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Reactor License Renewal

Introduction

The Atomic Energy Act authorizes the Nuclear Regulatory Commission to issue licenses for commercial power reactors to operate for up to 40 years. These licenses can be renewed for an additional 20 years at a time. The period after the initial licensing term is known as the period of extended operation. Economic and antitrust considerations, not limitations of nuclear technology, determined the original 40-year term for reactor licenses. However, because of this selected time period, some systems, structures, and components may have been engineered on the basis of an expected 40-year service life.

The decision to seek license renewal rests entirely with nuclear power plant owners. This choice is typically based on the plant's economic situation and whether it can meet NRC requirements. Each power reactor is licensed based on a specific set of requirements, depending primarily on its design. This set of requirements is called the plant's "licensing basis." The license renewal review process provides continued assurance that the current licensing basis will maintain an acceptable level of safety for the period of extended operation.

As of January 2022, the NRC has renewed the operating licenses of 94 commercial nuclear reactors. Fifty-eight entered their extended period of operation; eight of those have since ceased operations. An additional reactor with a renewed license shut down before reaching 40 years of operation.

The NRC and the industry are currently focusing on "subsequent license renewals," which authorizes plants to operate beyond the 60 years of the initial license and the first renewal. Subsequent license renewals are also for 20 years. The NRC has developed guidance for staff and licensees specifically for the subsequent renewal period. The first subsequent license renewal application, for the Turkey Point Units 3 and 4 reactors, was submitted to the NRC in January 2018. The NRC issued the Turkey Point renewal in December 2019. As of January 2022, the NRC has issued subsequent renewed licenses for six reactors, and applications are under review for an additional nine reactors.

Background

In 1982, the NRC established a comprehensive program for nuclear plant aging research. These research results concluded that most nuclear plant aging issues are manageable and do not pose technical issues that would prevent them for operating additional years beyond their original 40-year license period.

In 1991, the NRC published safety requirements for license renewal as 10 CFR Part 54. The NRC applied the new rule on several pilot plants to acquire experience and to establish implementation guidance. The rule's scope included all age-related degradation unique to license renewal. However,

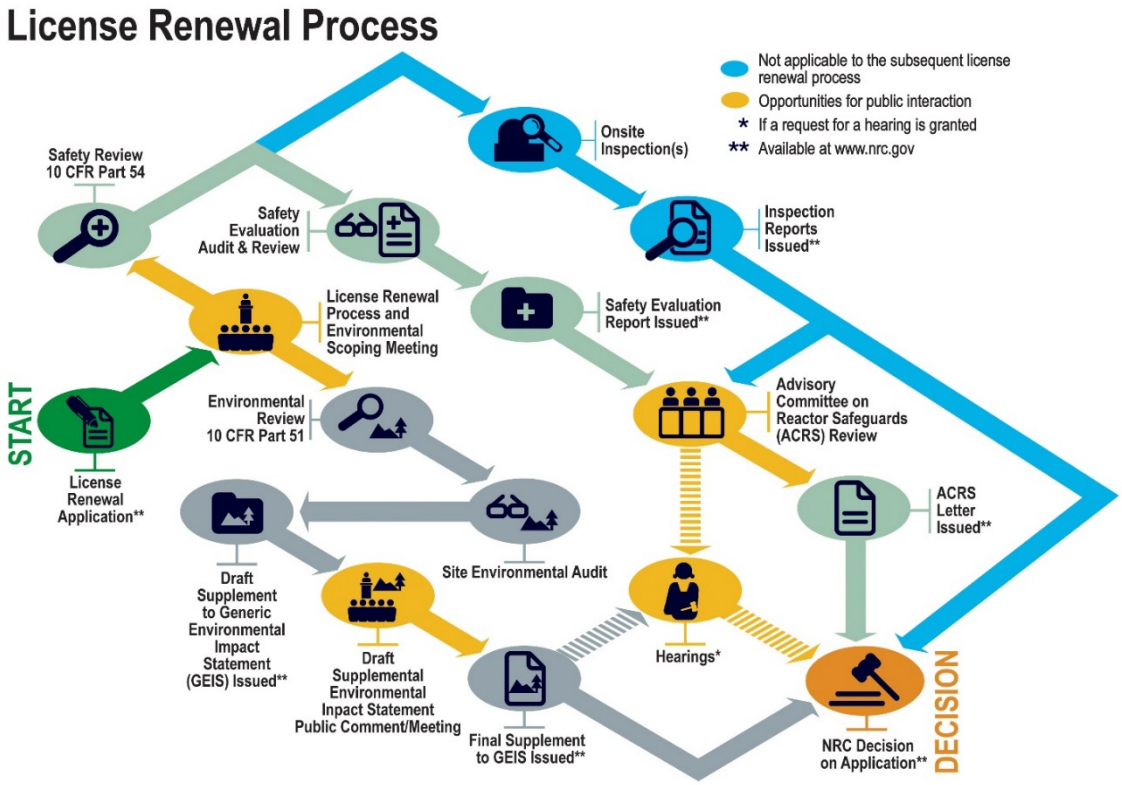
during the pilot program, the NRC found that many aging effects are dealt with adequately during the initial 40-year license period. The rule did not give enough credit for existing programs to manage plant-aging issues, particularly those under NRC's maintenance rule.

The NRC used this information to amend the license renewal rule in 1995. The amended Part 54 process is more efficient, stable and predictable than the previous license renewal rule. In particular, the amended Part 54 focuses on managing the adverse effects of aging. The changes meant to ensure that important systems, structures and components would continue to perform their intended function during the 20-year period of extended operation.

In parallel with aging management efforts, the NRC pursued a separate rulemaking, 10 CFR Part 51, to focus the scope of its environmental reviews. Under the National Environmental Policy Act, the NRC must review the environmental impact of license renewal.

License Renewal Process

The license renewal process proceeds along two tracks – one for review of safety issues (Part 54) and another for environmental issues (Part 51). An applicant must address the technical aspects of plant aging and describe how those effects will be managed. It must also evaluate potential environmental impacts of the plant operating another 20 years. The NRC reviews the application and verifies its evaluation through inspections. The NRC will renew a license only if it determines that a currently operating plant will continue to maintain the required level of safety.



Safety Reviews

Over a plant's life, safety is ensured through maintenance of the plant and its unique licensing basis. A plant's licensing basis is a specific set of evolving requirements and commitments. Over time, as technology advances and operating experience provides new information, a plant's licensing basis may change – for example, when the NRC issues new requirements and the plant makes modifications.

License renewal requirements for power reactors are based on two key principles:

1. With the possible exception of the effects of aging on certain systems, structures, and components, and a few other issues related to safety only during the period of extended operation, the current regulatory process is adequate to ensure the licensing bases of all operating plants provide and maintain an acceptable level of safety; and
2. Each plant's licensing basis is required to be maintained during the renewal term just as during the original licensing term.

Applicants identify all plant systems, structures and components whose failure could affect safety. These plant systems, structures and components must comply with the NRC's regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scrams and station blackout.

Some passive structures and components within the scope of the renewal evaluation do not require additional action. For these, the applicant must demonstrate that the existing programs provide adequate aging management throughout the period of extended operation. However, if additional aging management activities are needed for a structure or component, applicants have the flexibility to determine appropriate actions. These activities could include, for example, adding new monitoring programs or increasing inspections.

License renewal applicants must also identify and update "time-limited" aging analyses. During the design phase for a plant, certain assumptions about the length of time the plant will be operated are incorporated into design calculations. Under a renewed license, these calculations must be shown to remain valid for the period of extended operation, or the affected systems, structures and components must be included in an appropriate aging management program.

The NRC developed guidance for implementation of the license renewal rule with input from interested stakeholders. The main guidance documents are the Generic Aging Lessons Learned (GALL) report (NUREG-1801) and the Standard Review Plan for License Renewal (NUREG-1800). The GALL report explains how to determine whether existing programs should be augmented for license renewal. The GALL report and the standard review plan help the NRC staff identify programs that warrant particular attention during the staff's review of a license renewal application.

The NRC also issued Regulatory Guide 1.188, which provides the format and content of the safety aspects of a license renewal application. It endorses Nuclear Energy Institute guidelines as an acceptable method of implementing the license renewal rule. The NRC will continue to include changes to the guide and the standard review plan as generic renewal issues are resolved. The agency also incorporated other changes resulting from lessons learned during the review of renewal applications.

In 2017, the NRC published new guidance on subsequent license renewal applications. These are similar to the original GALL and SRP for license renewal, but focus on aging management requirements for the 60-to-80 year period. These documents are discussed in the Backgrounder on Subsequent License Renewal.

Inspections

The NRC's inspection program for license renewal verifies the information in the application and NRC's evaluation. The inspections sample the results used by the licensee to identify those structures and components within the scope of license renewal, aging management programs, and design analysis changes.

NRC staff perform an additional inspection after the license is renewed, typically prior to entering the period of extended operation. This inspection verifies that the license conditions, license renewal commitments and aging management programs are implemented. Inspection results are documented in a publicly available report.

Environmental Reviews

Environmental protection regulations were revised in 1996 to facilitate the environmental review for license renewal. Certain issues are evaluated generically for all plants, rather than separately in each plant's renewal application. The generic evaluation, NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," assesses the scope and impact of environmental effects associated with license renewal at any nuclear plant site, such as endangered species, impacts of cooling water systems on fish and shellfish, and groundwater quality. A plant-specific supplement to the generic environmental impact statement is required for each application for license renewal.

The NRC performs the plant-specific reviews in accordance with the National Environmental Policy Act and the requirements of 10 CFR Part 51. The NRC meets with the public near the plant shortly after receipt of the application to identify environmental issues specific to the plant for the license renewal action. The result is an NRC recommendation on whether the environmental impacts are so great that they disqualify license renewal.

The NRC presents that recommendation in a draft plant-specific supplement to the GEIS that is published for public comment and discussed, as necessary, at a separate public meeting. After consideration of comments on the draft, NRC prepares and publishes a final plant-specific supplement to the GEIS.

The NRC issued a standard review plan (NUREG-1555, Supplement No. 1) with guidance on how the agency conducts environmental reviews of renewal applications. Regulatory Guide 4.2, Supplement 1, identifies the format and content of the environmental reports that must accompany license renewal applications.

Public Involvement

Public participation is an important part of the license renewal process. Shortly after the NRC receives a renewal application, a public meeting is held near the plant. This meeting provides local stakeholders information about the license renewal process and opportunities for public involvement. This meeting is also used to solicit input on the scope of NRC's environmental review. Additional public meetings are held by the NRC during the review of the renewal application. NRC evaluations, findings and recommendations are published and posted on the NRC's website when completed.

All public meetings are posted on NRC's Public Meetings and Involvement page. Key meetings are announced in press releases and in the Federal Register. In addition, anyone who may be adversely affected by the license renewal may request an adjudicatory hearing before an NRC Atomic Safety and Licensing Board. Finally, members of the public may petition the Commission for consideration of issues other than aging during the license renewal process.

Schedule

A nuclear power plant licensee may apply to the NRC to renew its license as early as 20 years before expiration of its current license. There is no limit on how late a licensee may apply for license renewal. However, if the licensee submits a renewal application at least five years before expiration of its current license and the agency is still reviewing the application at the expiration date, the plant can continue to operate until the NRC completes its review. If a sufficient application is not submitted at least five years before the current license expires the plant may have to stop operating if the license expires before a renewal decision is made.

The NRC staff conducted early reviews on a 22-month schedule from receipt of an application to a decision on license renewal (longer if there was an adjudicatory hearing). After studying lessons learned and identifying ways to make reviews more efficient, the staff aims to complete remaining license renewal reviews (and reviews for subsequent license renewals) within 18 months, if there is no hearing.

License renewal schedules depend on a number of factors, including available staff resources and the number of current and projected applications. In addition, the quality of the application, the complexity of the review, applicant timeliness in responding to requests for additional information, and the coordination of the timing for on-site audits and inspections may all affect the review timeline.

Status of License Renewal Applications

The status of license renewal applications, pending planned applications as well as additional information on license renewal is available on the Reactor License Renewal page. Similar information on subsequent license renewal applications is also available.

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