UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

ACRSR-2265

September 26, 2007

The Honorable Dale E. Klein
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL APPLICATION FOR THE PILGRIM NUCLEAR POWER STATION

Dear Chairman Klein:

During the 545th meeting of the Advisory Committee on Reactor Safeguards (ACRS), September 6-8, 2007, we completed our review of the license renewal application for the Pilgrim Nuclear Power Station (PNPS) and the final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during a meeting on April 4, 2007. During our review, we had the benefit of discussions with representatives of the NRC staff, and Entergy Nuclear Operations, Inc., (the applicant). We also had the benefit of the documents referenced. This report fulfills the requirement of 10 CFR 54.25 that the ACRS review and report on all license renewal applications.

CONCLUSIONS AND RECOMMENDATION

1. The programs established and commitments made by the applicant to manage age-related degradation provide reasonable assurance that PNPS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public.

2. The license conditions proposed by the staff are appropriate.

3. The application of Entergy Nuclear Operations, Inc., for renewal of the operating license for PNPS should be approved with the proposed license conditions.

BACKGROUND AND DISCUSSION

PNPS is located approximately four miles southeast of Plymouth, Massachusetts. The NRC issued the PNPS construction permit on August 26, 1968, and the operating license on June 8, 1972. PNPS is a BWR-3 design with a Mark 1 containment. General Electric supplied the nuclear steam supply system and Bechtel Corporation originally designed and constructed the balance of plant. The PNPS licensed power output is 2028 megawatts thermal with a gross electrical output of approximately 690 megawatts. The applicant requested renewal of the PNPS operating license for 20 years beyond the current license term, which expires on June 8, 2012.

In the final SER, the staff documented its review of the license renewal application and other information submitted by the applicant and obtained during audits and inspections conducted at the plant site. The staff reviewed the applicant's identification of structures, systems, and components (SSCs) that are within the scope of license renewal; the integrated plant assessment process; the applicant's identification of the plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's aging management programs (AMPs); and the identification and assessment of time-limited aging analyses (TLAAs) requiring review.

The application either demonstrates consistency with the Generic Aging Lessons Learned (GALL) Report or documents deviations from the approaches specified in the GALL Report. The staff reviewed this application in accordance with NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants."

The applicant identified those SSCs that fall within the scope of license renewal. For these SSCs, the applicant performed a comprehensive aging management review. Based on the results of this review, the applicant will implement 40 AMPs for license renewal including existing, enhanced, and new programs. In the SER, the staff concludes that the applicant has appropriately identified SSCs within the scope of license renewal and that the AMPs described by the applicant are appropriate and sufficient to manage the aging of long-lived passive components that are within the scope of license renewal. We concur with this conclusion.

The staff conducted inspections and audits. The purpose of the inspections was to verify that the scoping and screening methodologies are consistent with the regulations and are adequately reflected in the application. The audits confirmed the appropriateness of the AMPs and the aging management reviews. Based on the inspections and audit, the staff concluded that these programs are consistent with the descriptions contained in the license renewal application. The staff also concluded that the existing programs, to be credited as AMPs for license renewal, are generally functioning well and that the applicant has established an implementation plan in its commitment tracking system to ensure timely completion of the license renewal commitments.

PNPS has a history of seepage of small amounts of water on the torus room floor. The water has been tested and the applicant has determined that it is non-aggressive ground water as defined in the GALL Report. Further analyses and evaluations performed by the applicant have shown that the probable source of the water is groundwater intrusion through construction joints in the basemat. The seepage of water through the 8-foot thick reactor building basemat is a highly localized phenomenon and the inflow is offset by evaporation such that the small accumulations do not require removal by other means.

An assessment performed by a civil engineering consultant for the applicant concluded that the seepage does not compromise the overall structural performance of the torus basemat and does not affect the bulk integrity of the concrete slab or the overall compressive and bending load bearing capacity of the reactor foundation. This assessment verified the non-aggressiveness of the water and concluded that the localized calcium leaching does not affect the overall structural performance of the slab. The staff agreed with the applicant's assessment but requested additional monitoring to provide assurance that the conclusions remain valid during the period of extended operation. The applicant committed to continue monitoring the chemistry of the water in the torus room prior to the period of extended operation and once every 5 years during the period of extended operation. The applicant further committed to inspect the torus room structures in accordance with the Structures Monitoring Program every

5 years. The staff concluded that the applicant's programs and commitments relative to the water intrusion met the requirements for license renewal. We concur with the staff's conclusion.

The applicant identified the systems and components requiring TLAAs and reevaluated them for 20 years of extended operation. Affected TLAAs include those associated with neutron embrittlement, metal fatigue, irradiation-assisted stress corrosion cracking, environmental qualification of electrical equipment, and stress relaxation of hold-down bolts. The staff concluded that the applicant has provided an adequate list of TLAAs. We concur with this conclusion.

For the TLAAs associated with neutron embrittlement, the applicant used the Radiation Analysis Modeling Application (RAMA) fluence methodology for its reactor vessel fluence evaluations. RAMA is an NRC-approved methodology, but it has not been benchmarked for BWR-3 designs. The calculations of fluence must be benchmarked against at least one credible plant-specific surveillance capsule. The applicant has not completed its benchmarking of the RAMA code for PNPS due to discrepancies between the fluence values obtained from the RAMA code and the dosimetry data. An alternative analysis provided by the applicant showed that substantial margin exists for the most limiting components and that the fluence used for the TLAAs was conservative. However, the staff required that the applicant provide a correctly benchmarked analysis for the period of extended operation that meets regulatory requirements. The applicant plans to remove a capsule during a future outage after precisely measuring its location and plans to perform an analysis using this capsule to complete the benchmarking. In parallel, the applicant is working with the Electric Power Research Institute (EPRI) to benchmark the code using data from another BWR-3. The staff concluded that either of these approaches could meet the regulatory requirements.

The applicant has committed to complete an analysis that meets the regulatory requirements and submit it to the NRC for approval before entering the period of extended operation. The results of the completed analysis will be reviewed against the fluence values used for the TLAAs to ensure that the values used were conservative. The staff has concluded that this approach is acceptable and has proposed a license condition that would require the analysis to be submitted to the staff on or before June 8, 2010. We concur with the staff's conclusion and the proposed license condition.

The applicant initially took exception to the GALL Report for the manner in which environmental effects were taken into account in the fatigue analyses. After further discussion with the staff, the applicant made the commitment to be consistent with the GALL Report. The staff will issue a supplement to the final SER to document this commitment. The supplement to the SER was not available for our review, but we concur with the staff's resolution of this issue as discussed at the meeting.

With the addition of the above commitments, the staff concluded that the applicant meets the requirements of the license renewal rule by demonstrating that the TLAAs will remain valid for the period of extended operation, or that the TLAAs have been projected to the end of the period of extended operation, or that the aging effects will be adequately managed for the period of extended operation. We concur with the staff's conclusion that TLAAs have been properly identified and that criteria supporting 20 more years of operation have been met.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating license for PNPS. The programs established and the commitments made by the applicant provide reasonable assurance that PNPS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The application for renewal of the operating license for PNPS should be approved with the proposed license conditions.

Sincerely,

William J. Shack
Chairman

References

1. Safety Evaluation Report Related to the License Renewal of Pilgrim Nuclear Power Station, June 28, 2007.

2. Safety Evaluation Report With Open Items Related to the License Renewal of Pilgrim Nuclear Power Station, March 2007.

3. Letter from M. A. Balduzzi to NRC, Pilgrim Nuclear Power Station License Renewal Application, January 25, 2006.

4. Audit and Review Report for Plant Aging Management Review and Programs, Pilgrim Nuclear Power Station, November 1, 2006.

5. Letter from Richard J. Conte, NRC to Kevin Bronson, Entergy, Pilgrim Nuclear Power Station - NRC License Renewal Inspection Report 05000293/2006007, March 15, 2007.

6. Letter from S. Bethay, Entergy to NRC, License renewal Application Amendment (including an assessment by a civil engineering consultant), May 1, 2007.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating license for PNPS. The programs established and the commitments made by the applicant provide reasonable assurance that PNPS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The application for renewal of the operating license for PNPS should be approved with the proposed license conditions.
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Sincerely,

/RA/

William J. Shack
Chairman

References

7. Safety Evaluation Report Related to the License Renewal of Pilgrim Nuclear Power Station, June 28, 2007.

8. Safety Evaluation Report With Open Items Related to the License Renewal of Pilgrim Nuclear Power Station, March 2007.

9. Letter from M. A. Balduzzi to NRC, Pilgrim Nuclear Power Station License Renewal Application, January 25, 2006.

10. Audit and Review Report for Plant Aging Management Review and Programs, Pilgrim Nuclear Power Station, November 1, 2006.

11. Letter from Richard J. Conte, NRC to Kevin Bronson, Entergy, Pilgrim Nuclear Power Station - NRC License Renewal Inspection Report 05000293/2006007, March 15, 2007.

12. Letter from S. Bethay, Entergy to NRC, License renewal Application Amendment (including an assessment by a civil engineering consultant), May 1, 2007.

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