NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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October 5, 1984

Docket No. 50-423
F0592A
F0592B

Director of Nuclear Reactor Regulation
Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) B. J. Youngblood letter to W. G. Counsil, Request for Additional Information, dated June 19, 1984.

(2) W. G. Counsil letter to B. J. Youngblood, Response to PSS Questions, dated July 31, 1984.

(3) W. G. Counsil letter to B. J. Youngblood, Response to PSS Questions, dated January 10, 1984.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Probabilistic Safety Study (PSS)

In Reference (1), Northeast Nuclear Energy Company (NNECO) was requested by the Commission to supply additional information which resulted from the Staff's review of information contained in Amendment No. 2 to the Millstone Unit No. 3 PSS. In Reference (2), NNECO responded to all questions except 720.88, 720.91 and 720.92 and stated that the response to these questions was still under investigation and would be submitted at a later date. Enclosed please find documentation to the above questions posed to NNECO along with our formal response herein. We trust you will find this information fully responsive.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
W. G. Counsil
Senior Vice President

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Request for Additional Information
Millstone Nuclear Power Station, Unit 3
Docket No.: 50-423

720.88 In the seismic analysis, in Section 2.5.1.3 of the Millstone PSS, the probabilities of the various plant damage states, conditional on a given peak ground acceleration, are calculated. These probabilities are uncertain, and the uncertainty distribution for these plant damage state probabilities are obtained by propagating the uncertainties associated with the basic event probabilities on the fault trees. It is our understanding that the uncertainty distributions for the basic events were assumed to be log-normal in the calculations performed in the PSS. However, the correct distribution for the probability (failure fraction, in the terminology of SMA) is given by eq (A-13) of the SMA report, Appendix 2-I of the PSS, and is not log-normal. As an example, the staff, using eq (A-13) of the SMA report, calculates that the mean probability of plant damage states V3, given peak ground acceleration of .8g is .03, considering only the containment wall failure and neglecting the failure of the steam generator tubes. In contrast, the mean probability of plant damage state V3 given a peak ground acceleration of .8g is .005, according to the PSS, Table 2.5.1 - 21EE. Similar discrepancies will likely affect other plant damage states (e.g., TE or SE) in the neighborhood of .45g.

Justify using a distribution for the failure fraction different than that given by eq (A-13) of the SMA report, or correct the analysis.

Response: Northeast Utilities will submit an Amendment addressing these concerns on November 30, 1984.

Question 720.91

Storms of lesser severity than the PMH can have wave run-up which exceeds the height of the door threshold for the service water (SW) pump rooms inside the pumphouse. We understand that due to the design of the circulating water system, water will rise inside of the circulating water pump bays as the water level increases outside.

(a) Estimate the annual frequency that the water level, due to wave action from a storm including run-up, is above the door threshold of the intake structure SW pump rooms.

(b) Estimate the probability that these doors (which provide entry into the SW pump room) will not function as water-tight barriers due for example to door seal leakage or improper door closure.

Response to Question 720.91

(a) The elevation of the threshold to the water-tight doors is 14.75 feet. Attached is Figure 2.4-6 from the FSAR entitled "Frequency of Tidal Flooding at New London, Connecticut." This figure is based upon historical data in the vicinity of Millstone and includes the occurrence of the 1938 Hurricane. Extrapolation of this data indicates that the recurrence interval for tidal flooding above elevation 14.75 is greater than 2000 years. This would equate to best estimate frequency of occurrence of 5×10^{-4}/yr.

(b) In response to SER question 240.9 the applicant stated that the two water-tight doors each isolating one of the two Service Water Train cubicles would be closed during severe weather condition; specifically conditions which could result in the water surface elevation exceeding 14.75 feet. The water-tight door is designed to withstand a 25 ft. head of water. These water-tight doors are simple mechanical devices typical of bulkhead doors found on maritime vessels which require only one operation of a hand wheel for closure. The probability that these doors do not function is dominated by the failure of the operator to close the doors and not by seal failures. Given the available warning times (greater than 1 hr.) and existing storm watch procedures, we would expect a relatively low Human Error Probability (H.E.P.) in the range of 10^{-3}.

(c) As a final point, it should be noted that with offsite AC power available, it is possible to safely shutdown the plant without any service water. Calculations demonstrating this capability were previously provided in Reference 3. Because of these considerations accident scenarios involving high wave run-up external flooding are insignificant contributors to core melt or public risk.

Question 720.92

The intake structure has hatches over the service water pumps. Each service water pump room has two service water pumps. We believe that failure of the two pumps in a pump room due to roof leakage is completely coupled.

(a) What is the probability that the service water pump hatch seals leak during a severe storm and disable the pumps?

(b) Estimate the common cause failure probability for loss of service water pumps in both rooms due to roof leakage.

Response to Question 720.92

(a) Attached is Figure 2.4-36 from the FSAR depicting the hatch covers over the service water pumps. The covers consist of pre-cast concrete sections which weigh approximately 76,800 lbs. and rest on neoprene gaskets to produce a very effective sealing mechanism.

A highly conservative design bases type analysis was performed using Hydrometeorological Report No. 51 (HMR 51) and No. 52 (HMR 52) to determine the water surface elevation on the intake structure roof during a postulated PMP event. Based on the PMP guidance for rainfall depth-durations contained in HMR 52, a rainfall intensity of 70.4 in/hr for a five minute duration was used to perform this analysis. The results, which are tabulated in Table 2.4-12 of the FSAR, show that during this five minute event the water surface would exceed the elevation of the hatch seals by approximately 0.5 in.

The impact on the S.W. pumps of this 0.5 in. of water against the hatch cover for the five minute duration was evaluated as follows. As shown in Figure 2.4-36 the neoprene seals consists of continuous strips of dense neoprene, 2-in. wide by 3/4 in. thick, set in a 2 in. x 1/2 in. groove in the concrete. The probability of failure for this neoprene seal arrangement was assessed to be negligible, and any localized failure would not result in an infiltration of water which would endanger the service water pump cubicles. A postulated condition of no neoprene seal was considered to ascertain the impact on inleakage. Due to the low head, 0.5 inches, and the resistance to flow that would be encountered along the concrete/concrete interface, in-leakage would be minimal using these conservative assumptions. Therefore, based upon a highly conservative analysis (the evaluation using the PMP event) the probability of in-leakage through the hatch seals is extremely small and need not be considered.

(b) There are four separate hatches (2 ft. thick reinforced concrete slabs) on the roof of the building to allow major repairs to each of the four service water pumps. Two service water pumps are located in each of the two separate pump train cubicles. The joints between the slabs are sealed with an auto traffic grade sealer. With only routine maintenance of the structure roof, leakage of any type should not occur. In the highly unlikely event that one of the hatches developed a catastrophic type leak concurrent with a highly unlikely excessive rainfall event and drained water into one of the compartments the maximum credible effect would be the failure of one of two redundant trains of service water. Such an event would be a highly unlikely way of inducing a loss of a single service water train which is more likely due to other causes. (The P.S.S. assessed the loss of a single service water train to have a mean frequency of occurrence of 1.27×10^{-2}/yr due to mechanical failures.) In order to fail two redundant trains of service water in this manner, the following sequence of events would have to happen:

- o a highly unlikely rainfall of excessive amounts.
- o an additional highly unlikely catastrophic failure of one hatch which somehow <u>does not allow drainage of the water over the hatches covering pumps in the redundant service water pumps</u>.
- o an additional highly unlikely catastrophic failure of a second hatch over the unaffected service water train.

Because of the fact that the failure of the first hatch would essentially eliminate the water buildup over the second hatch it is inconceivable how the second hatch would fail. Furthermore, as previously noted, with offsite power available the plant can be safely shutdown without any service water. Because of these considerations, estimation of the common cause failure probability for loss of service water pumps in both rooms due to roof leakage is unnecessary.

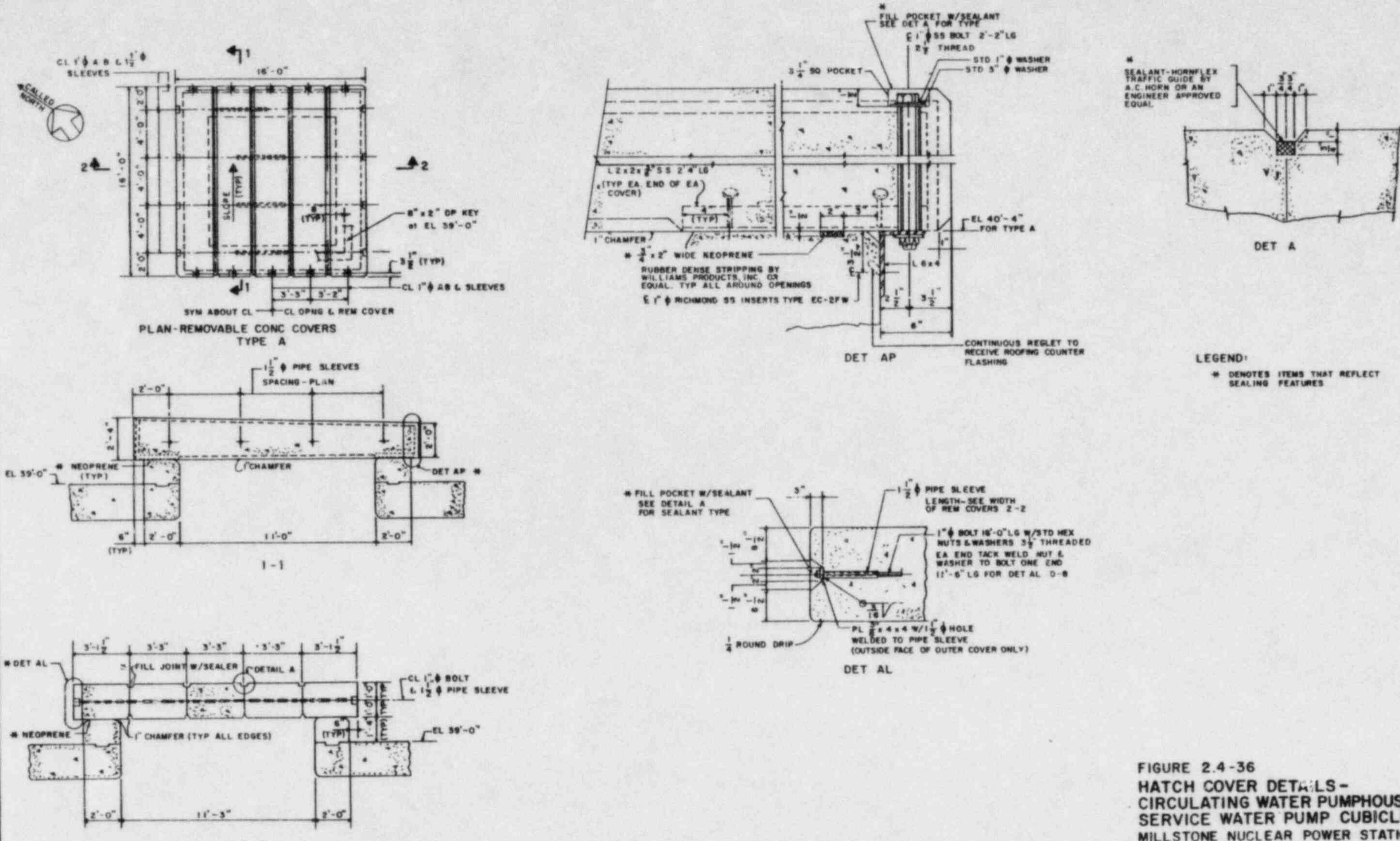

FIGURE 2.4-36
HATCH COVER DETAILS - CIRCULATING WATER PUMPHOUSE SERVICE WATER PUMP CUBICLE
MILLSTONE NUCLEAR POWER STATION
UNIT 3
FINAL SAFETY ANALYSIS REPORT

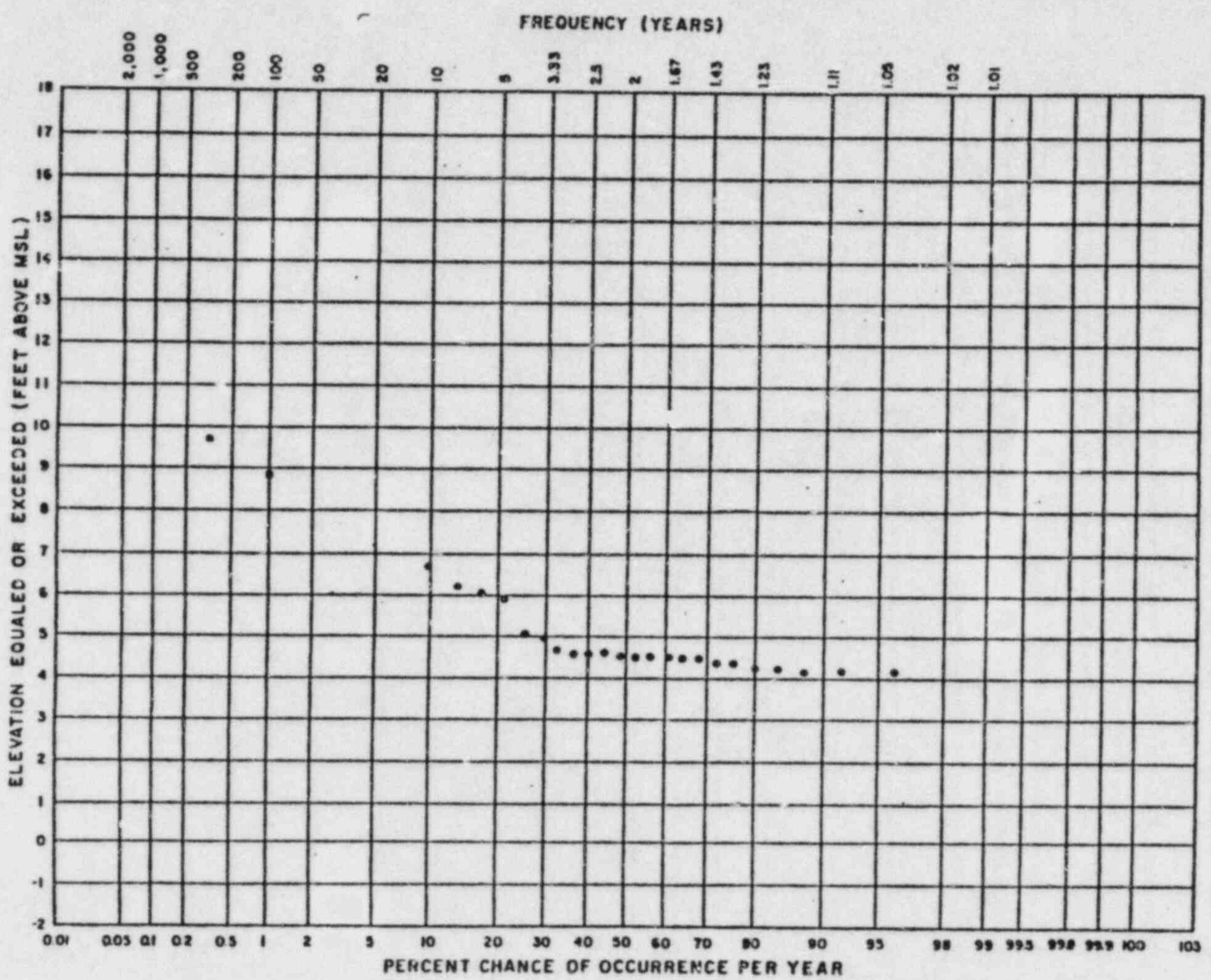

FIGURE 2.4-6
FREQUENCY OF TIDAL FLOODING AT NEW LONDON, CONNECTICUT
MILLSTONE NUCLEAR POWER STATION UNIT 3
FINAL SAFETY ANALYSIS REPORT