4	$3.3 \times 10^{-3} \leq e < 1 \times 10^{-2}$
5	$1 \times 10^{-2} \leq e$

* Extracted from NUMARC 87-00, Revision 1

Thus, in either case (i.e. using the power law or the logarithmic law of NBS 118 with a conservative value of z_o) the result is the same: Use of the Omaha fastest-mile data places CNS in S&O weather group ESW2.

SW CATEGORY

Using Part 1.C of NUMARC 87-00, Revision 1, with c = 0 (i.e., no salt spray vulnerability at CNS),

(4) $f = 1.3E\text{-}4 * h_1 + 12.5 * h_2 + 0.012 * h_3$.

From calculation NEDC 92-023, which was included with a previous NPPD submittal (Reference 4):

h_1 = 30" per year (the annual snowfall for CNS, from NUMARC 87-00, Revision 1)

$h_2 = 2.357E\text{-}4\ yr^{-1}$ (NSSFC tornado frequency for CNS at Brownville, Nebraska)

We must determine h_3, the expected frequency of storms with winds ≥ 75 mph at the transmission line elevation.

The Omaha 'fastest-mile' results from page 162 of NBS 118 (Reference 3), are again used. Using Equations (1) and (2) with U(z) = 75 mph at z = 30-meters above the ground, U_{fm} (10) = 66.7 mph at 10-meters above the ground. From page 162 of NBS 118 (Reference 3), the return period:

$\bar{N}$ = 7.75 years, and

h_3 = $1/\bar{N}$ = 0.1291 (for a Type 1 distribution).

Substitution of h_3 and the other values above into Equation (4) yields

f = 0.0084.

Since f < 0.01, Table 3-4 of NUMARC 87-00, Revision 1, places CNS in SW Group 2 with the Omaha data.

Table 3-4*

SEVERE WEATHER GROUPS (SW)

SW GROUP	Estimated Frequency of Loss of Offsite Power
1	f < 0.0033
2	0.0033 ≤ f < 0.0100
3	0.0100 ≤ f < 0.0330
4	0.0330 ≤ f < 0.100
5	0.10 ≤ f

* Extracted from NUMARC 87-00, Revision 1