U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Backgrounder

Office of Public Affairs
Telephone: 301/415-8200 E-mail: opa@nrc.gov

Reactor License Renewal

Introduction

Based on the Atomic Energy Act, the Nuclear Regulatory Commission (NRC) issues licenses for commercial power reactors to operate for up to 40 years and allows these licenses to be renewed for up to another 20 years. A 40-year license term was selected on the basis of economic and antitrust considerations, not technical limitations.

The decision whether to seek license renewal rests entirely with nuclear power plant owners, and typically is based on the plant's economic situation and whether it can meet NRC requirements. There are 104 reactors in the U.S. originally licensed to operate for 40 years. To date, the NRC has approved license renewal for 48 reactors.

The NRC has established a license renewal process that can be completed in a reasonable period of time with clear requirements to assure safe plant operation for up to an additional 20 years of plant life.

Background

In 1982, based on a widely attended workshop on nuclear power plant aging, the NRC established a comprehensive program for Nuclear Plant Aging Research. Based on the results of that research, a technical review group concluded that many aging phenomena are readily manageable and do not pose technical issues that would preclude life extension for nuclear power plants.

In 1991, the NRC published safety requirements for license renewal as 10 CFR Part 54 (Title 10 of the Code of Federal Regulations, Part 54). The NRC then undertook a demonstration program to apply the rule to pilot plants and develop experience to establish implementation guidance. To establish a scope of review, the rule defined age-related degradation unique to license renewal. However, during the demonstration program, the NRC found that many aging effects are dealt with adequately during the initial license period. In addition, the NRC found that the review did not allow sufficient credit for existing programs, particularly those under NRC’s maintenance rule, which also helps manage plant aging phenomena.

As a result, in 1995, the NRC amended the license renewal rule. The amended Part 54 established a regulatory process that is more efficient, more stable and more predictable than the previous license renewal rule. In particular, Part 54 was clarified to focus on managing the adverse effects of aging. The rule changes were intended to ensure that important systems, structures and components will continue to perform their intended function during the 20-year period of extended operation.

NRC's responsibilities under the National Environmental Policy Act call for a review of the environmental impact of license renewal. In parallel with aging efforts, the NRC pursued a separate rulemaking, 10 CFR Part 51, to focus the scope of review of environmental issues.

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 provide NRC an evaluation that addresses the technical aspects of plant aging and describes the ways those effects will be managed. It must also prepare an evaluation of the potential impact on the environment if the plant operates for another 20 years. The NRC reviews the application and verifies the safety evaluations through inspections.

Public participation is an important part of the license renewal process. There are several opportunities for members of the public to question how aging will be managed during the period of extended operation. Information provided by the licensee is made available to the public in a variety of ways. Shortly after the NRC receives a renewal application, a public meeting is normally held near the nuclear power plant to provide the public information about the license renewal process and opportunities for public involvement, and 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, and NRC evaluations, findings and recommendations are published when completed.

All public meetings are posted on NRC's Web site, with key ones being announced in press releases and in the *Federal Register*. Concerns may be litigated in an adjudicatory hearing if any party that would be adversely affected requests a hearing. In addition, members of the public may petition the Commission for consideration of issues other than the management of the effects of aging during the period of extended operation of the plant.

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 that is sufficient for the NRC's review at least five years before expiration of its current license and the agency is still reviewing the application at the end of the five years, the plant can continue to operate until the NRC completes its review. If a sufficient application is not submitted at least five years before and the current license expires before the review has been completed, the plant may have to cease operations until the renewal decision is made.

License renewal is expected to take about 30 months, including the time to conduct an adjudicatory hearing, if necessary, or 22 months without a hearing. In some cases the process is completed on a plant-specific schedule agreed upon with the applicant. Upon receipt of a license renewal application, the review is conducted, in general, according to the steps in the following table:

Licensing Milestone	Months Elapsed
Receive renewal application	0
Publish notice of opportunity for hearing	1.5
Conduct public meeting on license renewal process and scope of environmental impact statement	2.5
Opportunity for hearing closes	3.5
Pose environmental questions to applicant	5.5
Pose safety questions to applicant	6.0
Issue draft environmental impact statement for comment	11.0
Conduct public meeting on draft environmental impact statement	12.0
Issue safety evaluation report, identifying open items	13.0
Issue final environmental impact statement	18.0
Issue safety evaluation report	18.0
Complete Advisory Committee on Reactor Safety Review	20.0
Make decision on application (without hearing)	22.0
Complete hearing process (if needed)	---
Make decision on application (with hearing)	30.0

Environmental Reviews

Environmental protection regulations were revised in December 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" (GEIS), assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site such as endangered species, impacts of cooling water systems on fish and shellfish, and ground water quality. A plant-specific supplement to the generic environmental impact statement is required for each application for license renewal.

The NRC performs plant-specific reviews of the environmental impacts of license renewal in accordance with the National Environmental Policy Act (NEPA) and the requirements of 10 CFR Part 51. The public meeting held near the nuclear power plant shortly after receipt of the application is to "scope out" or 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 preclude license renewal. This recommendation is presented in a draft plant-specific supplement to

the GEIS which is published for comment and discussed 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) which provides guidance on how the agency is to review the environmental portions of renewal applications. The NRC also issued Supplement 1 to Regulatory Guide 4.2, that identifies the format and content of environmental reports which must accompany license renewal applications.

Safety Reviews

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

> 1) The regulatory process is adequate to ensure that currently operating plants will continue to maintain adequate levels of safety during extended operation, with the possible exception of detrimental effects of aging on certain systems, structures and components, and a few other issues that may arise during the period of extended operation; and
>
> 2) Each plant's licensing basis is required to be maintained during the renewal term in the same manner and to the same extent as during the original licensing term.

An applicant must identify all plant systems, structures and components that are safety-related, or whose failure could affect safety-related functions, and that are relied on to demonstrate compliance with the NRC's regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout.

The applicant is then required to identify all structures and components within the scope of the rule that are "passive and long-lived." It must be demonstrated that the effects of aging will be managed in such a way that the intended functions of passive and long-lived 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.

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 original license term and will continue throughout the period of extended operation. Therefore, active components do not require additional review during the license renewal process. Active components include equipment such as motors, diesel generators, cooling fans, batteries, relays, and switches.

For some passive structures and components within the scope of the renewal evaluation, no additional action may be required where an applicant can demonstrate that the existing programs provide adequate aging management throughout the period of extended operation. However, if additional aging management activities are warranted for a structure or component within the scope of the rule, applicants will have the flexibility to determine appropriate actions. These activities could include, for example, adding new monitoring programs or increasing inspections.

License renewal applicants are also required to 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 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, 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. A Generic Aging Lessons Learned (GALL) report (NUREG-1801) was prepared and made publicly available. The report documents the basis for determining when existing programs are adequate and when existing programs should be augmented for license renewal. The GALL report is referenced in the standard review plan for license renewal (NUREG-1800) as the basis for identifying those programs that warrant particular attention during NRC'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 a guideline prepared by the Nuclear Energy Institute 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, as well as other changes resulting from lessons learned and process improvements identified during the review of renewal applications.

Inspections

The NRC has established an inspection program for license renewal that verifies the information in the application and NRC's evaluation. The inspections sample the results of the process used by the licensee to identify those structures and components within the scope of license renewal, aging management programs and design analysis changes. Inspection results are documented in a publicly available report.

Hearings

The Commission expects that hearings be conducted on an efficient and reliable schedule, while ensuring fair resolution of contested issues. In addition, there should be timely identification of any open generic policy issues for Commission decision and effective integration of the review of technical issues into the adjudicatory process.

The Commission amended its regulations concerning its rules of practice to make the NRC’s hearing process more effective and efficient (*Federal Register* Vol. 69, page 2182, January 14, 2004). Hearing procedures are tailored to the differing types of licensing and regulatory activities the NRC conducts and will better focus limited resources of involved parties and the NRC.

Industry Activities

The industry has submitted technical reports on particular license renewal topics for NRC approval. This approach, along with compilations of past aging research programs, established a foundation of

technical information that licensees can use to evaluate the feasibility of license renewal and later reference in a license renewal application.

With regard to pressurized water reactors, the Babcock & Wilcox Owners Group, representing five operating B&W plants, has formulated a generic license renewal program. The B&W Owners Group has submitted generic license renewal reports on the reactor coolant system piping, the pressurizer, the reactor pressure vessel, and reactor vessel internals. The Westinghouse Owners Group also has a program for license renewal and has submitted technical reports on the aging management activities for the reactor coolant system supports, the pressurizer, certain piping, the containment structure, and the reactor vessel internals. The Boiling Water Reactor Owners Group has concentrated its efforts on reports related to the reactor vessel internals program.

Industry representatives participated in working groups and technical committees, coordinated by the Nuclear Energy Institute, to address generic technical and process issues. The resolution of the generic renewal issues and lessons learned during the review of renewal applications are documented and included in revisions of the guidance documents for implementing the license renewal rule.

Status of License Renewal Applications

Some licensees have expressed interest in license renewal and have described their plans to submit license renewal applications. In anticipation of continued interest by licensees in submitting renewal applications in the coming years, and with increasing experience in reviewing license renewal applications, the NRC expects to make the renewal review process more efficient.

The status of pending planned applications as well as additional information on license renewal can be found at: http://www.nrc.gov/reactors/operating/licensing/renewal.html on the NRC web site.

See the table below for the current status of license renewal applications.

Status of License Renewal Applications

Applicant	**Plant Name & Units**	**Date Application Received by NRC**	**Date NRC Issued GEIS Supplement***	**Date NRC Issued SER****	**Date NRC Issued License**
Baltimore Gas & Electric Co.	Calvert Cliffs 1 & 2	April 1998	November 1999	November 1999	March 2000
Duke Energy	Oconee 1, 2, & 3	July 1998	February 2000	February 2000	May 2000
Entergy Nuclear Operations	Arkansas Nuclear One 1	February 2000	April 2001	April 2001	June 2001
Southern Nuclear Operating Co.	Edwin I. Hatch 1 & 2	March 2000	May 2001	October 2001	January 2002
Florida Power & Light Co.	Turkey Point 3 & 4	September 2000	January 2002	February 2002	June 2002
Virginia Electric & Power	Surry 1 & 2 North Anna 1 & 2	May 2001	December 2002	November 2002	March 2003
Duke Energy	McGuire 1&2 Catawba 1 & 2	June 2001	December 2002	January 2003	December 2003
Exelon	Peach Bottom 2&3	July 2001	January 2003	February 2003	May 2003
Florida Power & Light Co.	St. Lucie 1 & 2	November 2001	May 2003	July 2003	October 2003
Omaha Public Power District	Fort Calhoun	January 2002	August 2003	September 2003	November 2003
Carolina Pwr. & Light	Robinson 2	June 2002	December 2003	January 2004	April 2004
Rochester Gas & Elec. Corp.	Ginna	August 2002	January 2004	March 2004	May 2004

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SCE&G	Summer	August 2002	February 2004	January 2004	April 2004
Exelon	Dresden 2 & 3 Quad Cities 1 & 2	January 2003	June 2004	July 2004	October 2004
Southern Nuclear Operating Co.	Farley 1&2	September 2003	March 2005	March 2005	May 2005
Entergy Nuclear Operations	Arkansas Nuclear One 2	October 2003	April 2005	April 2005	June 2005
Indiana & Michigan Power Co.	D.C. Cook 1&2	November 2003	April 2005	May 2005	August 2005
Tennessee Valley Authority	Browns Ferry 1, 2 & 3 ***	January 2004	June 2005	January 2006	May 2006
Dominion Nuclear Connecticut	Millstone 2&3	January 2004	July 2005	August 2005	November 2005
Nuclear Management Co.	Point Beach 1 & 2	February 2004	August 2005	October 2005	December 2005
Constellation Energy	Nine Mile Point 1 & 2 ***	May 2004	May 2006	June 2006	October 2006
Carolina Power & Light	Brunswick 1 & 2	October 2004	April 2006	March 2006	June 2006
Nuclear Management Co.	Monticello	March 2005	September 2006	July 2006	November 2006
Nuclear Management Co.	Palisades ***	March 2005	October 2006	September 2006	January 2007

Applicant	Plant Name & Units	Date Application Received by NRC	Date NRC Issued GEIS Supplement*	Date NRC Issued SER**	Date NRC Issued License
AmerGen Energy Co.	Oyster Creek	July 2005	January 2007	March 2007	
Entergy Nuclear Operations	Pilgrim	January 2006	July 2007	June 2007	
Entergy Nuclear Operations	Vermont Yankee ***	January 2006	August 2007		
Entergy Nuclear Operations	FitzPatrick	August 2006			
PPL Susquehanna LLC	Susquehanna 1 & 2 ***	September 2006			
Wolf Creek Nuclear Operating Corp.	Wolf Creek ***	October 2006			
Carolina Power & Light (Progress Energy)	Shearon Harris ***	November 2006			
Entergy Nuclear Operations Inc.	Indian Point 2&3 ***	April 2007			
Southern Nuclear Operating Co.	Vogtle 1&2 ***	June 2007			
First Energy Nuclear Operating Co.	Beaver Valley 1&2 ***	August 2007			

* Plant-specific supplement to the Generic Environmental Impact Statement
** Safety Evaluation Report
*** Plant-specific review schedule

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