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

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

INFORMATION ON PILGRIM STATION ALTERNATE REACTOR
BUILDING RESPONSE SPECTRA

This letter requests NRC review and approval of the engineering report used as closure for Long Term Program (LTP) item Number 599, in the Semi-Annual LTP report submittal of February 28, 1994.

BACKGROUND

The LTP is a voluntary program developed by Boston Edison Company (BECo) in 1983 to coordinate and schedule major work activities at Pilgrim Station, whether mandated by NRC or identified by BECo. At our request, the program became part of our license and was issued as Amendment No. 75 on July 13, 1984. The program is dynamic and updated and submitted to the NRC on a semi-annual frequency. Issues such as rule compliance, generic letter and bulletin actions, and other commitments to the NRC are prioritized according to safety significance and according to other ongoing betterment activities undertaken at Pilgrim Station.

LTP item Number 599, entitled, "Class I Piping Seismic Damping Ratio" involved activities established to resolve use of increased damping ratios in certain Class I piping. This issue was reported to the NRC in LER 92-001-00, dated February 21, 1992.

LER 92-001-00 detailed the circumstances related to the use of damping values in the seismic analyses of certain piping system at Pilgrim Station. Seismic response spectra and seismic damping values are two of the key parameters used to establish the design basis for piping and supports. For the analyses in question, damping values from Regulatory Guide 1.61 or ASME Code Case N-411 were used. The NRC has generally permitted use of these damping values in conjunction with response spectra based on the Regulatory Guide 1.60. Since the Pilgrim Station design basis seismic response spectra are based on a Housner shape ground response spectrum, the analyses that used Regulatory Guide 1.61 or ASME Code Case N-411 may not be considered acceptable by the NRC.

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As described in the LER, an operability evaluation was developed to support operation for Cycle 9 following discovery of this issue. The operability evaluation is consistent with the requirements of NRC Generic Letter 91-18. While the use of Regulatory Guide 1.61 or ASME Code Case N-411 damping with a Housner based spectra may be inappropriate for design basis analyses, such use has generally been considered acceptable to demonstrate operability. Note that for the operability evaluation, current design basis allowable criteria was used for all considerations even though NRC Generic Letter 91-18 allows the use of the increased faulted service limits for operability evaluations.

The LER corrective actions were integrated into the LTP and, subsequently, status was updated on a semi-annual frequency. These corrective actions initially included identification of stress analyses where the higher damping ratios were used, development of enhanced design specifications for piping and supports, and systematic review of safety grade piping systems to demonstrate conformance with the appropriate licensing basis.

As part of the LER corrective actions, preliminary analyses were also performed to re-evaluate the seismic response of buildings at Pilgrim Station. Initially, these analyses used the original, simplified mathematical model for the reactor building, but factored in the mitigating effects of soil/structure interaction behavior using techniques not available at the time of Pilgrim's original design work. Encouraged by the results, this work was continued. A state of the art three dimensional finite element model of the reactor building and supporting soil was created. The model combined the building structure, the reactor vessel and pedestal, the biological shield wall, and the drywell and torus in sufficient detail to eliminate interfaces resulting from previously separate models. Seismic analyses were then performed and response spectra generated using current NRC requirements and guidance for ground response spectra and soil/structure interaction. Results using Pilgrim's 0.15g Safe Shutdown Earthquake acceleration anchored to a control point at ground grade showed significantly reduced seismic responses when compared to those used for original plant design.

An updated operability evaluation was developed for Cycle 10 operation. Pilgrim's NRC Project Manager and appropriate NRR staff were kept informed of these efforts as they progressed. The NRC attended a detailed briefing at BECo offices on September 3, 1992, and was updated on the operability evaluation details by teleconference on January 14, 1993. The NRC was particularly interested in these developments because of interest about the seismicity of the Pilgrim site and offered constructive comments on our work.

In our March 1, 1993, LTP update, we notified the NRC of a revised action plan consisting of:

- Development of new amplified response spectra (ARS) for the reactor building to be used for resolution of the LER issues. New ARS would use an enhanced reactor building model and include soil structure interaction effects. Two families of ARS would be developed.
 - a) ARS based on Housner for various rates of damping, including Code Case N-411 levels.
 - b) ARS based on the Regulatory Guide 1.60 shape for various rates of damping, including Code Case N-411 levels.

- Comparison of the spectral contents of the two new families of ARS to the spectral contents of the design basis ARS at Regulatory Guide 1.61 and Code Case N-411 damping levels.
- Performance of several confirmatory piping stress analyses using the newly developed ARS (sample basis).

Upon completion of the above LTP activities, we concluded the content of any specific newly developed ARS was essentially enveloped by the content of the comparable FSAR design basis ARS; that is, a new Housner ARS at Regulatory Guide 1.61 damping was enveloped by a FSAR design basis ARS at Regulatory Guide 1.61 damping, and a new Regulatory Guide 1.60 ARS at Code Case N-411 damping was enveloped by a FSAR design basis ARS at Code Case N-411 damping.

Likewise, confirmatory stress analyses performed using the newly-developed spectra produced results that were less than design basis allowables. We, therefore, concluded that a systematic piping re-analysis was not warranted.

The new spectra were considered valid for the resolution of the damping issues identified in LER 92-001-00 only. Any future design modification analyses were to be based on existing FSAR design criteria. Details of the methodology and results were presented to the NRC during a meeting at our facilities on October 14, 1993. A final report on the evaluation of the effects of using various damping values in the seismic analysis of Pilgrim piping systems was issued in-house on January 6, 1994. The final report documented the completion of the required actions described in the LTP commitment scope. This LTP item was closed accordingly in the February 28, 1994, LTP Update.

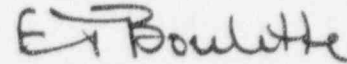
Subsequently, we issued a letter dated April 1, 1994, that furnished these new seismic spectra for NRC review. These spectra were based on Regulatory Guide 1.60 and soil-structure interaction analysis. The letter requested approval to use these spectra with Regulatory Guide 1.61 and ASME Code Case N-411 damping as an alternative to the design basis Housner spectra for future evaluations or modifications of reactor building structures, systems, and components. The NRC reviewed the above in-house report for closure of the original LER unresolved item number 50-293/92-04-01. Based on this report and our April 1, 1994, submittal, the NRC closed the LER unresolved item.

Requested Action

The engineering report dated October 1993, is provided as Attachment A. Attachment B provides the scope of the piping systems and analyses affected by LER 92-001-00, which are considered acceptable based on the evaluation contained in the engineering report. We request NRC review and approval of the Attachment A report by March 15, 1997. Based on NRC approval, our intention is to revise our FSAR to annotate that the engineering report is the referenced design basis of record for the piping systems affected by this issue. The scope is limited to those piping systems described in Attachment B. We recognize that any future modifications to these piping systems will be based on the current FSAR damping criteria unless the licensing basis is revised otherwise.

In this regard, Attachment C provides responses to the NRC "Request for Additional Information Regarding Pilgrim Nuclear Power Station Alternative Reactor Building Response Spectra", dated May 23, 1996. These NRC questions stem from our April 1, 1994, submittal requesting approval to use these new response spectra and the Regulatory Guide 1.61 and ASME Code Case N-411 modal damping as an alternate to the existing reactor building design response spectra and modal damping.

We request continued NRC review of our April 1, 1994, submittal and will provide a continued high level of importance to any questions or concerns that may arise in your review.



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JDK/dmc/ltp599B

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Attachment A

Evaluation of the Effects of Using Various Damping Values in the Seismic
Analysis of PNPS Piping Systems