

May 8, 2001

Mr. Mike Bellamy
Site Vice President
Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

SUBJECT: PILGRIM NUCLEAR POWER STATION - CORRECTION TO SAFETY
EVALUATION RELATED TO UNRESOLVED SAFETY ISSUE (USI) A-46
PROGRAM IMPLEMENTATION (TAC NO. M69471)

Dear Mr. Bellamy:

On August 14, 2000, the U.S. Nuclear Regulatory Commission (NRC) issued a safety evaluation (SE) regarding the licensee's activities related to USI A-46 program at the Pilgrim Nuclear Power Station (Pilgrim) that was established in response to Generic Letter 87-02, "Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors." By letter dated April 20, 2001 (ENGCO Letter 2.01.052), the licensee notified the NRC of several clarifications to the SE that they felt were needed. We have reviewed these comments and revised the SE to address the licensee's concerns. We did not address all your comments as several of them were clarifications for which the staff felt the original SE was sufficient. The changes, in general, clarified or corrected statements in the SE. The changes did not modify or change any of our conclusions with regards to the closure USI A-46 program.

In particular, in Section 2.4.2, "Assessment of Equipment Caveats," three valves were left out (MO-3813, MO-4083, and MO-4084) and one valve number was incorrect (MO-3905 should have been MO-3805). In addition, this section was modified to state that only the sample calculation for valve MO-3801 was provided and that this calculation is typical of the calculations performed for the other valves noted in this section. In Section 2.9, "Outlier Identification and Resolutions," a clarification was made to reflect the fact that the grade of the buildings onsite vary. The SE states that the revised application of Method A.1 "would consider the equipment as an outlier if the in-structure response structure (IRS) is greater than 1.5 times the Generic Implementation Procedure (GIP) bounding spectrum (BS) for the safe shutdown equipment list (SSEL) items located below 40 feet above the grade and with a fundamental natural frequency greater than 8 Hertz." The licensee noted that the grade level varies from building to building and that the SE needed to reflect this fact. The SE was modified to read that the revised application of Method A.1 "would consider the equipment as an outlier if the IRS is greater than 1.5 times the GIP BS for SSEL items located below 40 feet above the effective grade of the respective building and with a fundamental natural frequency greater than 8 Hertz."

Two editorial changes were also made. In Section 2.7, "Essential Relays," a reference to "Appendix" 3 is incorrect and should have been "Enclosure C Attachment 3." In Section 2.8, "Human Factors Aspect," references to "Chapter 15" should have been "Chapter 14."

M. Bellamy

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The staff has concluded that the proposed changes do not invalidate the conclusions reached in the staff's safety evaluation of August 14, 2000, that the licensee's USI A-46 implementation program, in general, met the purpose and intent of the criteria in Generic Implementation Procedure for Seismic Verification of Nuclear Plant Equipment and the staff's Supplemental Safety Evaluation Report No.2 for the resolution of A-46. The revised pages are enclosed. If you have any additional questions or comments, please contact me at (301) 415-1445.

Sincerely,

/RA/

Alan B. Wang, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-293

Enclosure: As stated

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Pilgrim Nuclear Power Station

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the ratio of the estimated realistic median-centered IRS to the GRS results in an amplification factor of 2.22 at 8 Hz. and 1.76 or less above 9 Hz.

RWB - The IRS for elevation 37 feet compared to the GRS shows the maximum amplification above 8 Hz is about 5.32 at 14 Hz. Dividing this value by 3.41 to obtain the ratio of the estimated realistic median-centered IRS to the GRS results in an amplification factor of 1.56.

DGB - The IRS for elevation 34.5 feet compared to the GRS shows the maximum amplification above 8 Hz is about 2.42 at 12 Hz. Dividing this value by 2.73 to obtain the ratio of the estimated realistic median-centered IRS to the GRS results in an amplification factor of 0.89. Since the licensee was able to demonstrate that if there were median-centered IRS developed for these structures, the amplification factors or the IRS over the GRS would be not more than about 1.5 for the elevations where GIP-2 Method A.1 was used, the staff considers the use of Method A.1 to be acceptable at those locations to verify the adequacy of SSEL components for USI A-46.

Therefore, the staff concludes that the equipment seismic capacity to seismic demand comparison for Pilgrim is adequate for use in the USI A-46 program.

2.4.2 Assessment of Equipment Caveats

The licensee indicated in Reference 5 that the SCEs verified that the caveats listed in Appendix B of GIP-2 for each equipment class were met. The caveats are the inclusion and exclusion rules, which specify characteristics and features particularly important for seismic adequacy of a specific class of equipment when the equipment seismic capacity is determined using the experience-based data. The phrase "meeting the intent of the caveats" applies to equipment that does not meet the specific wording in certain caveats, but which is deemed to be seismically adequate based on the judgment of the SCE.

The results for equipment whose seismic adequacy was verified by meeting the caveats were documented in Appendix D of Reference 5. In many cases, items of equipment which did not meet the GIP-2 caveats were considered as outliers and were documented in Section 8 of the summary report for USI A-46 resolution. In some cases, if an item of equipment was judged to meet the intent of the caveats, but the specific wording of the caveat rule is not met, then the equipment item was considered to have met the caveat rule, in accordance with GIP-2. Equipment items that met the intent rather than the specific wording of the caveats are listed in Section 5 of Reference 5.

In its response of June 15, 1998, to the staff's RAI dated December 16, 1997, the licensee provided supplemental information for some equipment items to demonstrate how the intent of certain caveats was met rather than the wording. For valve MO-3801, the licensee demonstrated the maximum calculated bending stress in the valve yoke, made of ASTM A-48 Class 40 cast iron having a minimum ultimate strength of 40 ksi, was 2.19 ksi which satisfies the 20-percent requirement criterion of GIP-2. This calculation was typical of the approach used for valves MO-3800, M0-3805, MO-3806, MO-3808, MO-3813, MO-4083, and MO-4084 to ensure the 20-percent requirement criterion of GIP-2 was met. The licensee also indicated that if a component did not meet the wording of a caveat, and was not found to be an outlier, the assessment and justification for meeting the intent of a caveat were noted on the screening and evaluation work sheets (SEWS).

walkdown and mounting spot checks. The licensee indicated that no anomalies were noted during the walkdowns.

The licensee identified 622 essential relays that required capacity versus demand screening. Section 6 of the USI A-46 relay evaluation report (Reference 13) identifies 110 essential relay outliers, of which 11 were due to relay manufacturers and/or model numbers being unknown, 89 were essential relays for which seismic capacity data was unavailable at the time of evaluation, 7 were GE HFA151 essential relays with a seismic demand that exceeds their capacity, and 3 were essential relays for which demand exceeds the GERS. These outliers are documented in Enclosure C Attachments 1 and 2 of the relay evaluation report. The licensee indicated that these relay outliers were resolved either by analysis or by comparison with similar rugged components.

The licensee provided the safety implications of outlier relays in Enclosure C Attachment 3 of the relay evaluation report. Enclosure C Attachment 3 also contains the outlier relay associated equipment, the function of the equipment, the outlier concerns, a basis for why an operability concern does not exist, and the proposed resolution. The licensee indicated in the summary report that it planned to resolve all outliers by the end of RFO 12, which was scheduled for the Spring of 1999. In Reference 10, the licensee stated that all relay work requiring replacement has been completed.

The staff finds the licensee's seismic relay evaluation to be acceptable for the USI A-46 resolution at Pilgrim as it meets the provisions of GIP-2.

2.8 Human Factors Aspect

GIP-2 describes the use of operator action as a means of accomplishing activities required to achieve a safe shutdown. Section 3.2.7 of GIP-2, "Operator Action Permitted," states, in part, that timely operator action is permitted as a means of achieving and maintaining a safe shutdown condition provided procedures are available and the operators are trained in their use. Additionally, Section 3.2.6 of GIP-2, "Single Equipment Failure," states that manual operator action of equipment, which is normally power operated, is permitted as a backup operation provided that sufficient manpower, sufficient time, and the appropriate procedures are available. Section 3.2.8, "Procedures," states, in part, that procedures should be in place for operating the selected equipment for a safe shutdown and operators should be trained in their use. It is not necessary for the licensee to develop new procedures specifically for compliance with the USI A-46 program.

Section 3.7, "Operations Department Review of SSEL," of GIP-2 describes three methods for accomplishing the operations department reviews of the SSEL against the plant operating procedures. Licensees were to decide which method or combination of methods to use for their plant-specific reviews. These methods included:

1. A "desk-top" review of applicable normal and emergency operating procedures.
2. Use of a simulator to model the expected transient.
3. Performing a limited control room and local in-plant walk-down of actions required by plant procedures.

The staff's review focused on verifying that the licensee had used one or more of the GIP-2 methods for conducting the operations department review of the SSEL, and had considered aspects of human performance in determining what operator actions could be used to achieve and maintain a safe shutdown (e.g., resetting relays, manual operation of plant equipment).

The licensee provided information which outlined the use of the desk-top and simulator review methods by the operations department to verify that existing normal, abnormal, and emergency operating procedures are adequate to mitigate the postulated transient and that operators could place and maintain the plant in a safe shutdown condition. The licensee determined that the systems and equipment selected for seismic review in the USI A-46 program are those for which normal, abnormal, and emergency operating procedures are available to bring the plant from a normal operating mode to a cold shutdown condition. The shutdown paths selected were reviewed by the Pilgrim nuclear operations staff who determined that the procedures would provide adequate guidance to the operators in response to a seismic event. However, as a result of this review, the Pilgrim Station Procedure 5.2.1, "Earthquake," was revised to include additional guidance identifying the seismically qualified success paths, clarify some of the terminology (i.e., rugged, redundant) and identified equipment vulnerabilities, and add active equipment for drywell cooling to the SSEL. The licensee provided assurance that ample time existed for operators to take the required actions to safely shut down the plant. It accomplished this during validation of the pertinent plant operating procedures related to the licensee's UFSAR, Chapter 14, Accident Analysis for the Loss of Offsite Power (LOOP) transient which preceded the A-46 program review, and through the A-46 simulator exercises.

The staff verified that the licensee had considered its operator training programs and verified that its training was sufficient to ensure that those actions specified in the procedures could be accomplished by the operating crews. The operations department verified that all actions necessary to safely shut down the plant were included in existing normal, abnormal, and emergency operating procedures. The licensee verified that the only additional operator actions, beyond those associated with the LOOP scenarios, which must be performed to bring the plant from a normal operating mode to a cold shutdown condition are those specifically associated with the vibratory motion of the SSE. Operator actions may be required to reset the turbine trip/throttle valve of the RCIC system turbine-driven pump. The specific actions associated with this were reviewed by the operations department, during the relay screening process and simulator exercises, to ensure that the actions could be performed in the required amount of time with normally available resources. The results of the review of these operator actions by the operations department verified that each of the actions was adequately covered by procedural guidance, and that adequate resources, including time available to take such actions, are available.

In addition, the staff requested verification that the licensee had adequately evaluated potential challenges to operators, such as loss of or diminished lighting, harsh environmental conditions, potential for damaged equipment interfering with the operators tasks, and the potential for placing an operator in unfamiliar or inhospitable surroundings. The licensee provided information to substantiate that potential challenges to the operator were explicitly reviewed during validation of the pertinent plant operating procedures related to the licensee's UFSAR, Chapter 14, Accident Analysis for the LOOP transient which preceded the A-46 program review. In addition, the licensee explicitly evaluated the potential for local failure of architectural features and the potential for adverse spacial interactions in the vicinity of safe shutdown equipment, where local operator action may be required, as part of the GIP-2 process.

As a result of the review, some control room anomalies were observed and corrected. This included securing S-hooks on light panels, securing tie wires on ceiling tee bars, and securing light panel covers. The licensee performed seismic interaction reviews which eliminated any concerns with the plant components and structures located in the immediate vicinity of the components which had to be manipulated. Therefore the potential for physical barriers resulting from equipment or structural earthquake damage which could inhibit operator ability to access plant equipment was considered, and eliminated as a potential barrier to successful operator performance.

The licensee has provided the staff with sufficient information to demonstrate conformance with the provisions of GIP-2 and the human factors review is, therefore, acceptable for resolution of USI A-46 at Pilgrim.

2.9 Outlier Identification and Resolutions

Section 8 of Reference 5 documents the equipment outliers identified during the USI A-46 implementation effort at Pilgrim. The documentation also includes descriptions of the associated defects or inadequacies, the safety implications, and the status of outliers at the time the USI A-46 program implementation submittal was made. Relay outliers are discussed in Section 2.7 of this evaluation report. Section 9 provides a discussion of the proposed resolutions or corrective actions for the unresolved outliers identified in Section 8.

Items of equipment were identified as outliers for three reasons: equipment class caveats, inadequate anchorage, and seismic interactions. One conduit and 182 items of mechanical and electrical equipment outliers were identified during the seismic verification and analytical reviews. The significant outliers associated with anchorages, tanks and heat exchangers, and cable tray and conduit raceway supports are discussed in Sections 2.4.3, 2.5, and 2.6 of this safety evaluation.

Tables 9.1 and 9-2 of the summary report (Reference 5) show the unresolved outliers and a summary of their proposed resolution. In Reference 10, the licensee provides the status of Pilgrim USI A-46 outliers. It shows that a majority of outliers requiring modifications have been completed. The licensee stated that of the 13 remaining equipment modifications, 11 are planned for on-line implementation and 2 require shutdown conditions for implementation. The licensee stated that it plans to complete the modifications by the end of the RFO 13 which is scheduled to commence in approximately April 2001.

In its November 8, 1999, response (Reference 10) to the staff's RAI, the licensee indicated that after revising its application of GIP-2, Method A.1, 19 additional outliers were identified. At Pilgrim, the revised application of Method A.1 would consider the equipment as an outlier if the IRS is greater than 1.5 times the GIP BS for SSEL items located below 40-feet above the effective grade of the respective building and with a fundamental natural frequency greater than 8 Hertz. By letter dated February 23, 2000 (Reference 18), the licensee indicated that of these 19 outliers, 14 have been resolved. The remaining five will be resolved by using vendor's qualification data, or performing minor modifications and inspection. The licensee has scheduled to complete resolution of all outliers by the next refueling outage (RFO 13) which is scheduled to commence in approximately April 2001.