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FORT BELVOIR, VIRGINIA 22060

50-293

CEREN-CD

19 November 1979

Mr. Terry Johnson
Hydrologic Engineering Section
Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Johnson:

Reference is made to your verbal request to review the information presented by Boston Edison regarding the 1978-79 damage of the rubble-mound breakwater associated with the Pilgrim Nuclear Power Station. After reviewing the questions posed by NRC and the applicants responses, I believe that certain key information is lacking that would clarify the adequacy of the breakwater to perform its safety related function. The following is, in my opinion, the type of information needed to evaluate the structural integrity of the breakwater.

1. A discussion of the comparison of the wave and water-level conditions associated with the storms of February 1978 and February 1979, which inflected the damage to the breakwater, with the design conditions and the acceptable design level of damage.

Comment: Although wave and water-level information was not presented in the applicants report for this particular site, limited information is presented in papers by Duncan Fitzgerald and G.S. Giese in the report entitled "The Blizzard of 1979" - Is Effects on the Coastal Environments of Southeastern New England, Boston State College. In this report, Fitzgerald indicated wave heights of 8 to 10 feet with periods of 7-10 seconds were observed at Boston Light Station and Gloucester. The water level from NOS data for Boston and Cape Cod Canal (#997) tide gages indicate maximum water levels for 7 FEB 1978 of 10.4 ft. MSL (15.0 ft. MLW) and 10.1 ft. MSL (14.2 ft. MLW), respectively. Giese reported water levels at Provincetown of 10.0 ft. (MTL, 1968) or 14.5 ft. MLW (3.4 ft. above predicted high tide). In addition, wave information at the plant site associated with the storm may be obtained from available wave hindcasting mathematical models.

2. A discussion of how repairs were made to the damaged areas of the breakwater to insure that they are structurally equal to or more stable than the adjacent undamaged structure.

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Comment: It is noted both in the model study report and in the applicants response to question e that both the placement of the armor stone and the lee-side slope are critical in establishing an acceptable level of stability. On page 19 of the Model Report, it is noted "... that strict quality control would be required both in the quarry and in the field to insure that armor stone were of the weight required and that placement was satisfactory." This does not appear to have been the case from the applicants response to question e. It would appear that this phase of construction lacked the necessary quality control on the armor stone, i.e., weight, shape (slab-like quarrystone - see specifi-fation requirements), and placement (interlocking and long axis of the quarrystone normal to the side slope).

3. Provide a detailed discussion of the model studies that lead to the structural design of the breakwater and the changes made in the design prior to and during construction. Discuss how these changes were justified without additional model studies.

Comment: The response to question f lacks a clear description of what was model tested in comparison to what was actually constructed. The model studies indicated on page 16 that "Lee side (of the breakwater) has more stability with flatter slopes." Yet a 1 on 1½ lee slope was designed (almost the steepest slope generally used in breakwater construction) and even steeper slopes were actually constructed (see response g-3). The model report on page 23 states that "It is possible that the quality of stone placement in the prototype will be superior to that achieved in the model...." It is doubtful that this is true and quite likely that the converse is more correct.

It is my opinion that if in fact design wave and water-level conditions were experienced in the February 1978 storm at the breakwater, then the damage to the breakwater associated with the storm is within acceptable levels for the type of structure involved. On the other hand, if wave and/or water-level conditions were not of design level than a more thorough study should be made to determine the integrity or structural stability of the prototype breakwater under design wave conditions. In either of these cases the repairs of the damaged sections should be closely scrutinized as discussed in item 2 above.

If I can be of any further assistance in this matter please do not hesitate to contact me.

Sincerely,

R.A. JACHOWSKI
Chief, Coastal Design
Criteria Branch