

Integrated Regulatory Review Service Mission to the United States

ELECTIVE POLICY ISSUE # 2: LONG-TERM OPERATION AND AGING MANAGEMENT OF NUCLEAR FACILITIES

Overview

The Atomic Energy Act and U.S. Nuclear Regulatory Commission (NRC) regulations limit commercial power reactors to initial licenses that cover 40 years but permit the renewal of these licenses. The decision to seek license renewal rests with nuclear power plant (NPP) owners. The plant owners must demonstrate to the NRC that the facilities can be safely operated for additional time (up to another 20 years) beyond the original license period of 40 years. To assess the safety of the NPPs during the extended period of operation, the NRC has established a license renewal process to focus the agency's review on the ability of the plant to operate safely beyond the initial license period; on the effectiveness and completeness of the plant's aging management program; and on the impact on the environment of the continued operation of the plant. To date, 59 of the 104 U.S. NPPs have received renewed licenses. Applications for an additional 20 units are under review. The NRC expects to receive two additional applications for three units in 2010, bringing the number of units under review to 23. Based on statements from industry representatives, the Commission expects nearly all sites to apply for license renewal. In 2009, four plants¹ completed their initial licensed life of 40 years and entered the period of extended operation. Three additional plants² will enter the period of extended operation in 2010.

NRC Policy/Program

Background/History

In 1982, the NRC established a comprehensive Nuclear Plant Aging Research Program as a result of a widely attended workshop on NPP aging. Based on the results of that research, a technical review group concluded that many aging phenomena could be readily managed. The review group identified no technical issues that would preclude the life extension of NPPs.

In 1991, the NRC published safety requirements for license renewal as Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" [Ref 1]. The NRC then undertook a demonstration program with industry to apply the rule to pilot plants. However, during the demonstration program, the NRC found that many aging effects are dealt with adequately during the initial license stage. In addition, the rule did not allow sufficient credit for existing programs, particularly those under the NRC's maintenance rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" [Ref 2]), which also helps manage plant aging effects.

As a result, in 1995, the NRC revised the license renewal rule. The amended 10 CFR Part 54 established a regulatory process that is more efficient and effective than the previous license renewal rule. In particular, the revision clarified 10 CFR Part 54 to focus on how an applicant for

¹ The four plants are Oyster Creek, Nine Mile Point Unit 1, Ginna, and Dresden Unit 2.

² The additional plants are Robinson Unit 2 in July, Monticello in September, and Point Beach Unit 1 in October

license renewal will manage or mitigate the adverse effects of aging for certain passive long-lived systems, structures, and components (SSCs) at the facility during the period of extended operation.

The Commission also determined that the NRC would prepare an environmental impact statement for every NPP license renewal decision to fulfill its responsibilities under the National Environmental Policy Act. In parallel with the 10 CFR Part 54 rulemaking on NPP aging management safety reviews, the NRC pursued a separate rulemaking to revise 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions" [Ref 3], to mandate consideration of environmental issues as a part of the renewal of NPP licenses. In 1996, the NRC published the final rule, which revised 10 CFR Part 51 and addressed environmental impacts of license renewal. For each plant under review, the NRC prepares a site-specific supplement to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," issued May 1996 [Ref 4].

To date, the NRC has approved all applications for license renewal for which it has completed a review. The NRC has clearly defined the requirements for license renewal, and the nuclear industry has the experience of many successful renewal requests. These factors allow applicants for license renewal to have high confidence that they can meet the regulatory requirements prior to submitting a license renewal application (LRA).

Current Policy/Program

Clearly stated in 10 CFR Part 51 and 10 CFR Part 54 are the requirements that a license renewal applicant must meet to obtain a renewed license. If a plant can demonstrate in its LRA that it will meet the requirements in 10 CFR Parts 51 and 54, and that it will continue to meet the applicable regulations from other parts of Title 10 of the *Code of Federal Regulations* during the period of extended operation, as during the initial license period, then the staff will recommend to the Commission that a renewed license be issued.

The license renewal process proceeds along two tracks—one for the review of safety issues and another for environmental issues. An applicant must provide the NRC with an LRA that addresses the safety aspects of plant aging and describes ways it will manage those effects. The applicant must also prepare an environmental report on the potential impact on the environment of continued plant operation for an additional 20 years.

For the review of safety issues, the NRC has developed several documents to aid in the effective and efficient evaluation of LRAs. The agency developed NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR) [Ref 5], to ensure quality and uniformity of the staff's review and to present a well-defined technical basis from which to evaluate the applicant's programs and activities for the period of extended operation. The SRP-LR was based on information developed in NUREG-1801, Volumes 1 and 2, "Generic Aging Lessons Learned (GALL) Report" [Ref 6]. The GALL Report documents the basis for determining when existing programs are adequate and when they should be augmented for license renewal. The NRC initially issued both the SRP-LR and the GALL Report in 2001 and issued Revision 1 of both documents in 2005. The NRC plans to issue Revision 2 of these documents by December 2010.

The NRC staff performs a safety review of the aging management information provided in the application, which includes on-site audits to assess the aging management programs that the applicant claimed are consistent with the GALL Report. During the on-site audit, the staff also

reviews the relevant basis documents and plant operating experience reports. The results of the staff's review are documented in a publicly available safety evaluation report. During the review of the LRA, a site inspection is performed to verify the documentation, implementation, and effectiveness of the programs and activities associated with an applicant's license renewal program. The intent of the inspection is to ensure the consistency of the applicant's programs to manage aging within the current licensing basis and support the conclusion that there is reasonable assurance that the applicant's aging management programs provide an adequate basis for renewing the license for an additional 20 years. The results of the staff's inspection are documented in a publicly available inspection report. The Advisory Committee on Reactor Safeguards (ACRS) conducts an independent safety review of LRAs and NRC staff evaluations and forwards its recommendation to the Commission. Subsequent to the issuance of a renewed license, another inspection is performed in three phases to verify that the license conditions and license renewal commitments are being implemented. The first phase is conducted to verify that the applicant has implemented the programs committed to in the LRA. The second phase is performed prior to entering the period of extended operation to ensure readiness for this period. The third phase is performed after the applicant has entered the period of extended operation and allows for necessary follow-up on issues from the first two phases. Inspection reports document the results of the inspections. To date, the NRC has completed the first two phases for four units and is in various phases of the inspection for other units with renewed licenses.

Additionally, the NRC reviews the applicant's environmental report, which includes an audit of the site and surrounding environment, to determine the environmental effects of operating the nuclear power facility for an additional 20 years. The staff documents the results of its review in a site-specific supplemental environmental impact statement.

Public participation is an important part of the NRC license renewal process. All information related to the review and approval of a renewed application is publicly available. Members of the public have an opportunity to request an Atomic Safety and Licensing Board hearing through which significant safety and environmental concerns may be litigated. In addition, members of the public have the opportunity to provide input on the scope of the environmental review and to comment on related draft documents.

Given all the information from the safety and environmental review, the Commission determines whether there is reasonable assurance that the plant can be operated safely during the period of extended operation without undue risk to the health and safety of the public and to the environment.

Strengths of Current Policy/Program

The NRC's license renewal program is a successful program that affords the utilities a stable process to seek license renewal for their NPPs at their discretion. This comprehensive program encompasses safety and environmental reviews and inspections by NRC staff, an independent evaluation by the ACRS, and an opportunity for an adjudicatory hearing for parties affected by the renewal. The license renewal program is complemented by NRC's robust and mature processes that enhance regulatory requirements on an on-going basis as identified through operating experience reviews and the Reactor Oversight Process. The license renewal program is an open and transparent process that ensures members of the public are informed throughout the process. The NRC has periodically updated information in its guidance documents as new lessons are learned from reviews and new operating experience becomes available.

Considerations for the Future

Subsequent License Renewal Beyond 60 Years

To assess the viability of subsequent license renewal activities, the NRC and the U.S. Department of Energy (DOE) jointly sponsored Life Beyond 60: NRC/DOE Workshop on U.S. Nuclear Power Plant Life Extension Research and Development on February 19–21, 2008. Representatives from U.S. Government agencies, the nuclear industry, the National Laboratories, academia, international organizations, and the public attended the workshop. The topics discussed included aging of SSCs, material degradation, diagnostics and prognostic technologies, and the future technical and research requirements of the nuclear industry to continue long-term operation.

It is the responsibility of the applicants and the industry to demonstrate through research and engineering activities that an applicant for a subsequent license renewal can safely manage the effects of aging on SSCs that are within the scope of license renewal. However, the NRC must be prepared to review applications for subsequent renewals. Therefore, to prepare for the evaluation of the feasibility of subsequent LRAs, the NRC has initiated research activities that will review operating experience and industry research to address aging management technical issues, expand materials degradation assessment to verify current assumptions, assess results from the implementation of the current license renewal aging management programs, and develop domestic and international partnerships to exchange information related to aging management research.

Long-Term Operation in the International Community

Internationally, more than 400 NPPs are operating in the International Atomic Energy Agency (IAEA) Member States. The option of long-term operation for these NPPs is of great interest to the international community. Drawing from its domestic license renewal experience, the NRC has actively participated in the IAEA guidance development efforts for the long-term operation of NPPs [Ref 7]. The NRC will continue to participate in international activities, such as the development of the “International Generic Aging Lessons Learned (IGALL) Report.”