

NPP License Renewal and Aging Management: An International Perspective

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There are 103 licensed, operating commercial nuclear power plant (NPP) reactors in the United States today. At present there are over 400 operational NPPs in the International Atomic Energy (IAEA) Member States. Many of these operating NPPs are approaching the end of their original design life; license renewal and the possibility of long-term operation (LTO) are topics of increasing interest. The extensively documented license renewal program within the United States is currently going through an evolution towards attributable information available through both hardcopy reference documents and relational databases. This process could be improved by broader technical knowledge gained from international operating experience and, reciprocally, may provide valuable insight for beneficial multilateral efforts. Other countries are conducting similar NPP inspections, audits, and monitoring, without observing unanticipated LTO-related degradation. This knowledge of international experience provides added assurance of the effectiveness of the aging management programs (AMPs) that have been implemented.

Based on the Atomic Energy Act of 1954, the U.S. Nuclear Regulatory Commission (NRC) issues licenses for commercial power reactors to operate for up to 40 years and allows these licenses to be renewed. The NRC has developed a license renewal process that establishes the technical and administrative guidelines for renewal of operating power plant licenses and that can be completed in a reasonable period of time with clear recommendations to assure safe power operation of nuclear plants for an additional 20 years. The applicant must demonstrate that programs are in place to manage those aging effects applicable to the passive, long-lived plant structures and components. The safety review also verifies that design and analysis conclusions based on the current operating term have been evaluated and are valid for the 20-year extended period of operation. As of June 2005, the NRC has renewed the operating licenses for 18 nuclear plant sites (33 reactor units).

The NRC has developed a number of internationally available license renewal guidance documents to describe the interrelated aspects of preparing and reviewing license renewal applications. As an example, the Generic Aging Lessons Learned (GALL) Report catalogs plant structures and components; lists the materials, environments, aging effects and mechanisms; and documents how existing commonly used plant programs can be used or enhanced to mitigate or manage these aging effects. The NRC is incorporating lessons learned from reviews and audits conducted by the staff to update the guidance documents to support and improve the process. These documents, originally published in 2001 have been revised to incorporate lessons learned from the reviews and audits of recently submitted license renewal applications.

The NRC is also using this license renewal experience to focus on significant age related issues. For example, the NRC has assembled both foreign and domestic information concerning nickel alloy penetration nozzle cracking and boric acid corrosion. International operating experience has demonstrated that nickel alloys at dissimilar metal weld connections in the reactor coolant system of pressurized water reactor (PWR) plants may be susceptible to Primary Water Stress Corrosion Cracking (PWSCC). The NRC has several ongoing activities that address inspection of nickel alloy components susceptible to PWSCC. Aging management programs in the updated GALL Report have been improved and expanded to provide improved assurance for safe long term operation.