



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

September 28, 2009

The Honorable Gregory B. Jaczko  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:     REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL  
                  APPLICATION FOR THE THREE MILE ISLAND NUCLEAR STATION, UNIT 1**

During the 565<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, September 10-12, 2009, we completed our review of the license renewal application for the Three Mile Island Nuclear Station, Unit 1 (TMI-1), and the final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during its meeting on April 1, 2009. During these reviews, we had the benefit of discussions with representatives of the NRC staff and the applicant, Exelon Generation Company, LLC (Exelon). We received and considered comments from a member of the public. 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.

**CONCLUSION AND RECOMMENDATION**

1. The programs established and committed to by the applicant to manage age-related degradation provide reasonable assurance that TMI-1 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 application for renewal of the operating license of TMI-1 should be approved.

**BACKGROUND AND DISCUSSION**

TMI-1 is a two-loop Babcock & Wilcox pressurized water reactor with once-through steam generators and a large, dry, steel-lined, reinforced concrete containment. The current power rating of 2568 MWt includes a 1.3 percent power uprate that was implemented in 1988. The original TMI-1 steam generators are scheduled to be replaced in late 2009. In January 2008, AmerGen Energy Company, LLC, requested renewal of the TMI-1 operating license for 20 years beyond the current license term, which expires on April 19, 2014. On January 8, 2009, the TMI-1 operating license was transferred to Exelon Generation Company, LLC, which is the current applicant.

The staff documented in the final SER its review of the license renewal application and other information submitted by the applicant or obtained during two staff audits and an inspection conducted at the plant site, and a supplemental inspection at the Exelon headquarters offices.

The staff reviewed the completeness of 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 applicant identified the SSCs that fall within the scope of license renewal and performed an aging management review for these SSCs. The applicant will implement 38 AMPs for license renewal. These include 30 existing programs, seven new programs, and one existing plant-specific program to manage the aging of nickel alloy components and welds. A total of 24 AMPs, nine of which contain enhancements, are consistent with the guidance in the Generic Aging Lessons Learned (GALL) Report. Fourteen AMPs contain exceptions to approaches specified in the GALL Report. We reviewed these exceptions and agree with the staff that they are acceptable.

The applicant identified the systems and components requiring TLAAAs and reevaluated them for the period of extended operation. The staff concluded that the applicant has provided an acceptable list of TLAAAs, as defined in 10 CFR 54.3. Furthermore, the staff concluded that in all cases the applicant has met the requirements of the License Renewal Rule by demonstrating that the TLAAAs will remain valid for the period of extended operation, or the TLAAAs have been projected to the end of the period of extended operation, or the aging effects will be adequately managed for the period of extended operation. We concur with the staff's conclusion that the TMI-1 TLAAAs have been properly identified and that the required criteria will be met for the period of extended operation.

The staff conducted two license renewal audits and one inspection at the TMI site. The audits verified the appropriateness of the scoping and screening methodology, aging management review, and TLAAAs. The inspection verified that the license renewal requirements are appropriately implemented. Based on the audits and inspection, the staff concluded in the final SER that the proposed activities will adequately manage the aging of SSCs identified in the application and that the intended functions of these SSCs will be maintained during the period of extended operation. We agree with this conclusion.

In the 1990s, corrosion of the containment liner was detected in several locations behind and just above the moisture barrier at the containment floor. The corrosion was caused by leakage of borated water and degradation of the moisture barrier seal that allowed water to collect between the moisture barrier and the inner surface of the liner. The moisture barrier was replaced in 2007. At that time, the previous licensee inspected the entire periphery of the liner to a depth of approximately four to eight inches in the opened gap and confirmed that no corrosion extended below the moisture barrier sealing surface. The applicant has verified that the containment liner currently meets all design requirements, and all identified locations of the corrosion have been recorded. The applicant will perform weld repairs to restore the liner to its nominal thickness for all locations where the base metal thickness is reduced by more than 10%. These repairs will be performed during the 2009 outage to replace the steam generators.

We agree with the staff's conclusion that these corrective actions and continued monitoring through the ASME Section XI, Subsection IWE Program will provide adequate assurance of the liner integrity.

High-density spent fuel storage racks containing Boral panels were installed at TMI-1 in 1992. Different rack designs are used in two regions of the spent fuel pool. In Region 1, the racks have a water gap between adjacent storage cells that functions as a flux trap. In Region 2, there is no water gap between adjacent cells. The Boral panels in Region 1 have thinner sheathing than the panels in Region 2. Corrosion and blistering of Boral surveillance coupons were detected in 1997 and 2008. The largest blister was approximately 1-inch in diameter, 0.058-inch deep, and was filled with water. The previous licensee performed analyses to confirm that the largest blister would not reduce the neutron absorption capacity of the Boral or the neutron attenuation in the Region 1 water gaps, even if the blister were filled with gas. The staff concluded that the TMI-1 Water Chemistry Program and the Boral Surveillance Program will adequately manage the aging effects from Boral corrosion during the period of extended operation. The staff also stated that Interim Staff Guidance is currently being prepared to address the general topic of neutron absorbing materials in fuel storage racks. We agree that these programs will adequately manage the effects of Boral corrosion.

During the site AMP audit, the staff observed water in manholes which contain medium voltage cables that are important to safety. The staff identified water intrusion into underground cable ducts and manholes as a generic, current operating plant issue in Information Notice 2002-12, "Submerged Safety-Related Electrical Cables," and in Generic Letter 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients." The applicant stated that they will re-grade areas surrounding cable manholes, replace manhole lid gaskets, and refurbish cable vault French drains to minimize water intrusion. The staff will continue to address this issue through the Reactor Oversight Process during the current period of operation.

The license renewal application did not fully document TMI-1 plant-specific operating and maintenance experience for the five- to ten-year period that is recommended by the Nuclear Energy Institute (NEI) guideline NEI 95-10. Exelon originally referred to information in the Electric Power Research Institute (EPRI) report, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4," as a surrogate for TMI-1 plant-specific operating and maintenance experience from November 30, 2001 through December 31, 2004. Actual plant-specific operating and maintenance records were reviewed only for the period from January 1, 2005 through November 30, 2006. In response to questions raised during our interim review of the TMI-1 license renewal application and the associated NRC staff's SER with open items, the applicant completed a full review of the TMI-1 plant-specific operating experience for the five-year period ending November 30, 2006. The staff audited this operating experience during a supplemental inspection conducted in July 2009. We agree that the augmented plant-specific operating experience review appropriately supports the license renewal application.

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 TMI-1. The programs established and committed to by Exelon provide reasonable assurance that TMI-1 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 Exelon application for renewal of the operating license for TMI-1 should be approved.

Dr. J. Sam Armijo did not participate in the Committee's deliberations regarding this matter.

Sincerely,

*/RA/*

Mario V. Bonaca  
Chairman

**REFERENCES**

1. Memorandum from David L. Pelton, Chief, Projects Branch 1, Division of License Renewal, Office of Nuclear Reactor Regulation, to Edwin M. Hackett, Executive Director, Advisory Committee on Reactor Safeguards, "Advisory Committee on Reactor Safeguards Review of the Three Mile Island Nuclear Station, Unit 1, License Renewal Application - Safety Evaluation Report," July 1, 2009 (ML091400112 and ML091660470)
2. Memorandum from David L. Pelton, Chief, Projects Branch 1, Division of License Renewal, Office of Nuclear Reactor Regulation, to Edwin M. Hackett, Executive Director, Advisory Committee on Reactor Safeguards, "Advisory Committee on Reactor Safeguards Review of the Three Mile Island Nuclear Station, Unit 1, License Renewal Application - Safety Evaluation Report," July 1, 2009 (ML090760531 and ML090710604)
3. Letter from Michael P. Gallagher, Vice President, License Renewal, AmerGen Exelon Generation Company, LLC, to U.S. Nuclear Regulatory Commission, "Three Mile Island, Unit 1 License Renewal Application," January 8, 2008 (ML080220219)
4. Letter from Jay Robinson, Sr. Project Manager, Division of License Renewal, Office of Nuclear Reactor Regulation, to Michael P. Gallagher, Vice President License Renewal Projects, AmerGen Energy Company, LLC, "Audit Report Regarding the Three Mile Island Nuclear Station, Unit 1, License Renewal Application," November 24, 2008 (ML082880003)
5. Letter from Jay Robinson, Sr. Project Manager, Division of License Renewal, Office of Nuclear Reactor Regulation, to Michael P. Gallagher, Vice President License Renewal Projects, AmerGen Energy Company, LLC, "Scoping and Screening Audit Summary Regarding the Three Mile Island Nuclear Station, Unit 1, License Renewal Application," December 3, 2008 (ML083240245)
6. Letter from Richard Conte, Chief, Division of Reactor Safety, Region I, to Charles G. Pardee, Sr. Vice President and Chief Nuclear Officer, Exelon Generation Group, LLC, "Three Mile Island Nuclear Station Unit 1 – NRC License Renewal Inspection Report 05000289/2008010," March 10, 2009 (ML090690605)
7. Letter from Richard Conte, Chief, Division of Reactor Safety, Region I, to Charles G. Pardee, Sr. Vice President and Chief Nuclear Officer, Exelon Generation Group, LLC, "Three Mile Island Nuclear Station Unit 1 – NRC License Renewal Inspection Report 05000289/2008010," August 19, 2009 (ML092310405)
8. U.S. Nuclear Regulatory Commission, NUREG-1801, Volumes 1 & 2, Revision 1, "Generic Aging Lessons Learned Report," September 2005 (ML052700171)
9. U. S. Nuclear Regulatory Commission, Information Notice 2002-12, "Submerged Safety-Related Electrical Cables," March 21, 2002 (ML020790238)
10. U. S. Nuclear Regulatory Commission, Generic Letter 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients," February 7, 2007 (ML070360665)

11. Letter from Alex Marion, Senior Director, Engineering, Nuclear Energy Institute, to P. T. Kuo, Program Director, License Renewal and Environmental Impacts, Division of Regulatory Improvement Programs, Office of Nuclear Reactor Regulations, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," NEI 95-10, Revision 6, June 2005 (ML051860406)
12. Nuclear Energy Institute, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54, - The License Renewal Rule," NEI 95-10, "Revision 6, June 2005 (ML051860406)
13. Electric Power Research Institute, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4," Technical Report 1010639, January 2006
14. Written comments from Ms. Marjorie Aamodt, a member of the public, regarding Three Mile Island, Unit 1, License Renewal Application, April 1, 2009 (ML092520228)

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 TMI-1. The programs established and committed to by Exelon provide reasonable assurance that TMI-1 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 Exelon application for renewal of the operating license for TMI-1 should be approved.

Dr. J. Sam Armijo did not participate in the Committee's deliberations regarding this matter.

Sincerely,

*/RA/*

Mario V. Bonaca  
Chairman

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Letter to the Honorable Gregory B Jaczko, Chairman, NRC, from Mario V. Bonaca, Chairman, ACRS, dated September 28, 2009

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APPLICATION FOR THE THREE MILE ISLAND NUCLEAR STATION, UNIT 1

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