

## UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D. C. 20555

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MEMORANDUM FOR: Harold R. Denton, Director Office of Nuclear Reactor Regulation

FROM:

Carlyle Michelson, Director Office for Analysis and Evaluation of rational Data

ENGINEERING EVALUATION OF THE SALT WATER SYSTEM (SSWS) FLOW SUBJECT: BLOCKAGE AT THE PILGRIM NUCLEAR POWER STATION BY BLUE MUSSELS (MYTILUS EDILUS)

A recently completed AEOD engineering evaluation addressing the SSWS flow blockage at Pilgrim indicates that the surveillance requirements specified in the current plant technical specifications (T/Ss) are not sufficient to demonstrate SSWS operability, particularly in view of the magnitude of the mussel incursion.

The engineering evaluation, initiated as a result of LER 81-049/01T-0 submitted by Boston Edison Company (BECo), was conducted to determine the extent of mussel-related flow blockages at the Pilgrim Nuclear Power Station (PNPS). The LER reported that on August 28, 1981 the "B" reactor building closed cooling water (RBCCW) system was declared inoperable due to a bypass condition that existed on the salt service water system (SSWS) side of the "B" RBCCW heat exchanger (HX). The flow bypass condition was caused by a high differential pressure across the HX baffle plates in the inlet/outlet waterbox due to a buildup of mussels which blocked the flow through the HX tubes. The evaluation of this LER and the information obtained from the licensee during the site visit is presented in the enclosed engineering evaluation.

Based on the evaluation, the addition of the following T/S surveillance requirements is recommended at Pilgrim:

- 1. The SSW flow to each RBCCW HX should be periodically measured to verify that it is within acceptable limits. Flow measurements should be made with the system aligned to its postaccident mode whenever practicable.
- 2. The overall heat transfer coefficient of the RBCCW HX should be periodically calculated by the licensee and verified by comparison to the design value specified by the manufacturer.



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 An internal inspection of the RBCCW HX SSW supply headers should be conducted on a semiannual basis, at some appropriate. interval following the spring and fall mussel spawning peaks, as practicable.

The above recommendations, although plant specific, are based on the generic recommendations contained in the AEOD case study, "Report on the Service Water System Flow Blockages by Bivalve Mollusks at Arkansas Nuclear One and Brunswick", dated February 1982. A review of the Pilgrim evaluation against the recommendations and conclusions of the above mentioned AEOD case study does not indicate the need for further recommendations with regard to system fouling by aquatic organisms, but it lends support and an additional sense of urgency toward the implementation of the recommendations made in the case study.

An additional generic recommendation can, however, be made regarding plant operation as a result of Boston Edison's response to IE Bulletin 81-03. In this response, it was stated that the SSWS had experienced daily flow variations of 2000 to 2300 gpm, about 40% of the 5000 gpm flow specified in the FSAR to be supplied to the RBCCW HXs following an accident or transient. Backflushing the RBCCW HXs, which were apparently clogged by mussels, enabled the service water flow to meet this requirement. These deviations from required flow were not reported in LERs since the RBCCW HXs do not have a T/S surveillance requirement on flow. (See enclosure for further discussion.) Since backwashing of the RBCCW HXs restored the required flow, the plant could probably have continued to operate as permitted by an RBCCW HX T/S on SSW flow (assuming for the moment that such a T/S existed) even though the SSWS was operating in a degraded mode, i.e., with extensive mussel growth. The situation of permissible continued operation while frequently entering the same LCO is representative of a mode of operation that is permissible in all T/Ss because of the manner in which they are structured.

It is recommended that the T/Ss be amended such that licensees are forced to direct their attention to the root cause of a continuing problem rather than treating recurring symptoms. One way that this can be easily accomplished, particularly in plants using standard technical specifications (STS), is to address this concern in Section 3/4.0 "Applicability," by adding a new Limiting Condition of Operation. This new LCO could be structured as follows:

When a Limiting Condition for Operation is repeatedly not met as a result of the occurrence of similar repetitive failures, entry Harold R. Denton

into an Operational Mode in which the specifications apply shall not be made until the cause of the failures is determined and corrected.

With the suggested LCO, the 40% daily SSWS flow variation : PNPS, necessitating daily backwashing of the RBCCW HXs to meet the required flow, would have been sufficient to allow the NRC to require that the SSWS be cleaned prior to continued power operation.

Please contact Eugene Imbro, of my staff, if you have any questions regarding this subject. Mr. Imbro can be reached at 492-4495.

Carlyle Michelson

Carlyle Michelson, Director Office for Analysis and Evaluation of Operational Data

Enclosure: As stated

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