General Electric Systems Technology Manual

Chapter 4.16

Reactor License Renewal

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4.16 REACTOR LICENSE RENEWAL

Learning Objectives:

1. Recognize the major steps in the process to renew an operating license, including:

    a. conducting Time-Limiting Aging Analysis (TLAA),
    b. developing and implementing Aging Management Programs (AMPs), and
    c. documenting the analysis and commitments regarding license renewal in the current licensing basis for the plant.

2. Identify how the NRC reviews the application for license renewal and inspects the utilities' activities regarding license renewal, including inspections conducted following approval of the renewed license.

3. Recognize the major categories of structures and components that must be evaluated for aging effects when applying for license renewal.

4.16.1 Introduction

All commercial nuclear power reactors operating in the United States must be licensed and monitored by the NRC. The original license issued by the NRC is limited to 40 years. If a reactor operator seeks to extend its original license, it must submit an application to the NRC for an independent evaluation of the safety and environmental issues related to license renewal.

The license renewal review provides an independent examination, asking the following questions:

- Does the reactor operator understand the effects of aging on critical safety components?
- Has the operator taken appropriate actions to assure safe operation?

4.16.2 Background

- In 1982, the NRC established a program for Nuclear Plant Aging Research (NPAR). The program concluded that many aging phenomena are manageable and should not preclude license renewal for nuclear power reactors.

- The NRC issued a license renewal (LR) rule in 1995, focusing on managing the adverse affects of aging. The safety requirements for license renewal were codified in Title 10 of the Code of Federal Regulations, 10 CFR Part 54.

- The NRC later developed guidance documents for the implementation of the reactor license renewal rule, including the Generic Aging Lessons Learned (GALL) report (NUREG-1801), the Standard Review Plan for license renewal (NUREG-1800) and Regulatory Guide (RG 1.188). These guidance documents recommend safety standards for aging management programs (AMPs) and an acceptable format for the renewal application.

- The NRC issued an amended rule in 1996 regarding the environmental protection requirements for license renewal, 10 CFR Part 51. In 2000, the NRC issued supplements to the Regulatory Guide (RG 4.2) and the Standard Review Plan (NUREG-1555) providing further guidance to the NRC staff and the public reviewing environmental portions of the renewal applications.

- As the NRC gains experience from current and future reviews it also expects to update this guidance to further improve the process.

4.16.3 The Principles of License Renewal

License renewal in the United States relies on two key principles.

The first principle is that our regulatory process is adequate to ensure the safety of the operating plants.

To support the development of the LR rule, NRC performed an analysis of the current regulatory process (documented in NUREG-1412) to determine what level of review was needed to renew a license. The conclusion the NRC reached was that, with the exception of aging (unique to license renewal), the current mix of regulatory requirements provided reasonable assurance that the continued operation of the plants would not adversely affect public health and safety to the end of the renewal period. Therefore, NRC concluded that it was unnecessary to re-review an operating plant's licensing basis, except for age-related degradation (unique to license renewal) at the time of license renewal.

This forms the basis for the second principle which is that the current licensing basis (CLB) is adequate and carries forward into the period of extended operation. This means that the CLB must be maintained throughout the renewal period, in part through a program of age-degradation management for systems, structures, and components that are important for license renewal.

It is important to note that the NRC relies on the current regulatory process to handle any new plant issues that impact the current operation of plants and they carry forward.

Note: CLB is the set of NRC requirements applicable to the plant and the licensee's written commitments, including all modifications and additions to the commitments over the life of the current license. Thus, documentation of the analysis and commitments regarding license renewal in the current licensing basis for the plant.

License renewal

- Is voluntary
- Is not a re-review
- Plants are not required to meet latest standards
- There is no reduction in requirements

4.16.4 Reactor License Renewal Process

If a reactor operator seeks to extend its original license, it must submit an application to the NRC that:

- Identifies any reactor system, structure and component that would be affected by license renewal.

- Demonstrates that it can safely manage the adverse effects of aging during the renewal period.

- Analyzes the environmental effects of extended reactor operation.

The flow chart in Figure 4.16-1 illustrates the parallel processes of the safety and environmental reviews and the interrelationships with the inspection, Advisory Committee on Reactor Safeguards (ACRS), and hearing process.

The renewal process is conducted in two parallel paths:

1. The environmental review, when much of the public opportunity for comment occurs;

2. The safety review, which includes the opportunity for public comment when the ACRS holds its meetings to review the staff's safety evaluation report. There are also inspection activities, which consist of two team inspections to sample the scoping process and aging management programs, and a third optional inspection to cover any other areas the Regional Administrator considers appropriate before making a recommendation to the Commission.

In addition, when the application is submitted, there is an opportunity for individuals or groups to petition for a hearing to address specific issues related to either plant safety or environmental impacts. If granted, a hearing is held and the Licensing Board's

decision is presented to the Commission, along with the inspection results, the safety evaluation, and the environmental impact statement.

4.16.4.1 Safety Review

The NRC Office of Nuclear Reactor Regulation reviews the operator's renewal application and supporting documentation. The review results in a safety evaluation report that is made available for public review. Teams of specialized inspectors travel to the reactor site to verify that the aging management plan has been, or is ready to be, implemented.

The NRC license renewal inspection program verifies the information in the renewal application and important findings in the safety evaluation report. The operator must show that the effects of aging will not adversely affect any reactor structures and components during the renewal period. These structures and components include components such as the reactor vessel, containment structure, and steam generators.

For some reactor structures and components, additional action may not be needed when an operator can demonstrate that it already has programs that will assure safe operation of the plant throughout the period of extended operation.

If additional aging management activities are needed, the applicant may be required to establish new monitoring programs, increase inspections, or revise design criteria.

When the plant was designed, certain assumptions were made about the length of time the plant would be operated. During the renewal process, the operator must also confirm whether these design assumptions will continue to be valid throughout the period of extended operation or that aging effects will be adequately managed.

The application must also include an Integrated Plant Assessment as follows:

- Integrated Plant Assessment [10 CFR 54.21(a)(1)]
    - Identify and list structures and components subject to an aging management review (AMR):
        - Perform intended function without moving parts or without a change in configuration or properties (passive)
        - Not subject to replacement based on a qualified life or specified time period (long-lived)
    - Intended Functions:
        - Functions that a system, structure, or component must be shown to fulfill that form the basis for including the system, structure, or component within the scope of the rule

"Passive" Structures and Components

An applicant must review all systems, structures and components within the scope of the rule to identify "passive" and "long-lived" structures and components. It must be demonstrated that the effects of aging will be managed in such a way that the intended functions of those structures and components will be maintained for the period of extended operation. Passive and long-lived structures and components include components such as the reactor vessel, reactor coolant system piping, steam generators, pressurizer, pump casings, and valve bodies.

"Active" Structures and Components

The detrimental aging effects in "active" components are more readily detected and corrected by routine surveillance, performance indicators and maintenance. Surveillance and maintenance programs for active components are required throughout the period of extended operation. Active components include equipment such as motors, diesel generators, cooling fans, batteries, relays, and switches.

The Integrated Plant Assessment is used to:

- Describe/Justify:
  - Methods to identify structures and components subject to an aging management review (AMR) from those systems, structures, and components within scope [10 CFR 54.21(a)(1)]
- Demonstrate:
  - Effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the period of extended operation [10 CFR 54.21(a)(3)]

In addition, a Time Limiting Age Analysis (TLAA) must be included. During the design phase for a plant, certain assumptions about the length of time the plant will be operated are made and incorporated into design calculations for several of the plant's systems, structures, and components. Under a renewed license, these calculations must be shown to be valid for the period of extended operation. Alternatively, an applicant can show how the aging effects associated with these calculations will be adequately managed for the period or extended operation.

4.16.4.2 Environmental Review

The NRC also has responsibilities under the National Environmental Policy Act (NEPA), which calls for a review of the environmental impact of reactor license renewal. Alongside its review of aging mechanisms, the NRC must investigate the environmental issues related to the extension of the reactor's operating license.

Certain issues were evaluated generically for all plants. The generic evaluation, NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), assessed the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site.

A site-specific supplement to the GEIS is required for reactor license renewal. A public "scoping" meeting is held near the plant to get input from the public and local officials on any additional environmental issues and information they believe should be included in the NRC's assessment of the environmental impact. The NRC then determines whether the environmental impacts should preclude renewal.

The NRC recommendation is published for public comment as a draft environmental impact statement and discussed at a second public meeting. After consideration of comments on the draft, the NRC prepares and publishes a final plant-specific supplement to the GEIS.

4.16.5 Inspections

The intent of the inspections are to support a finding as to the reasonable assurance of the acceptability of an applicant’s license renewal program and activities to manage the effects of aging consistent with the CLB during the period of extended operation.

Scoping Inspection

- Verify that the applicant for license renewal has:
  - properly included the systems, structures, and components within the scope of license renewal; and
  - properly designated those portions of the structures and components in scope that are subject to aging management review
- Verify scoping of nonsafety-related structures and components whose failure could affect safety-related structures and components from performing their intended functions

Aging Management Program (AMP) Inspection

- Verify aging management programs will reasonably manage aging affects:
  - Existing Program
  - Existing Program Modified
  - New Program
- Review supporting documentation for validity
- Verify the Applicant implemented their methodology for AMPs
- Verify the Applicant evaluated site specific and industry information for applicability

- Surveillance Tests
- Maintenance Records
- History Files
- Inservice Test and Inspection Results
- Work Orders, Corrective Actions

Aging Management Program Elements

There are generally 10 elements for acceptable aging management programs. The programs in a license renewal application are evaluated against these 10 elements:

1. Scope of program
2. Preventive actions
3. Parameters monitored or inspected
4. Detection of aging effects
5. Monitoring and trending
6. Acceptance criteria
7. Corrective actions
8. Confirmation process
9. Administrative controls
10. Operating experience

Inspection Guidance Documents

- Statements of Consideration
- 10CFR54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants
- Manual Chapter 2516, Policy and Guidance for the License Renewal Programs
- Inspection Procedure 71002, License Renewal Inspection
- Inspection Procedure 71003, Post-Approval Site Inspection for License Renewal

General Inspection Requirements

License renewal inspections verify:

- The applicant implements the scoping and screening methodology in conformance with descriptions contained in the license renewal application and staff's safety evaluation report (SER)
- The applicant correctly and completely identifies the systems, structures, and components (SSCs) satisfying the conditions of 10 CFR 54.4(a)
- The passive, long lived structures and components (SCs) are subject to an aging management review (AMR), and have aging management programs (AMPs) that are in conformance with descriptions contained in the license renewal application and SER

- The engineering analysis documentation used to support the application exists, is credible and auditable
- Inspections are performed prior to the approval of a renewed license
- Inspections should be performed by NRC regional offices including visits to the applicants' site
- Inspections will cover:
    - Scoping and Screening
        - Verifies that the SSCs required by the rule have been included in the scope
        - That there is reasonable assurance the applicant identified all the passive and long-lived SSCs requiring an aging management review
    - Aging Management
        - Determine which aging management programs are credited to prevent applicable aging effects
        - Review selected aging management programs
        - Verify use of site-specific and industry information in determining aging effects
        - Perform walkdowns of selected in-scope SSCs
    - The annual LRA update process
    - Any open items resulting from inspections or staff review of the LRA

Verification of Implementation

- Implemented through Inspection Procedure 71003 prior to or shortly after the beginning of the period of extended operation
    - Objectives:
        - To verify that license renewal programs and activities have been implemented in accordance with the requirements of 10 CFR 54
        - To verify, on a sample basis, that outstanding commitments identified at the time a renewal license was granted have been met.
        - To verify, on a sample basis, whether the licensee has made any amendment to the original license renewal application (LRA) describing any changes that materially affect the contents of the original LRA
        - To verify, as appropriate, that the summary description of the aging management programs and activities are contained in the FSAR supplement
        - To verify, as appropriate, that the description of the programs are consistent with the programs implemented by the licensee

4.16.6 License Renewal Duration

The current operating license allows a nuclear power plant to operate for 40 years. The licenses are renewable. 10 CFR Part 54 allows a new license to be issued to operate for up to 20 years beyond the current term.

U.S. nuclear power plants are licensed to operate for 40 years as specified by Congress in the Atomic Energy Act of 1954. The law was modeled on the Communications Act of 1934 in which radio stations were licensed to operate for several years and then allowed to renew their licenses as long as they continued to meet their charters. The Atomic Energy Act likewise allowed for nuclear power plants to renew their licenses. Congress selected 40 years for nuclear power plant licenses because that was the time over which electric power plants typically were paid off in customer rates. The 40-year license term was not based on safety, technical, or environmental factors.

The plants can reapply after 20 years of operation. Superseding licenses are issued for the remaining term plus up to a 20 year extension. Renewal is voluntary. The decision is primarily economical and whether the licensee can continue to meet NRC requirements. There is no limit on the number of renewals.

Note: The license renewal rule was founded on the Nuclear Plant Aging Research program. That program concluded that there are no technical limits to plant life. So as long as there are effective inspection and maintenance practices, the plant life is simply limited by economics; that is, the cost of repair or replacement of any components that do not meet specified acceptance criteria.

4.16.7 License Renewal Regulations

The license renewal review process proceeds along two parallel paths: One is a safety review, which evaluates whether the plant can continue to operate safely during the period of extended operation. The other is an environmental review, which evaluates the interaction between the plant and the surrounding environment.

- Safety Review (10 CFR Part 54)
  - Safety Evaluation
  - Advisory Committee on Reactor Safeguards review
  - Inspection Verification

- Environmental Review (10 CFR Part 51)
  - National Environmental Policy Act (NEPA)

4.16.8 Opportunities for Public Participation

There are ways that the public can be heard:

- Public outreach information meeting
- Hearing Opportunities and License Applications
- Public meetings on environmental scoping
- Opportunity to provide environmental scoping comments
- Public meetings on the draft environmental impact statement
- Opportunity to provide comments on the draft environmental impact statement
- ACRS meetings
- Public meetings on safety review, including inspection and audit exit meetings

4.16.9 License Renewal Schedule

The license renewal process schedule goal is:

- 22 month schedule (if there is no hearing), or
- 30 month schedule with hearing

NRC monitors efforts to identify process improvements.

License renewal in the United States has been successful because of good project planning. The important features of that planning are an aggressive schedule to complete the process, including the conduct of any hearing, a focus on effective communications, and vigilant efforts to achieve public confidence in the process.

For planning purposes, NRC estimates that the review of a license renewal application will take 22 months. If a hearing is granted, the review is estimated to take 30 months. As a result, it is very important for the NRC to get as much advance warning as possible from applicants so it can plan on having enough resources to complete their review according to the schedule.
Of particular note, to improve the effectiveness and efficiency of our process, NRC has improved the way it conducts reviews with on-site audits. The purpose of the improved process is to help the NRC review multiple applications at the same time within the established schedule.

4.16.10 Roles and Responsibilities

License Renewal Project Manager (Safety)

- Coordinates activities associated with license renewal safety reviews, audits, and site inspections.

- Coordinates communications among the technical branches, regions contractor, and the applicant.
- Coordinates with environmental section, ensuring public scoping meeting held.
- Prepares work requests for safety evaluation inputs from the technical staff.
- Assembles the Safety Evaluation Report (SER) including the staff evaluations from the technical branches' input, and coordinates resolution of issues relating to the safety review.
- Ensures that regulatory bases for granting a renewed license are clearly articulated in the SER.
- Coordinates the participation of NRC staff when presenting the safety review to the Advisory Committee on Reactor Safeguards (ACRS).
- Prepares the renewed license, if approved.

License Renewal Project Manager (Environmental)

- Coordinates activities associated with license renewal environmental reviews.
- Coordinates communications among the NRC technical branches, regions, and contractors; Federal, State, local and Tribal officials; and the applicant.
- Prepares work requests for environmental impact statements inputs from the staff (severe accident mitigation alternatives are reviewed by the Probabilistic Safety Assessment Branch with contract assistance).
- Conducts scouting trip to applicant site environs to make logistical arrangements for site audit and public meetings.
- Directs and monitors contractor efforts and costs.
- Leads NRC/contractor team in conduct of environmental site audit.
- Coordinates and makes NRC presentation at environmental scoping and draft environmental impact statement public meetings.
- Prepares and issues the Supplemental Environmental Impact Statement with assistance from contractor team and other members of Environmental section.

License Renewal Project Team

- On-site audit of portions of the License Renewal Application.
- Prepare audit report.
- Provide SER input based on audits.

Technical Branches

- Perform safety reviews, prepare Requests for Additional Information (RAIs) as needed, and prepare input for SERs consistent with license renewal guidance documents and negotiated work plans.
- Perform scoping and screening audits.
- Review the UFSAR supplement and technical specification changes.

- Ensure that the technical bases for staff conclusions are clearly articulated in the SERs.

Regions

- Prepare plant-specific inspection plans for each LRA.
- Perform inspections of licensee renewal programs and activities consistent with inspection guidance documents.
- Provide Regional Administrator recommendation letter.

4.16.11 Decision

An agency decision on the License Renewal Application will be made upon completion of the review. This includes:

a. Safety Review completion including issuance of the following documents:
    - Safety Evaluation Report
    - Regional Inspection Report
    - ACRS Recommendation Letter
    - Regional Administator's Letter
b. Environmental Review completion including issuance of the Supplement to the Generic Environmental Impact Statement, and
c. Atomic Safety and Licensing Board (ASLB) Hearing completion, if required

Issuance of a Renewed License if Approved

a. A renewed license will be of the class for which the operating license currently in effect was issued.
b. A renewed license will be issued for a fixed period of time, which is the sum of the additional amount of time beyond the expiration of the operating license (not to exceed 20 years) that is requested in a renewal application plus the remaining number of years on the operating license currently in effect. The term of any renewed license may not exceed 40 years.
c. A renewed license will become effective immediately upon its issuance, thereby superseding the operating license previously in effect. If a renewed license is subsequently set aside upon further administrative or judicial appeal, the operating license previously in effect will be reinstated unless its term has expired and the renewal application was not filed in a timely manner.
d. A renewed license may be subsequently renewed in accordance with all applicable requirements

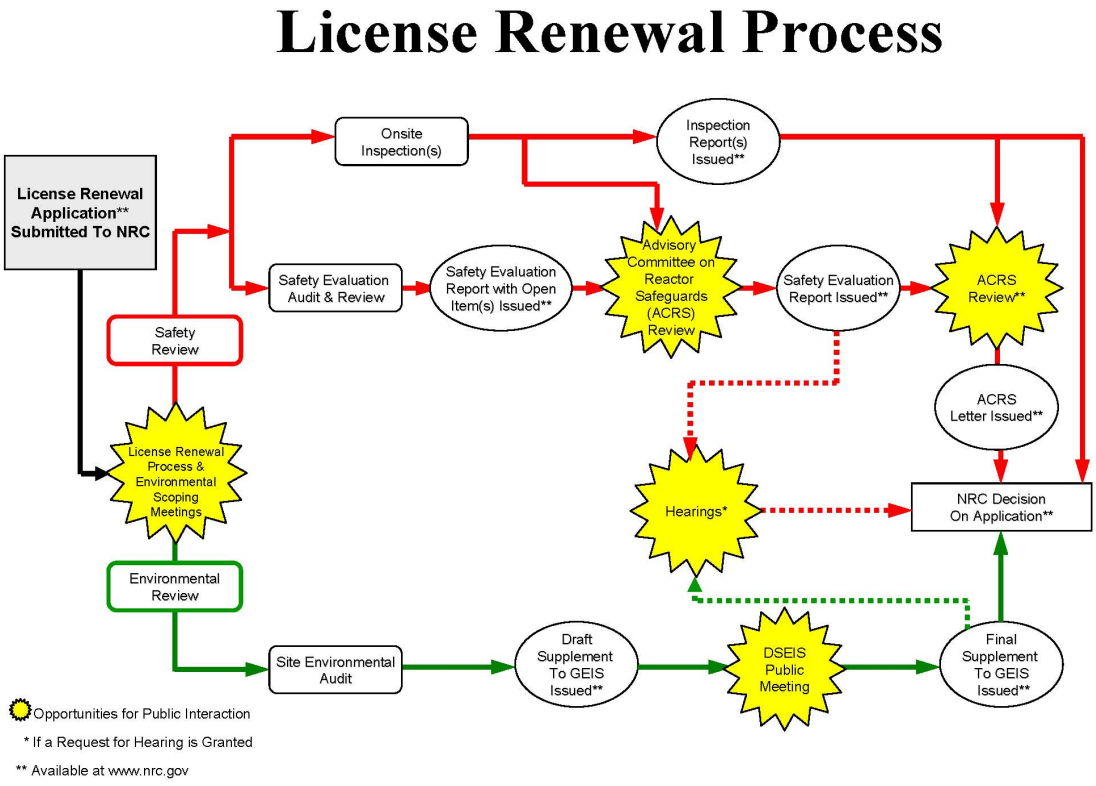

FIGURE 4.16-1

Figure 4.16-1 License Renewal Process