



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

September 23, 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 INDIAN POINT NUCLEAR GENERATING UNIT  
NOS. 2 AND 3**

Dear Chairman Jaczko:

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 Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3), 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 March 4, 2009. During these reviews, we had the benefit of discussions with representatives of the NRC staff, Riverkeeper Inc., and Entergy Nuclear Operations Inc. (Entergy or 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.

### **CONCLUSION AND RECOMMENDATION**

1. The programs established and committed to by the applicant to manage age-related degradation provide reasonable assurance that IP2 and IP3 can be operated in accordance with their current licensing bases for the period of extended operation without undue risk to the health and safety of the public.
2. The Entergy application for renewal of the operating licenses for IP2 and IP3 should be approved.

### **BACKGROUND AND DISCUSSION**

IP2 and IP3 are Westinghouse 4-loop pressurized water reactors with large, dry ambient pressure containments. They are located approximately 24 miles north of the New York City boundary line. The current licensed power rating of each of the Indian Point units is 3,216 megawatts thermal with a gross electrical output of approximately 1,080 megawatts. Entergy requested renewal of the IP2 and IP3 operating licenses for 20 years beyond the current license terms, which expire on September 28, 2013, for IP2 and December 12, 2015, for IP3.

In the final SER, the staff documented its review of the license renewal application and other information submitted by the applicant or obtained from the staff audits and inspections at the plant site. The staff reviewed the completeness of the applicant's identification of the 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.

In the license renewal application, Entergy identified the SSCs that fall within the scope of license renewal. For these SSCs, the applicant performed a comprehensive aging management review. Based on this review, the applicant will implement 41 AMPs for license renewal, including 10 new programs, and 31 existing programs of which 16 are enhanced and 9 have exceptions to the Generic Aging Lessons Learned (GALL) Report.

The Entergy application either demonstrates consistency with the GALL Report or documents deviations to the specified approaches in this Report. The Entergy application includes several exceptions to the GALL Report. We reviewed these exceptions and agree with the staff that they are acceptable. The staff conducted five license renewal audits and four inspections at the Indian Point site. The audits verified the appropriateness of the scoping and screening methodology, AMPs, aging management review, and TLAAs. The site inspections verified that the license renewal requirements are appropriately implemented. Based on the audits and inspections, the staff concluded in the final SER that the proposed activities will adequately manage the effects of 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.

The applicant identified the systems and components requiring TLAAs and reevaluated them for the period of extended operation. The staff concluded that the applicant has provided an adequate list of TLAAs. Further, the staff concluded that the applicant has met 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.

In 1992, a leak was detected in the IP2 spent fuel pool liner. The leak was determined to be the result of work performed in the spent fuel pool during 1990. Repairs were made to the liner and the structural integrity of the spent fuel pool was evaluated. The evaluation included testing of core bore samples of the concrete to confirm that the structure could perform its intended design function.

Leakage was observed again in 2005. The applicant performed additional testing and inspections of the spent pool liner using visual, robotic camera, and vacuum box testing techniques. This testing identified a pin-hole leak in a weld. The weld flaw was attributed to original construction of the spent fuel pool and was not attributed to any age related degradation mechanism. The leak was repaired and, currently, there is no evidence of continued leakage from the IP2 spent fuel pool.

The applicant has committed to a quarterly sampling program to test for changes in tritium concentrations in groundwater in close proximity to the IP2 spent fuel pool. The applicant has installed over 40 monitoring wells, most of which are multi-level and range up to 300 feet in depth. These wells are configured with level transducers and sample ports for chemical and radiological sampling. Any significant changes in the groundwater, such as an increase in the

tritium level, will be evaluated as an indication of potential leakage from the IP2 spent fuel pool. If leakage is identified in the future, it will be resolved using the applicant's corrective action program.

The staff reviewed Entergy's evaluations, corrective actions, and commitments relative to the IP2 spent fuel pool. Based on the inspections previously conducted and Entergy's commitment to monitor the groundwater samples, the staff concluded that there is reasonable assurance that any future degradation of the IP2 spent fuel pool would be detected. Results from the tritium groundwater monitoring program were used with other information to confirm the source and extent of the leak in the IP2 spent fuel pool. The applicant indicated that the tritium monitoring program will continue to be used to assess the effectiveness of repairs to the IP2 spent fuel pool and to identify any further corrective actions prior to loss of intended functions. Therefore, the staff concluded that the effects of aging will be adequately managed during the period of extended operation. We concur with the staff's conclusions.

The refueling cavity at IP2 has had a history of leakage at the upper elevations of the stainless steel cavity liner when flooded during refueling outages. Once the water gets through flaws in the liner, it travels through gaps in the concrete down to the lower level of the containment where it is collected and pumped to the radioactive waste processing system. Previous corrective actions have reduced, but not eliminated, the leakage. Entergy has performed several inspections and analyses to provide assurance that the leakage is not affecting other structures and that the affected structures remain fully capable of performing their intended design function. To provide additional assurance of the structural integrity, the applicant has committed to perform another inspection that includes taking and analyzing core bore samples of the concrete in affected structures prior to the period of extended operation. Chemical analysis of the water collecting in the lower level of containment will also be performed. During the next three refueling outages, Entergy will perform evaluations and repairs of the liner in an attempt to eliminate the leakage. If the planned repairs do not eliminate the leakage, Entergy will re-inspect the concrete structure and perform chemical analysis of the water prior to the tenth year of the extended period of operation.

The staff evaluated Entergy's inspections and analyses of the structures affected by the leakage. Entergy's mitigation plan and commitments for future inspections were also reviewed. Based on the inspections conducted to date and the actions Entergy is planning to take prior to and during the period of extended operation, the staff concluded that the aging effects on the IP2 refueling cavity concrete will be adequately managed during the period of extended operation. We concur with the staff's conclusion.

In 1973, IP2 experienced a transient in which hot steam and water from a feedwater line leak sprayed onto an uninsulated portion of the containment liner. As a result of the rapid temperature change, the liner buckled and deformed in the affected area. Repairs were made to the liner and the containment was returned to service. Since the 1973 transient, Integrated Leak Rate Tests and inspections have been performed and have confirmed that the containment liner has not experienced any degradation following the repairs. Entergy will perform another inspection of the affected area prior to the period of extended operation.

The staff reviewed Entergy's evaluation and inspection results as well as the monitoring plan and commitments for the containment liner inspections and tests. The staff concluded that the applicant's commitments for future monitoring provide adequate assurance that the containment

liner will remain capable of performing its intended design function during the period of extended operation. We concur with the staff's conclusions.

Entergy predicts that both the IP2 and IP3 reactor vessels will have Charpy Upper-Shelf Energy (USE) values slightly less than 50 ft-lbs at the end of the period of extended operation. IP2 is projected to be at 48.3 ft-lbs and IP3 is projected to be at 49.8 ft-lbs. When a USE value is projected to be less than 50 ft-lbs, 10 CFR Part 50, Appendix G requires that an applicant demonstrate margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code. Appendix K of ASME Code Section XI and ASME Code Case N-512 provide criteria for reactor vessels with Charpy USE values less than 50 ft-lbs. Entergy submitted an equivalent margins analysis demonstrating the applicability of WCAP-13587, Revision 1 to both IP2 and IP3. WCAP-13587, Revision 1 demonstrates that 4-loop plants can meet ASME Code requirements with a Charpy USE of 43 ft-lbs.

The staff reviewed Entergy's equivalent margins analysis and concluded that IP2 and IP3 meet the requirements of 10 CFR Part 50, Appendix G for the projected Charpy USE values. We concur with the staff's conclusion.

Industry experience with leaks in buried piping and tanks has revealed the need for an inspection program. As a result of Indian Point operating experience, such as the recent IP2 condensate return line leak, Entergy amended its buried piping and tanks inspection program to include additional testing of buried components. They have committed to 51 inspections prior to entering the period of extended operation and additional periodic inspections during the period of extended operation. This inspection and monitoring program is consistent with the GALL Report and significantly exceeds the minimum number of inspections required in similar programs at other plants.

The staff reviewed Entergy's amended buried piping and tanks inspection program and concluded it was adequate to manage aging effects. We concur with the staff's conclusion.

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 licenses for IP2 and IP3. The programs established and committed to by Entergy provide reasonable assurance that IP2 and IP3 can be operated in accordance with their current licensing bases for the period of extended operation without undue risk to the health and safety of the public. The Entergy application for renewal of the operating licenses for IP2 and IP3 should be approved.

Sincerely,

**/RA/**

Mario V. Bonaca  
Chairman

**REFERENCES**

1. Memorandum to Edwin M. Hackett, Executive Director, ACRS, transmitting the NRC Final Safety Evaluation Report for Indian Point Nuclear Generating Unit Nos. 2 and 3 License Renewal Application – Safety Evaluation Report, August 18, 2009 (ML092250413 and ML092240268)
2. Letter from F.R. Dacimo (Entergy) to U.S. Nuclear Regulatory Commission, transmitting the Application to Renew the Operating Licenses of Indian Point Nuclear Generating Units No. 2 and 3, April 23, 2007 (ML071210512)
3. U. S. Nuclear Regulatory Commission, “Generic Aging Lessons Learned (GALL) Report,” NUREG-1801, Volumes 1 & 2, Revision 1, September 2005 (ML052110005 and ML052110006)
4. Letter from Kimberly Green, Safety Project Manager, NRR, to Entergy Nuclear Operations, Inc., “Audit Reports Regarding the License Renewal Application for the Indian Point Nuclear Generating Unit Nos. 2 and 3, License Renewal Application,” January 13, 2009 (ML083540625)
5. Letter from R. J. Conte, Chief, Engineering Branch 1, Region 1, to J. Pollock, Site Vice President, Entergy, “Indian Point Nuclear Generating Units 2 and 3 – NRC License Renewal Inspection Report 05000247/2008006 and 05000286/2008006,” August 1, 2008 (ML082140149)
6. Letter from P. Musegaas, Esq. and D. Brancato, Staff Attorney, Riverkeeper, to M. V. Bonaca, Chairman, ACRS, “Comments to the Advisory Committee on Reactor Safeguards on the Indian Point License Renewal Application and Safety Evaluation Report with Open Items,” February 27, 2009 (ML092640558)
7. Letter from P. Musegaas, Esq. and D. Brancato, Staff Attorney, Riverkeeper, to O. L. Maynard, ACRS, “Follow-up Comments to the ACRS on the Indian Point License Renewal Application and Safety Evaluation Report with Open Items,” dated April 16, 2009 (ML091170625)
8. Letter from D. Brancato, Staff Attorney, Riverkeeper, to M. V. Bonaca, Chairman, ACRS, “September 10-12, 2009 ACRS Meeting to Discuss License Renewal Application and Final Safety Evaluation (SER) Report for the Indian Point Nuclear Generating Units 2 and 3,” September 4, 2009 (ML092540360)
9. Letter from M. W. Hodges, NRR, to W. Rasin, Vice President and Director, Nuclear Management and Resources Council, “Staff Safety Assessment of Report WCAP-13587, Revision 1, “Reactor Vessel Upper Shelf Energy Bounding Evaluation for Westinghouse Pressurized Water Reactors,” September 1993,” April 21, 1994 (ML090580069)

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 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 23, 2009

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