



Boston Edison

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BECo Ltr. #96-092

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Docket No. 50-293
License No. DPR-35

Subject: NRC Bulletin 96-03: Potential Plugging of Emergency Core Cooling Suction Strainers (Pilgrim's 180 Day Response)

References: 1) Pilgrim's response to NRC Bulletin 95-02, dated November 16, 1995
2) NRC Bulletin 96-03, dated May 6, 1996

SUMMARY

Boston Edison Company shares the NRC concerns expressed in NRC Bulletin 96-03 and is aggressively pursuing resolution of those concerns. We intend to install larger passive strainers to resolve the concerns during refueling outage (RFO)#11, scheduled to begin February 1, 1997. However, there are significant uncertainties associated with the design, procurement, and installation issues listed below:

- Can the modification be installed using the 10 CFR 50.59 process?
- Can design, analysis and testing be completed in time to support procurement and installation during RFO#11?
- Can the selected manufacturer fabricate and deliver the equipment prior to the start of RFO#11?
- Will potential physical interferences in the suppression chamber (torus) be sufficiently identified and resolved without further measurements being taken during RFO#11?

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180 DAY RESPONSE

Strainer Modification

Pilgrim has been vigorously pursuing resolution to the concerns of NRCB 96-03 from before its issuance. This effort concluded the most effective measure in addressing NRCB 96-03 at Pilgrim will be the installation of passive strainers that are large enough to ensure postulated debris loading calculated in accordance with RG 1.82, Revision 2, will not cause a loss of NPSH for the ECCS pumps. The design will be completely passive and require no operator intervention. It will also not require the interruption of ECCS flow to perform its function.

The current Pilgrim ECCS design provides two residual heat removal (RHR) system and one core spray (CS) system suction nozzle in each of two torus bays with individual basket strainers bolted to each of them. The proposed design we are pursuing replaces these six basket strainers with two full-bay, stacked-disk type strainers. Each strainer will span the distance (approximately 19.5 feet) between and be supported by the torus ring girders. The outside strainer diameter will be approximately 44 inches with an estimated surface area of 700 square feet for a combined RHR and CS total flow of 14,600 gpm. The three individual suction nozzles in each bay will be piped to the large common strainer. This arrangement allows a large strainer to be installed without overloading the torus shell or ECCS suction nozzles because the strainer loads will be carried by the ring girders.

Material of construction will be 304 and/or 316 stainless steel. The design code and code of construction will be ASME III, NF Class 2. The new strainers and affected containment structures will be analyzed to show that NUREG 0661 Mark I Containment LTP requirements are met.

We expect the proposed strainer size will bound the final debris values produced using the design methodology currently being developed by the NRC and BWR Owners Group. Confirmatory testing is ongoing to confirm the stacked disk design's ability to handle debris loading. The final strainer design will reflect the test data.

Because the design provides a significant improvement in design margin, we intend to install the proposed strainers using the 10 CFR 50.59 process. We believe this mechanism is appropriate; however, there are uncertainties indicating this assumption may have to change as information further evolves.

Boston Edison Company intends to install the proposed strainers in RFO#11 which is scheduled to commence February 1, 1997. However, uncertainties concerning procurement, design assumptions, potential undetected suppression chamber interferences and the appropriateness of using 10CFR50.59 may compel us to amend our installation schedule to RFO#12. We are therefore, requesting a conditional schedule extension from the NRC to be invoked should the uncertainties make installation during RFO#11 unfeasible.

Debris Control

Our response to NRCB 95-02 (Reference 1) discussed processes used at Pilgrim to control containment debris. Our review indicates current debris control processes ensure debris in the form of "foreign material" will not challenge strainer performance. We restate the NRCB 95-02 discussion below for your convenience.

Comprehensive and effective foreign material exclusion (FME) controls are in place at Pilgrim for the drywell, torus, and for systems that interface with the torus. These controls were reviewed in response to previous guidance on this topic including Information Notice (IN) 93-34, IN 94-57, and Institute of Nuclear Power Operations (INPO) SOER 95-1. The effort included reviews of procedures, training, and implementation on FME. Our FME process was reviewed by the NRC (Inspection Report 94-22, conducted September 13 through October 24, 1994) for conformity to the guidance of NRC Temporary Instruction 2515/125, "Foreign Material Exclusion Controls." The inspection found that the programmatic and procedural provisions in place at Pilgrim to preclude foreign material intrusion are effective.

Annual General Employee Training includes modules addressing FME. Pre-outage training on FME for contract and in-house craft and management personnel is performed to assure heightened awareness and compliance with FME processes.

As stated in our NRCB 95-02 response, a torus cleaning is scheduled for RFO#11. We determined the torus cleaning date based on a review of data, sludge generation rate calculations, and the time elapsed since the last torus cleaning. Based on the results of the next cleaning, sludge generation rate calculations will be verified. We are also supporting BWROG studies on debris (sludge) generation. The BWROG data, along with the plant specific sludge generation rate, will be used to determine the frequency of future torus cleaning.

Technical Specifications

NRCB 96-03 noted strainers are a fundamental part of the ECCS; therefore, new LCOs and action statements are not necessary if passive strainers are being installed with sufficient capacity to address debris generation as calculated in accordance with RG 1.82, Revision 2. Pilgrim's proposed strainers are within the purview of that statement so no amendment to existing Pilgrim Technical Specifications is required. We would enter the appropriate ECCS system action statement should strainer degradation cause an ECCS to be inoperable. ECCS performance is currently trended by recording idle and running suction pressures of RHR and CS pumps during routine quarterly surveillance testing.

Torus visual inspections are conducted in accordance with Pilgrim Technical Specification 4.7.A.1.e and Pilgrim procedure 3 M.4.-9, "Inspection of Interior Surface of the Drywell and Suppression Chamber." The containment, including the suppression chamber, is also subject to Pilgrim procedure 3.M.1-38, "Primary Containment Closeout." These controls, coupled with our foreign material exclusion processes, provide assurance that Pilgrim's strainer performance will not be degraded; therefore, an amendment to Pilgrim's Technical Specifications concerning torus visual inspections and cleanliness is unnecessary.

Summary of 180 Day Response

Pilgrim has an effective FME program in place and sufficient administrative controls to ensure routine torus inspections and cleanings when necessary. ECCS performance is routinely (quarterly) monitored which includes trending of pump suction pressures.

New and larger ECCS suction strainers are being designed to resolve the NRCB 96-03 issue at Pilgrim. Uncertainties and our 2-year operating cycle mandate that we request NRC approval of a conditional installation schedule extension to RFO#12 to be invoked if the uncertainties preclude installation during RFO#11.

Information is presented in the next section to facilitate an expeditious NRC review of the conditional schedule extension request.

BASES FOR SCHEDULE EXTENSION

In addition to the programmatic and administrative controls discussed above, the following considerations are offered as compensatory measures in support of delaying strainer installation to RFO#12 (March 1999) should such a delay become necessary.

Minimized Probability of Initiating Event

The probability of a design basis LOCA is already small due, in part, to thorough ISI inspections and leak detection methods aimed at identifying precursors to design basis piping failures. However, this probability is further reduced at Pilgrim because piping susceptible to Intergranular Stress Corrosion Cracking (IGSCC) was replaced in 1984 (Recirculation Piping Replacement Project). Also, Pilgrim uses the EPRI guidelines for primary water chemistry and injects hydrogen into reactor coolant (Hydrogen Water Chemistry) which reduces recirculation system piping vulnerability to IGSCC.

Clogged Strainer Detection, Procedures and Training

Pilgrim will re-establish a baseline suction pressure datum for each ECCS pump by running each 4-8 hours prior to startup from RFO#11. These values will be compared to suction pressure readings recorded during performance of quarterly pump surveillance testing with the intention of detecting potential strainer fouling.

Schedule Considerations

Because of the above uncertainties it may not be possible to install the strainers during RFO#11, which would require us to defer installation until RFO#12, scheduled to begin in March 1999. Therefore, although we intend to install larger strainers in RFO#11, we request conditional relief from the schedule suggested in NRCB 96-03. This relief will be invoked if circumstances make it unfeasible to install the strainers during RFO#11.

Should the need for such a schedule extension be identified, little time would remain for NRC review and approval. Therefore, to support this request for a conditional schedule extension, we have provided a description of our evolving strainer design and its supporting assumptions. In addition, we have provided compensatory and mitigative measures taken or planned to supplement measures discussed in our response to NRCB 95-02.

We request expeditious NRC review and approval of this conditional extension request which will be invoked only if circumstances make installation during RFO #11 unfeasible.

BACKGROUND

Section 50.46 of Title 10 of the Code of Federal Regulations (10 CFR 50.46) requires emergency core cooling systems (ECCS) to meet 5 criteria, one of which is to provide long-term cooling capability of sufficient duration following a successful system initiation so that core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core. The Pilgrim ECCS is designed to meet this criterion, assuming the worse-case single failure.

However, industry experience gained from operating events and analysis demonstrates that excessive buildup of debris from thermal insulation, corrosion products, and other particulates on ECCS pump strainers can create the potential for a common-cause failure of the ECCS which could prevent the ECCS from providing long-term cooling following a LOCA. NRCB 96-03 concluded this issue must be resolved to ensure compliance with the regulations. NRCB 96-03 also endorsed Regulatory Guide (RG) 1.82, Revision 2, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," as an acceptable method of ensuring compliance with 10 CFR 50.46.

NRC REQUESTED ACTIONS

NRCB 96-03 requests BWRs to implement appropriate measures to ensure the capability of the ECCS to perform its safety function following a LOCA. Three potential resolution options were provided.

It also requests that within 180 days of the NRCB 96-03's issuance (May 6, 1996) a report be submitted indicating how compliance will be achieved and that it contain an implementation schedule for any planned actions. A report is to be submitted 30 days after completion of NRCB 96-03 actions.

Should a clogged ECCS suction strainer manifest itself during pump operation, station procedures are in place that enable operators to mitigate the situation. The Pilgrim simulator has been upgraded to include the clogged strainer scenario.

Defense-in-Depth

Of the six ECCS pumps that take suction from the torus, the two core spray pumps can also be aligned to the condensate storage tanks (CSTs). The CSTs provide 500,000 gallons of makeup water. Our Safety Enhancement Program (SEP) modifications were installed to address beyond design basis loss of ECCS scenarios. The SEP modifications include the firewater cross-tie to RHR, drywell spray modifications and the direct torus vent. In addition, Pilgrim has the capability to crosstie the Salt Service Water System to the RHR, which provides an infinite makeup ability as a means of flooding the reactor.

Summary of Bases for Installation Schedule Extension

Over the last decade, Pilgrim has invested heavily in improving safety margin at Pilgrim. The replacement of recirculation piping and the installation of a hydrogen water chemistry system reduce the potential for a design basis LOCA between RFO#11 and RFO#12. Existing ISI inspections and leak detection systems provide further assurance that precursors to design basis LOCAs would be detected.

Also, operators have been trained on procedures that mitigate the clogged strainer event. Should ECCS strainers clog, the Pilgrim service water cross-tie and SEP modifications provide alternative methods of mitigating the LOCA consequences. In the aggregate, these mitigating factors are sufficient to ensure that Pilgrim would be safe to operate until RFO#12.

Should you require further information on this submittal or NRCB 96-03 as it pertains to Pilgrim, please contact P. M. Kahler at (508) 830-7939.

E. T. Boulette, PhD

Commonwealth of Massachusetts)
County of Plymouth)

Then personally appeared before me, E. T. Boulette, who being duly sworn, did state that he is Senior Vice President - Nuclear of Boston Edison Company and that he is duly authorized to execute and file the submittal contained herein in the name and on behalf of Boston Edison Company and that the statements in said submittal are true to the best of his knowledge and belief.

My commission expires: September 20, 2002
DATE

NOTARY PUBLIC

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DCC Desk

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