VERMONT YANKEE
NUCLEAR POWER CORPORATION

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BVY 91-68

REPLY TO:
ENGINEERING OFFICE
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BOLTON, MA 01740
(508) 779-6711

September 30, 1991

U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

References:
a) Licensee No. DPR-28 (Docket No. 50-271)
b) 10CFR 50.63, "Loss of All Alternating Current Power"
c) Letter, USNRC (Thadani) to NUMARC (Rasin), "Approval of NUMARC Documentation Station Blackout" dated 10/7/89
d) Letter, VYNPC to USNRC, BVY 89-36, "Response to Station Blackout Rule 10CFR 50.63, dated 4/12/89
e) NUMARC 87-00 Supplemental Questions and Answers, dated 12/27/89
f) NUMARC 87-00 Major Assumptions, dated 12/27/89
g) NUMARC Letter, "Station Blackout (SBO) Implementation: Request for Supplemental SBO Submittal to NRC," dated 1/4/90
h) LER 89-09 (VYV 89-135), dated 7/28/89
i) Letter, USNRC (Thadani) to NUMARC (Marion), dated 1/3/90
j) Letter, VYNPC to USNRC, BVY 90-038, "Supplement to Response to Station Blackout Rule 10CFR 50.63," dated 3/30/90
k) Letter, USNRC to VYNPC, NVY 91-98, "Vermont Yankee Station Blackout Analysis" (TAC No. 68620), dated 6/5/91
l) Letter, VYNPC to USNRC, BVY 91-69, "Vermont Yankee Response to Station Blackout Rule Safety Evaluation Report," dated 7/17/91

Subject: Station Blackout (SBO) Supplemental Information on Coping Assessment

Dear Sir:

By letters dated March 30, 1990 and April 12, 1989 (Reference j and d), Vermont Yankee Nuclear Power Corporation (VYNPC) submitted information required by the Station Blackout (SBO) Rule as defined in 10CFR 50.63 and provided a plan and schedule for conformance to the SBO Rule.



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By letter dated June 5, 1991, the U.S. Nuclear Regulatory Commission notified VYNPC that the review of the submittals for the SBO Rule had been completed. This review found that, based on satisfactory resolution of the recommendations presented in the Safety Evaluation Report (Reference k), Vermont Yankee conforms with the SBO Rule and the guidance of Regulatory Guide 1.155, NUMARC 87-00 and NUMARC 87-00 Supplemental Questions/Answers and Major Assumptions dated 12/27/89. The NRC further indicated, based on the Technical Evaluation Report (TER) attached to the June 5th letter, that Vermont Yankee should be classified as a P3/I3 plant, which along with the proposed Emergency Diesel Generator (EDG) reliability of 0.95, requires Vermont Yankee to "cope" for a sixteen hour SBO duration.

As identified in Reference d), Vermont Yankee originally proposed to utilize an alternate ac power source (AAC), available within ten minutes of the onset of the SBO event, to meet the requirements of the Station Blackout Rule. In Reference j), using NUMARC 87-00 guidance, Vermont Yankee characterized itself, as a P2 (Offsite Power Design Characteristic), and I1/2 (Offsite Power System Grouping) plant and selected a target EDG reliability of 0.95. Also provided in Reference j) was the documentation for ensuring Vermont Yankee can "cope" during the required eight-hour SBO event using the power from the AAC source.

By letter dated July 17, 1991, we indicated we were in the process of reassessing the proposed target EDG reliability and performing a site-specific weather analysis to further assess the proposed SBO duration. Vermont Yankee committed to submit either the documentation required to propose a different SBO coping duration, or a schedule to complete the documentation required for a sixteen hour SBO coping duration. The following information, including Attachments 1 and 2, provides the results of a coping duration assessment, based on site-specific weather analysis, that demonstrates Vermont Yankee meets the requirements for being classified as an eight-hour coping plant.

A site-specific weather analysis was performed per the requirements of NUMARC 87-00. The following information is provided to clarify information previously provided by Vermont Yankee, as well as provide conclusions based on the recently completed weather analysis:

1) Vermont Yankee meets the requirements of an Off-site Power Design Characteristic Group P2 designated plant. The P2 category is based on:

   a. Expected frequency of grid-related LOOP does not exceed once per 20 years (Section 3.2.1, Part 1A, page 3-3). This is not changed from that previously submitted in Reference j).

b. Estimated frequency of LOOP due to extremely severe weather places the plant in ESW Group 2 (Section 3.2.1, Part 1B, Page 3-4). This is a change as a result of the Vermont Yankee site-specific weather analysis provided in Attachments 1 and 2.

c. Estimated frequency of LOOP due to severe weather places the plant in the SW Group 2 (Section 3.2.1, Part 1C, Page 3-7). Vermont Yankee classified itself as SW 2 in Reference j), however the basis for the classification provided here is the Vermont Yankee site-specific weather analysis as provided in Attachments 1 and 2.

d. The Off-Site Power System is in the I3 Group (Section 3.2.1, Part 1D, Page 3-10). This is consistent with the conclusion of the TER contained in Reference k).

A comparison of the site-specific weather analysis and NUMARC 87-00 data is provided in Attachment 1, with a summary of the site-specific analysis provided in Attachment 2.

Classification as a P2 plant, along with an Emergency AC Power Configuration Group C determination and a target EDG reliability of 0.95, require Vermont Yankee to cope for a eight-hour SBO duration.

As separately requested during a telecon with the Vermont Yankee NRR Project Manager on July 10, 1991, Vermont Yankee has investigated the historical weather-related effects on the grid. A review of Rhode Island, Eastern Massachusetts and Vermont Electric Control (REMVEC) records of line disturbances over the last eleven years on each of the four transmission lines (345-kv lines to Scobie, Coolidge and Northfield, and 115-kv line to Keene) to which Vermont Yankee is connected was conducted. These records identified minimal (0.04% worst case) weather-related down time for any of these lines. It was concluded that there were no instances where all four lines were simultaneously affected by a common weather disturbance.

Additionally, as identified in Reference l), Vermont Yankee had determined that some statements in the FSAR and in References d) and j) regarding operation of the Vernon Hydroelectric Station require updating. Vermont Yankee has discussed the operating modes of the hydrostation with the owner of the station, New England Power Company, to determine the exact output available.

The FERC operating license for the hydrostation requires a minimum river flow of 1250 cfs. This 1250 cfs flow, if passed through the turbine-generator wheels, corresponds to an average electrical output of 3.5 MW available to Vermont Yankee. Since the maximum

safe shutdown load requirement for Vermont Yankee is 2.3 MW, it is clear that the hydrostation always has sufficient capacity to supply all loads required for a Station Blackout event under these conditions.

Vermont Yankee is aware that the hydrostation, on occasion this summer, has generated less than 3.5 MW. The hydrostation operators have acknowledged that while operating at minimum flow during this summer, contrary to an internal operating directive some of the river flow was not directed to the water wheels. New England Power, however, has subsequently reconfirmed the operating directive requiring a minimum flow of 1250 cfs be directed through the water wheels; thus assuring 3.5 MW is available to Vermont Yankee. Vermont Yankee is in the process of updating the description of the hydrostation in the FSAR to correspond to the current mode of operation of the hydro.

We trust that the information supplied above and in Attachments 1 and 2, along with the information supplied in Reference l), is satisfactory for resolution of the recommendations presented in Reference k), and will be sufficient to demonstrate that Vermont Yankee meets the requirements of a plant requiring coping for a 8 hour SBO duration, as proposed in References d) and j) and allow you to confirm that Vermont Yankee is in compliance with the SBO rule.

Sincerely,

James P. Pelletier

James P. Pelletier
Vice President, Engineering

jbb

cc: USNRC Region I Administrator
USNRC Resident Inspector
USNRC Project Manager - VYNPS

Attachment 1

Comparison of NUMARC 87-00 Weather Parameters for Vermont Yankee Relative to this Study (VYC-1012)

| | NUMARC 87-00 | VYC-1012 |
|---|---|---|
| **Severe Weather** | | |
| Annual Expectation of Snowfall (inches) | 79 | 63 |
| Annual Expectation of Tornadoes equal to or greater than F2 | 8.71E-5 | 9.8E-5 |
| Annual Expectation of 75 to 125 mph Wind Speeds | 4.0E-2 | 3.87E-2 |
| Annual Expectation of Salt Spray | 0 | 0 |
| **Extremely Severe Weather** | | |
| Annual Wind Speed Expectation Equal to or greater than 125 mph | 3.4E-3 | 7.2E-4 |

Attachment 2

Summary of Vermont Yankee Site-Specific
Station Blackout Weather Grouping Analyses

## Severe Weather Grouping

### Snowfall

The site-specific annual snowfall parameter is based on the Vernon, Vermont data which was obtained from the National Climatic Data Center. The data base covers a 40-year period of record from 1951 to 1990. Based on these data, the annual snowfall parameter is 63 inches. From the Climatography of the United States, Report No. 60-43, for the state of Vermont, it is noted that "average annual total snowfall is from 55 to 65 inches in much of the Western Division and also in parts of the Connecticut Valley." The snowfall value of 63 inches for Vernon is consistent with the above statement and is considered to be a site-specific estimate for the region surrounding the Vermont Yankee site.

### Tornado

The tornado frequency parameter is based on the tornado data base (1950-1990) maintained by the National Severe Storms Forecast Center (NSSFC). This data base was obtained from NSSFC and a program was written to identify all tornadoes that have occurred within a 2,000 square mile box centered on the Vermont Yankee site. This analysis identified 6 tornadoes of severity F2 or greater within the 2,000 square mile study region.

Using the methodology presented in Reference 1, the above analysis was corrected for incompleteness. Application of this methodology accounts for the possibility that some tornadoes may have occurred during this time period, yet were not reported. A conservative application of the Reference 1 methodology resulted in an estimate of 8 tornadoes (6 reported plus 2 unreported) to have occurred in the study area between 1950 and 1990.

Based on 8 F2 or greater tornadoes in a 41-year period and a land area of 2,000 square miles, the site-specific tornado frequency parameter is 9.8E-5 events per year per square mile.

### Storms

The storm frequency parameter was developed using the same straight wind and hurricane probability relationships discussed in Extremely Severe Weather (ESW) analysis. Please refer to that discussion for details on the development of these two relationships.

The storm frequency parameter is the annual probability of winds at the site between 75 and 125 mph. The probability within this wind speed range is the difference in the

exceedance probabilities at the two wind speeds. This calculation was performed separately for straight and hurricane winds and then summed as discussed below (see ESW analysis). The resulting probabilities for the wind speed range are 7.04E-3 for straight winds and 3.17E-2 for hurricane winds. The sum of the two is 3.87E-2, which is the annual expectation at the site of fastest-mile wind velocities between 75 and 125 mph at 30 meters above grade.

Extremely Severe Weather (ESW)

The ESW parameter is the annual probability of wind storms at the site with wind velocities greater than or equal to 125 mph. As noted in NUMARC 87-00, this parameter is normally associated with the occurrence of great hurricanes. The site-specific evaluation included both a hurricane and a non-hurricane (straight wind) component. For both components, a wind speed-probability relationship was developed which is applicable to the Vermont Yankee site.

The straight wind speed-probability relationship is based on information from References 2 and 3. These reports provide wind speed-probability relationships for four long-term stations at Albany, New York, and Concord, New Hampshire. These stations are essentially equidistant from the Vermont Yankee site to the west-southwest and the east-northeast respectively.

Two of the relationships were adjusted from 10-meter fastest-mile to 30-meter fastest mile values. The four station values were averaged and are considered to be representative of the Vermont Yankee region. The results are given in Table 1.

Even though the data used to develop the straight wind-probability relationship does include some tropical storms, a separate hurricane wind relationship for the Vermont Yankee region was developed. The hurricane evaluation is based on two detailed studies which are fully described in References 4 and 5. These two studies summarize the results of detailed probabilistic hurricane wind studies. Both studies provide results for inland locations such as Vermont Yankee.

References 4 and 5 were used to develop a hurricane wind speed-probability relationship for the Vermont yankee site. The relationship was adjusted to yield a 30-meter fastest-mile relationship. The two relationships were averaged and are considered to be representative of the Vermont Yankee site. The results are presented in Table 2.

The annual probability of exceeding 125 mph at the Vermont Yankee site was determined for both straight wind and the hurricane components. As noted in NUMARC 87-00, the predominant component was the hurricane portion. Interpolation from Table 2 yields an annual probability of 7.2E-4 for a hurricane wind equal to or greater than 125 mph at the site. Extrapolation from Table 1 yields an annual probability of 4.0E-6 for the straight wind component. The sum of the two is 7.2E-4, which is the annual expectation at

the site of a fastest mile wind equal to or greater than 125 mph at 30-meters above ground.

The ESW data for Vermont Yankee given in NUMARC 87-00 is, as noted, not verified. It is our understanding that documentation is also not available for review. However, the site-specific value presented herein is based upon published reports and uses data which is appropriate for the Vermont Yankee site and region.

REFERENCES


1. NUREG/CR-3058, A Methodology for Tornado Hazard Probability Assessment, J. R. McDonald, Texas Tech University, 1983.

2. NUREG/CR-2639, Historical Extreme Winds for the United States - Atlantic and Gulf of Mexico Coastline, M. J. Changery, NOAA, 1982.

3. NUREG/CR-2890, Historical Extreme Winds for the United States - Great Lakes and Adjacent Regions, M. J. Changery, NOAA, 1982.

4. National Bureau of Standards Building Science Series 124, Hurricane Wind Speeds in the United States, 1980.

5. Design Wind Speeds in Tropical Cyclone-Prone Regions, PhD Thesis by Peter Georgiou, 1985.

Table 1
Straight Wind-Probability Relationships

| Annual Probability of Exceedance | 30-Meter Fastest-Mile Wind Speed (mi/h) |
|---|---|
| 0.5 | 49 |
| 0.2 | 56 |
| 0.1 | 60 |
| 0.05 | 64 |
| 0.04 | 65 |
| 0.02 | 69 |
| 0.01 | 73 |
| 0.005 | 77 |
| 0.002 | 83 |
| 0.001 | 87 |

Table 2

Hurricane Wind-Probability Relationship

| Annual Probability of Exceedance | 30-Meter Fastest-Mile Wind Speed (mph) |
|---|---|
| 0.04 | 71 |
| 0.02 | 85 |
| 0.01 | 94 |
| 0.0005 | 130 |