

June 3, 1999

SECY-99-148

FOR: The Commissioners

FROM: William D. Travers /s/
Executive Director for Operations

SUBJECT: CREDIT FOR EXISTING PROGRAMS FOR LICENSE RENEWAL

PURPOSE:

This paper discusses options for crediting existing programs to improve the efficiency of the license renewal process. The staff seeks guidance from the Commission on the preferred approach through endorsement of the staff recommended approach.

BACKGROUND:

By a memorandum dated March 24, 1999, the staff informed the Commission of an issue relating to how existing programs may be credited for license renewal and the industry concern about rejustifying existing programs relied upon to manage aging of plant structures and components. The license renewal rule requires a demonstration that the effects of aging will be adequately managed for the period of extended operation. The staff and the initial license renewal applicants have found that most of the aging management programs for license renewal are existing programs.

By letter dated March 3, 1999, the Nuclear Energy Institute (NEI) documented the industry's views on how existing plant programs and activities should be credited for license renewal (see Attachment 1). The staff understands the NEI's position to be that existing programs found acceptable for the current term should be deemed adequate for license renewal without further staff review, unless a significant change in the aging effect is expected during the period of extended operation. New or modified programs would require a demonstration of adequacy for license renewal. The NEI letter contains a list of typical existing programs that are based on regulatory requirements, technical specifications, licensee commitments, and programs under the jurisdiction of other federal agencies. NEI indicates that most license renewal

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applicants will credit these typical current licensing basis programs for license renewal. The staff understands that NEI believes that the current licensing basis programs are subject to the regulatory oversight process and the license renewal rule does not require the rejustification of the adequacy of these programs for the period of extended operation. NEI states:

The fundamental issue then becomes did the Commission conclude that existing programs that adequately manage aging effects during the current term to ensure compliance with the current licensing basis will continue to be adequate in the renewal term because of the ongoing regulatory oversight, or, did they conclude that existing programs may or may not be adequate and direct the Staff to formally conclude how that adequacy is demonstrated as part of the basis for granting a renewed license?

The staff believes that the NEI statement is a proper description of this issue. In implementing Part 54, the review of existing programs sets up a situation where actions needed to manage aging effects and maintain the current licensing basis for the period of extended operation might be increased beyond those considered necessary for the current term. The initial license renewal applicants' examination of aging effects for the period of extended operation resulted in additional applicants' initiatives to address aging effects for the current license term. For example, an applicant implemented a program for monitoring fatigue transients at selected piping locations. These additional actions implemented on the applicant's own initiative are not required for the current license term.

The NRC License Renewal Steering Committee meets with NEI bimonthly and has provided guidance in developing this paper to address the issue.

DISCUSSION:

The staff accepts NEI's characterization of an existing program for the purpose of this paper as a program which is based on a current regulatory requirement, a specific current licensing basis commitment, or otherwise is subject to regulatory oversight (for example, the subject of a staff safety evaluation report). The staff's understanding has been that under the license renewal rule, existing programs are not, without some explanation, automatically considered adequate to manage aging effects for license renewal by virtue of being part of the current licensing basis. By letter dated March 26, 1999, NEI submitted another example of credit for existing programs regarding the maintenance rule. The staff met with NEI on March 30, 1999, to discuss NEI's views. By letter dated May 4, 1999, to the Chairman, NEI provided additional comments on the issue and requested a Commission briefing.

The Commission formulated the following two principles of license renewal:

[W]ith the possible exception of the detrimental effects of aging on the functionality of certain plant systems, structures, and components in the period of extended operation and possibly a few other issues related to safety only during extended operation, the regulatory process is adequate to ensure that the licensing bases of all currently operating plants provides and maintains an

acceptable level of safety so that operation will not be inimical to public health and safety or common defense and security.

[T]he plant-specific licensing basis must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term. (60 FR 22464, May 8, 1995, underline added).

The first principle of license renewal reflects the Commission's conclusion that "...the only issue where the regulatory process may not adequately maintain a plant's current licensing basis concerns the detrimental effects of aging on the functionality of certain systems, structures, and components in the period of extended operation." (60 FR 22464, May 8, 1995). Thus, the Commission asserted, "...the objective [of the license renewal rule] was to supplement the regulatory process, if warranted, to provide sufficient assurance that adequate safety will be assured during the extended period of operation." Id. To achieve this objective, the license renewal rule requires an applicant to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation. The Commission concluded that "[t]he license renewal review is intended to identify any additional actions that will be needed to maintain the functionality of the systems, structures, and components in the period of extended operation." Id. In order to identify such activities, the staff and the license renewal applicants must examine those programs being relied upon to manage aging for license renewal, including the review of existing programs.

The Commission substantially reduced the scope of review of license renewal when the rule was amended in 1995. The structures and components which are now subject to an aging management review for license renewal are those which perform an intended function without moving parts or without a change in configuration or properties, and are not subject to replacement based on a qualified life or specified time period. The Statements of Consideration of the license renewal rule call such structures and components "passive, long-lived structures and components." The license renewal rule excludes "active, short-lived structures and components" from an aging management review because of the existing regulatory process, existing licensee programs and activities, and the maintenance rule. However, the Statements of Consideration for the license renewal rule state:

Unlike the extensive experience associated with the performance and condition monitoring of the active functions of structures and components, little experience has been gained from the evaluation of long-term effects of aging on the passive functions of structures and components. The Commission considers that the detrimental effects of aging affecting passive functions of structures and components are less apparent than the detrimental effects of aging affecting the active functions of structures and components. Therefore, the Commission concludes that a generic exclusion for passive structures and components is inappropriate at this time. The Commission also concludes that an aging management review of the passive functions of structures and components is warranted to provide the reasonable assurance that their intended functions are adequately maintained during the period of extended operation. (60 FR 22476, May 8, 1995).

The industry has not provided new information that supports changing this view. In fact, recent utility initiatives confirm this view. For example, a utility on its own initiative has recently developed acceptance criteria for managing corrosion effects on buried service water system piping. Thus, the staff believes the response to NEI's "fundamental issue" is that the Commission has concluded that existing programs may or may not be adequate to manage the aging effects of passive, long-lived structures and components for the period of extended operation and has directed the staff to formally conclude how that adequacy is demonstrated as part of the basis for granting a renewed license. In its March 3, 1999, letter, NEI also cited the Statements of Consideration for the rule to support the NEI's position. However, NEI's citations to the Statements of Consideration relate to the Commission's decision to exclude active components and did not address the Commission's decision that an aging management review of the passive, long-lived structures and components is warranted.

If the staff is to determine whether existing programs are adequate to manage aging effects, the next determination becomes whether and to what extent if any, an applicant is required to submit a description of existing programs relied on for license renewal. In reviewing a license renewal application, the Commission must have enough information to make the findings set forth in 10 CFR 54.29. Pursuant to 10 CFR 54.29, the Commission must find that actions have been identified and have been or will be taken with respect to managing the effects of aging and time-limited aging analyses such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. To demonstrate that the effects of aging will be adequately managed for license renewal, the staff views that an applicant must identify the program relied upon to manage certain aging effects for a particular structure or component, state that the program manages the aging effects, and describe how the program will manage those aging effects. Without such information, it is not apparent that the staff will be able to present a basis for concluding that actions have been or will be taken to manage the effects of aging during the period of extended operation to ensure the functionality of those structures and components.

If the program is an existing program, the rule does not require a licensee to describe an entire program and show how that program complies with Commission regulations that are part of the plant's current licensing basis. To satisfy the requirements of Part 54, the current staff practice is to request an applicant to describe the particular parts of the program that the applicant is relying on to manage aging for license renewal. For example, an applicant could describe a particular examination performed as part of the existing inservice inspection program to manage certain aging effects for specific structures and components. In addition, if that particular portion of the program has been described previously in the plant's current licensing basis and the staff has already found that portion of the program adequate to manage the aging effect of concern, the applicant can reference the previous description and the staff's review, together with a statement that there have been no changes material to the staff's previous review. If the staff has already found that program sufficient for the purpose it is being relied upon in the license renewal application, the staff can reference its previous review in the license renewal safety evaluation. The staff's review of existing programs would only be of sufficient extent to determine whether new or augmented programs to manage the effects of aging are necessary.

The staff recognizes that existing programs will usually be found adequate to manage the effects of aging if continued into the period of extended operation. For example, during the initial license renewal reviews, the staff has determined based upon additional description of certain parts of the program and supplemental analyses, that certain existing programs cited in the March 3, 1999, NEI letter are adequate in managing particular aging effects for license renewal. Examples of these programs include the existing environmental qualification (EQ) program for electrical equipment and the existing erosion/corrosion piping program. Current programs have evolved over time to incorporate additional licensee inspections to account for experience with different types of aging (for example, the staff issued Generic Letter 97-01, "Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel Closure Head Penetrations," to address potential cracking of these components). In addition, during the initial license renewal reviews, the staff has identified certain aging management issues that the applicants could resolve by reliance on particular existing programs to manage specific aging effects.

NEI contends that the staff should not review existing programs in the context of a license renewal review. This view is at odds with the staff's understanding of the license renewal rule as explained above. In addition, there may be areas within existing programs that would not adequately address aging effects that should be managed for license renewal. Attachment 2 contains a list of such examples. The staff identified these areas by reviewing the attributes of the existing programs regarding aging management and has requested that applicants augment the existing programs for the period of extended operation. The staff and the initial license renewal applicants have found that about 30 percent of the aging management programs for license renewal required some modifications of existing programs or new programs. In many instances, the applicants have already elected to implement program changes.

The staff also recognizes the potential improvements in the efficiency of the license renewal process if the staff and applicants could credit existing programs and focus their resources in addressing the areas where existing programs should be augmented. There are several options to credit existing programs for license renewal and they are described below. The NEI approach is Option 1. The staff has developed Options 2 and 3. Under Options 1 and 2, the staff would not review existing programs. Any potential concerns regarding the adequacy of existing programs would be addressed within the current regulatory process. Under Option 3, the staff would review existing programs generically to identify areas where existing programs should be augmented for license renewal. Options 1 and 2 would involve rulemaking. Option 3 involves improvements to the standard review plan for license renewal. The staff is recommending Option 3. (Further discussion of these options appears in Attachment 3.)

Option 1: Do not review the adequacy of existing programs.

The staff understands that NEI believes that existing programs found acceptable for the current term should be deemed adequate for license renewal without further description by a license renewal applicant or review by the staff. This option means that the staff would not review the adequacy of existing programs to manage aging effects for license renewal. If the staff has concerns about the adequacy of existing programs, these concerns would be addressed within the current regulatory process.

This option clarifies that existing programs would not be reviewed in a license renewal review and would significantly reduce the staff and applicant burden. NEI contends that a rule change is not needed to implement this option. However, based on the license renewal experience to date, the staff considers that this approach does not provide a sufficient safety basis for the staff's finding in 10 CFR 54.29. The staff believes it will be unable to set forth a basis for its conclusion that actions have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of those structures and components identified as requiring an aging management review. Thus, this option cannot be implemented without a rulemaking. Also, the public may view the license renewal process as unjustifiably narrow in scope and could perceive the Commission as granting renewed licenses without a sufficient technical basis.

Option 2: Amend rule to exclude structures and components subject to existing programs.

By amending Part 54, the Commission could exclude those structures and components subject to any existing programs from a license renewal review in 10 CFR 54.21. This option explicitly credits existing programs by excluding selected structures and components from rule requirements. Although additional resources would be required for rulemaking, this option would significantly reduce the staff and applicant burden. The rationale for not selecting this approach is similar to Option 1.

Option 3: Focus staff review guidance in standard review plan on areas where existing programs should be augmented.

The staff is engaged in an effort called "Generic Aging Lessons Learned (GALL)," which evaluates existing programs generically to document the basis for determining when existing programs are adequate and when existing programs should be augmented for license renewal. The staff plans to reference the GALL report in the standard review plan for license renewal as a basis for determining the adequacy of existing programs. The staff will present review guidance in the standard review plan for license renewal to focus its review on the areas where existing programs should be augmented. Applicants would submit information on specific existing programs that are relied on to manage certain aging effects for particular structures and components and would reference the GALL report as basis for program adequacy. The staff would follow the guidance in the standard review plan for license renewal to verify that the applicants have identified the appropriate existing programs. The main focus of the staff review would be on augmented programs for license renewal.

This option could be implemented with the existing license renewal rule. Under this option, the standard review plan for license renewal would need to provide sufficient technical detail and guidance to the staff to preclude any staff review of the existing programs. Improvements to the standard review plan for license renewal based on lessons learned would provide predictability and objectivity to the license renewal

process. However, this option differs from the NEI's approach in that the staff would be identifying areas where existing programs should be augmented for license renewal. The Commission may also be criticized for granting renewed licenses based on generic information.

All three options described above would improve the efficiency of the license renewal process. Under Option 3, safety is maintained during the period of extended operation with a focused review of aging management for license renewal. Option 3 provides an effective integrated review of programs being relied upon to manage aging for license renewal. Options 1 and 2 would significantly reduce the staff and applicant burden. Option 3 would reduce unnecessary burden by focusing the staff review on augmented programs for license renewal. Option 3 likely provides additional public confidence, because under the other two options, the public could view the license renewal process as unjustifiably narrow in scope. Further, the staff's experience thus far is limited to two license renewal applications, both for pressurized-water reactor (PWR) plants. When the staff has developed more experience related to implementation of Part 54, the staff will revisit the issue of existing program credit and develop further process efficiencies.

RESOURCES:

The staff compared the resource requirements of the three options with the current budgeted resources to implement the license renewal rule. Options 1 and 2 would require more resources initially, because of the rulemaking effort, which is about 1.5 to 2 full-time equivalent (FTE) over a 15- to 18-month period, including the Office of Nuclear Reactor Regulation and the Office of the General Counsel. After the rulemaking, Options 1 and 2 would require significantly less resources for an application review than currently budgeted, depending on the extent to which the staff review is narrowed. For Option 3, the resource requirements remain about the same as currently budgeted because the staff's work has been budgeted to account for the resolution of license renewal issues, many of which relate to existing programs, and incorporation of lessons learned into the standard review plan for license renewal. Some additional resources would be needed in the Office of Nuclear Regulatory Research to contribute to the technical basis for the rulemaking for Options 1 and 2, and to support the development of the GALL report. The current estimate for the review of a license renewal application is 22 FTE and \$340K over 30 to 36 months. The staff will refine future budget estimates to incorporate the Commission's guidance on the preferred approach and experience with the initial license renewal reviews.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The Office of the Chief Information Officer has reviewed the Commission paper for information technology and information management implications and concurs in the paper.

RECOMMENDATION:

The staff recommends that the Commission approve the use of Option 3 to provide credit for existing programs for license renewal.

William D. Travers
Executive Director
for Operations

Attachments:

1. March 3, 1999, NEI letter
2. Examples where existing programs should be augmented
3. Further discussion of options



NUCLEAR ENERGY INSTITUTE

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NUCLEAR GENERATION DIVISION

March 3, 1999

Mr. Roy P. Zimmerman, Chairman
License Renewal Steering Committee
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Zimmerman:

Enclosed is a draft paper that discusses the industry's views on how existing plant programs and activities should be credited for license renewal. We are providing this paper with the objective that it will serve as a starting point for discussions on the level of detail versus re-verification question that has dominated many of our meetings with the Steering Committee.

The paper provides background information including our view of the NRC staff's position on the topic. If we have misrepresented the staff's position, we did so unintentionally and look forward to understanding the differences so that this matter can be resolved.

In summary, we believe that existing programs that comply with the current licensing basis and that are subject to NRC oversight should be credited for the renewal period. The focus of the staff's review should be on aging effects that are not being managed by current licensing basis programs.

We look forward to meeting with the Steering Committee March 30 and trust this paper will help facilitate discussions and drive the issue to closure.

Sincerely,

A handwritten signature in black ink that reads "Anthony R. Pietrangelo". The signature is written in a cursive, flowing style.

Anthony R. Pietrangelo

Enclosure
ARP/DJW/ngs

c: Mr. Sam Collins
Mr. David Matthews
Mr. Scott Newberry
Mr. Chris Grimes

**LEVEL OF DEMONSTRATION REQUIRED FOR EXISTING PROGRAMS
UNDER THE LICENSE RENEWAL RULE**

LEVEL OF DEMONSTRATION REQUIRED FOR EXISTING PROGRAMS UNDER THE LICENSE RENEWAL RULE

I. Introduction

The purpose of this paper is to present the industry's view on how to make the demonstration required for license renewal when the demonstration is taking credit for existing plant programs and activities.

For some time, the industry and NRC staff have struggled with articulating how a license renewal applicant makes the demonstration called for in 10 C.F.R. 54.21(a)(3). Our objective is to use this paper as a foundation for dialogue with the NRC staff to drive the issue to resolution. We have taken some liberty in describing our understanding of the NRC staff's views on this issue. If we misrepresented their views we did so unintentionally and look forward to understanding the differences so that we can resolve this matter.

The paper begins with some background information on the issue of the demonstration required for license renewal and crediting existing programs. There is a summary of the industry position regarding the demonstration. A brief discussion of our understanding of the NRC staff's position is also provided. Next is an overview of the license renewal rulemaking history followed by a summary and conclusion. Appendix A is a detailed discussion of the industry approach. It includes an example of how the industry envisions an existing current licensing basis program being credited for license renewal. Appendix B is a typical list of current licensing basis programs.

II. Background

The integrated plant assessment is the centerpiece of the license renewal application. Section 54.21(a)(3) states that the integrated plant assessment must:

“...demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation.”

A. Industry Position

The industry position is that the demonstration required for license renewal is continued compliance with current licensing basis programs that manage aging effects plus any new programs to address aging effects not managed by the current licensing basis. It is important to

note that when we discuss our position, our reference to the current licensing basis is not a reference to the definition provided in Part 54. The current licensing basis in this context is a set of information and the regulatory oversight process which includes ongoing inspections, assessments, and enforcement.

Rather than requiring a new showing of *programmatic* adequacy for license renewal, the industry believes the rule allows a graded approach under which the adequacy of programs relied upon to manage aging would depend on the degree of regulatory oversight for such programs. Existing programs that have been found acceptable for the current term should be deemed adequate unless a significant change in the aging effect is expected during the period of extended operation. New or modified programs or actions would require a more detailed demonstration of adequacy. This recommended approach would better fulfill the Commission's policy objectives, as understood by the industry, underlying the revised Part 54.

A detailed discussion of the industry position is included as Appendix A to this paper.

B. The NRC Staff Position

Recent pronouncements from the NRC staff suggest that the demonstration for license renewal is a level of detail question; meaning how much information about an aging management program needs to be provided in the license renewal application. Other views expressed by the NRC staff suggest that the demonstration requires a new showing of adequacy for existing programs that are relied upon under the current license to manage aging. This appears to be true even for programs that are based on regulatory requirements, such as in-service inspection programs under 10 C.F.R. § 50.55a and environmental qualification pursuant to 10 C.F.R. § 50.49.

The NRC staff's position is best captured in the following excerpts from their letter to the Westinghouse Owners' Group dated January 29, 1998 regarding the ASME Code Section XI in-service inspection program:

The ASME Code Section XI ISI program is used to meet the requirements of 10 C.F.R. Part 50 but does not explicitly address the regulatory requirements of 10 C.F.R. Part 54. The Commission promulgated the License Renewal rule under the basic premise that *current programs may or may not be adequate to manage the effects of aging* on passive, long-lived structures and components or with regard to time-limited aging analyses during the period of extended operation. While there may be many existing programs that will provide adequate aging management under Part 54, the License Renewal rule requires that the NRC staff formally conclude *how* that adequacy is demonstrated as part of the basis for granting a renewed license." (Emphasis added.)

Similarly, in a recent Request for Additional Information, the adequacy of the containment inspection program which is based on the NRC's regulations in 10 C.F.R. § 50.55a is questioned.

The license renewal rule requires a specific "demonstration" that the effects of aging are adequately managed to ensure structure and component intended function during the period of extended operation. The report needs to provide such a demonstration. The current report identifies an aging effect that needs to be managed for renewal and then provides a brief summary of existing plant programs. There is no demonstration of management of the aging effect of interest by specific elements of the existing plant program.

We believe these views are derived from (1) an overly broad interpretation of the demonstration required under Section 54.21(a)(3) and the finding required by Section 54.29, and (2) a misconception that the renewed license issued under Part 54 is a new license which offers the opportunity to "neaten up" the technical specifications and FSAR to comport with the "new license."

III. Rulemaking History

So often, and even in this paper, isolated phrases or sections of the rule or Statements of Consideration are cited to support one view or another. The starting point in the analysis of any regulation is the language and structure of the regulation itself. A particular part or section of the regulation may not be considered in isolation but must be interpreted in reference to the entire regulation so as to produce a "harmonious whole." A regulation must also be interpreted in light of its regulatory history if it is not otherwise clear on its face. We reviewed the Part 54 rulemaking history and believe it is clear that the Commission did not intend applicants to re-justify the adequacy of existing programs that manage aging of long-lived passive structures and components

The license renewal rule was first promulgated in 1991 to establish specific procedures, criteria and standards governing nuclear power plant license renewal. A fundamental principle of the license renewal rule is that "[t]he licensing basis for a nuclear power plant during the renewal term will consist of the current licensing basis and new commitments to monitor, manage, and correct age-related degradation unique to license renewal, as appropriate."¹ The Commission engages in a large number of regulatory activities which, when considered together, constitute a regulatory process that provides ongoing assurance that the licensing bases of nuclear power

¹ 56 Fed. Reg. 64946

plants provide an acceptable level of safety. That led the Commission to conclude that there is likely only one real issue generally applicable to all plants – age-related degradation. The renewal rule focuses the Commission’s review on this one safety issue but provides leeway for the Commission to consider, on a case-by-case basis, other issues unique to extended operation. Thus, with the exception of age-related degradation unique to license renewal and possibly a few other issues related to safety only during extended operation, the Commission concluded that regulatory process is adequate to ensure that the licensing bases of all currently operating plants provide and maintain an acceptable level of safety for operation so that operation will not be inimical to public health and safety or common defense and security.²

Following promulgation of the original license renewal rule in 1991, the Commission “determined that the requirement for carrying out the license renewal review can and should be simplified and clarified. The Commission has concluded that, for certain plant systems, structures, and components, the existing regulatory process will continue to mitigate the effects of aging to provide an acceptable level of safety in the period of extended operation.”³ As a result, the Commission concluded that the license renewal review “is intended to identify any additional actions that will be needed to maintain the functionality of systems, structures, and components in the period of extended operation.”⁴

Because aging is a continuing process, the Commission has concluded that existing programs and regulatory requirements that continue to be applicable in the period of extended operation and provide adequate aging management for systems, structures, and components should be credited for license renewal. Accordingly, the license renewal rule “focuses the renewal review on plant systems, structures, and components for which current activities and requirements may not be sufficient to manage the effects of aging in the period of extended operation.”⁵

The concept of the current licensing basis continuing through the renewal term is a critical principle underlying the license renewal rule. Unfortunately, despite the Commission’s clear statement of intent to the contrary, questions have been raised concerning the need for licensees to document their current programs to demonstrate compliance with NRC regulations as part of the license renewal application.

² Id. at 64949. See also 60 Fed. Reg. 22461, 22464 (May 8, 1995).

³ 60 Fed. Reg. 22464.

⁴ Id. (emphasis added).

⁵ Id. at 22469.

The Commission addressed precisely this issue in its Statement of Considerations of the 1995 rule. Two commenters had raised concerns that the proposed rule could be erroneously interpreted as requiring a general demonstration of compliance with the current licensing basis as a prerequisite for the issuance of a renewed license.

The Commission concluded that the proposed rule was sufficiently clear in distinguishing between the issues that must be addressed as part of the renewal review versus those that must be addressed in the context of operation under the current license. However, to eliminate any possible misinterpretation, the Commission narrowed the findings required to be made under Section 54.29, *Standard for Issuance of Renewed License*, for issuance of a renewed license. A new provision, 54.30, *Matters Not Subject to a Renewal Review*, was created to clarify the licensee's responsibilities for addressing safety matters under its current license that are not within the scope of the renewal review.⁶ The Commission observed that “[s]eparating the subjects into two different sections should minimize any possibility of misinterpreting the scope of the renewal review and finding.”⁷

Section 54.30 requires additional licensee, and NRC, action under the current license if the reviews of the integrated plant assessment or time-limited aging analyses required by Sections 54.21(a) and (c) show that there is not reasonable assurance during the current license term that licensed activities will be conducted in accordance with the current licensing basis. It does not require a licensee to demonstrate that the current licensing basis contains programs adequate to ensure compliance with current NRC requirements.

There is no regulatory basis for a demand by the NRC staff that a license renewal applicant provide justification that its programs or other aspects of its current licensing basis comply with NRC regulations, nor does the license renewal rule require that the Commission make a finding that the applicant's programs comply with Commission regulations such as to justify the required submission by a license renewal applicant of any data regarding the sufficiency of current licensee programs.

IV. Summary

From a review of the rule and its history, it is clear that the way in which the demonstration is made is not well defined. Nevertheless, it appears that the Commission did not intend that applicants would have to re-justify existing programs relied upon to manage aging. Instead, a

⁶ 60 Fed. Reg. at 22482.

⁷ Id.

review of the revised Part 54 supports the view that existing performance and condition monitoring programs can be effectively relied upon in satisfying the aging management review requirements applicable to long-lived, passive structures and components.

The fundamental issue then becomes did the Commission conclude that existing programs that adequately manage aging effects during the current term to ensure compliance with the current licensing basis will continue to be adequate in the renewal term because of the ongoing regulatory oversight, or, did they conclude that existing programs may or may not be adequate and direct the Staff to formally conclude how that adequacy is demonstrated as part of the basis for granting a renewed license?

When the Commission directed the Staff to revise Part 54 and generically eliminate active components from aging management reviews, the purpose behind the effort was to realign the focus of the rule away from a "mechanistic" evaluation of aging degradation and toward ensuring "functionality" of key equipment. Moreover, the Commission wanted to allow greater reliance on existing programs, including performance and condition monitoring programs, provided that the applicant performed a review to ensure that those programs that indirectly verify functionality of long-lived, passive components were adequate to provide the requisite reasonable assurance of function for the renewal term.

The precise nature of the programs relied upon by renewal applicants to manage the effects of aging are not defined in Part 54. Nor is there a specific requirement in Part 54 for a renewal applicant to re-justify existing current licensing basis programs. The rule requires only that the FSAR supplement contain a "summary description of the programs and activities for managing the effects of aging." At most, in defining the findings the Commission must make prior to issuing a renewed license, the rule requires a finding that "[a]ctions have been identified and have been or will be taken . . . such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis, and that any changes made to the plant's current licensing basis in order to comply with this paragraph are in accord with the Act and the Commission's regulations." 10 C.F.R. § 54.29(a). The rule is silent with regard to the justification necessary to demonstrate reasonable assurance.

V. Conclusion

If a license renewal applicant reviews an existing program and has sufficient technical basis to conclude that the program provides reasonable assurance that the intended function will be maintained throughout the period of extended operation, the program should simply be credited in the aging management review process. The demonstration provided in the license renewal application should be proportional to the level of regulatory scrutiny that is applied in the current

term. Programs that are subject to full regulatory scrutiny under the current licensing basis should not require detailed justification for the renewal term. Those programs that must be created or significantly enhanced to provide reasonable assurance that the intended function will be maintained throughout the renewal term may require additional justification and discussion in the license renewal application.

Appendix A

INDUSTRY APPROACH TO THE LICENSE RENEWAL DEMONSTRATION

I. Elements of a Demonstration

The industry approach to demonstrating the adequacy of existing programs is graded. Following the identification of long-lived passive structures and components, an applicant determines the aging effects which challenge the ability of the structure or component to perform the intended function in accordance with the current licensing basis. These effects would then be compared against existing programs which manage them. Adequate aging management can be accomplished by any one or a combination of existing programs, establishment of new programs, revisions to existing programs, one-time inspections, analytical techniques or replacement.

If existing programs are used, the applicant would present a correlation of the aging effects to the existing programs at a program level and a description of the basis for the conclusion that aging is being adequately managed. Under the first principle of license renewal, existing programs should be deemed adequate unless the aging effect is found to be new or significantly different in the period of extended operation. If a new aging effect or significant change to an existing aging effect is identified, then a new program or enhancement to an existing program is necessary.

The demonstration required by Section 54.21(a)(3) is provided by the correlation of the aging effects to the existing program and the description of the basis for the conclusion that aging is being adequately managed. The level of detail that needs to be provided in the application would depend on the degree of regulatory oversight. Where the existing program is based on a current regulatory requirement, a specific current licensing basis commitment, or otherwise is subject to detailed regulatory oversight (e.g., the subject of a Staff Safety Evaluation Report), a detailed description would not be needed. For new or modified programs, or other programs initiated by the applicant and not previously subject to NRC staff review, a more detailed description of its effectiveness would be required.

In summary, the elements of a demonstration that should be described in the license renewal application include the identification of the component or structure, identification of the function, a description of the environment, the applicable aging effects, the existing program credited, and a discussion of the link between the existing program and the other elements.

A discussion of each element is provided below. An example is provided as Enclosure 1.

A. Component/Structure Identification

The rule language is fairly straight forward; however, the rule also allows for the use of commodity groups. If commodity groups are utilized, it is not necessary to identify each component or structure in the group. Rather, a description of the characteristic that apply to the commodity group should be provided.

B. Intended Function

Intended function is defined as the function that causes the component or structure to be included in the scope of the rule. While the rule is also clear that the aging management review is performed at the structure and component level, initial scoping is conducted at the system level. In this regard, system level functions are identified. The intended function may be the same as the system level function or it may be a function that supports the system level function.

C. Aging Effects

The license renewal rule also requires the identification of the aging effects that need to be managed in the period of extended operation. The application does not have to identify the aging effects that were considered but dispositioned as not applicable. Onsite documentation identifies those effects/mechanisms considered and their disposition. It is also true that aging mechanisms must be known in order to identify the aging effects. However, mechanisms are not required to be discussed or identified in the license renewal application.

D. Programs

Programs that manage aging are in place for various reasons. One method to characterize existing programs is with a scale which measures the amount of NRC direction to initiate the program. At the high end are those programs mandated by regulation (e.g. the EQ program per 50.49). Less directed programs are the result of generic correspondence which requests the implementation of a program (e.g. Generic Letter 89-13 which deals with degradation of service water piping and heat exchangers). Even less directed are those programs that the industry initiated and implemented proactively, either on a plant specific basis or with an industry wide program such as the EPRI water chemistry guidelines and erosion-corrosion programs. The lowest level are those programs that individual utilities have implemented to address problems at their plant which resulted from aging of structures and components (e.g. inspection of river water pumps because of cavitation).

The term “programs” as used for purposes of license renewal includes a broad range of activities, from formal programs to procedures to specific work orders. Formal programs are typically characterized by a governing document which describes the history and purpose of the program, and how it is implemented. Formal programs typically have reporting requirements that allow management to review the results of the program. Less formally, procedures are used to achieve the same results as a formal program. When the scope of the “program” is not extensive, it may be more appropriate to implement the “program” with a procedure that describes the purpose and implements the necessary actions. The use of a procedure as a “program” can be just as effective as implementing a formal program. The least formal approach to a “program” occurs when a plant decides that the appropriate implementation of a “program” is through specific work orders. The implementation details will be unique to the plant, but generally are characterized by one or more work orders that are performed at a specified frequency and include the information needed to perform the required work, analyze the results, and initiate corrective actions if needed. The

work orders will include information as to the reason for the work order, including the initiating event. For example, a utility's response to Generic 89-13, "Service Water System Problems Affecting Safety-Related Equipment," may have included a commitment to perform UT wall thickness measurements on piping to determine if general corrosion is causing loss of wall thickness. The utility may have elected to implement these examinations with a series of work order activities which are automatically issued at the required frequency, without having a formal program that describes the work to be performed.

E. The Link

The "link" is the correlation that shows how the program manages a specific aging effect. A program may manage more than one effect, but the application must show that the program is linked to each of the aging effects. It may also be necessary to show the link between a specific part of a program and the effect of concern. As an example, the applicant's in-service inspection program addresses many different types of aging for various components. The link will be to the appropriate part of the in-service inspection program. A reference to the in-service inspection program as the aging management program does not show the link. What is needed in the application to demonstrate this link depends on how closely the aging management program is tied to the aging effect.

The link for a program such as the EQ program is both simple and direct. Licensees established EQ program to comply with 10 C.F.R. § 50.49 which requires that electrical equipment must be qualified to operate under accident conditions when considering the effects of various stressors. EQ programs exist specifically, and clearly, to manage the effects of aging due to exposure to elevated temperatures, humidity and radiation.

For programs that are unique to a power plant, the description of the link will be more extensive. The link will have to describe how the program prevents, mitigates, or detects the aging effect so that the intended function will be maintained.

F. Other Considerations

1. Regulatory Oversight:

Regulatory oversight is a key element of the first principal of license renewal, providing and maintaining an acceptable level of safety. Regulatory oversight is the Commission's process that includes research, inspections, audits, investigations, evaluation of operating experience, and regulatory actions to resolve identified issues. When evaluating the acceptability of an aging management program, the amount of regulatory oversight should be considered in making the demonstration for license renewal

2. Operating Experience

The operating experience that exists for an aging management program can vary greatly, depending both on the age of the aging management program, and on the operating history of the equipment associated with the aging management program.

Some aging management programs have been in existence since initial operation of the plant, and there is an extensive amount of information about the equipment, its operating and maintenance history, and changes that may have been made to operations and maintenance because of problems with the equipment. The information derived from an aging management program that has been in existence for a long time will vary, depending on equipment performance. A review of operating experience for equipment that has operated well will show that there has been little, if any, degradation of the equipment, meaning that the aging management programs in place have been effective at preventing or mitigating the effects of aging. In some cases, the absence of degradation may be due to a good design that resulted in a combination of material, environment and stressors. For this equipment, there will be no need for an aging management program.

The opposite extreme is equipment that has significant amount of problems caused by rapid degradation of structures and components. A review of the operating history of this equipment may reveal that aging management programs were in place that detected the degradation and were successful at correcting the aging before loss of function occurred, or the review may reveal that the function of the equipment was lost before the degradation was detected. In the latter case, the corrective action program will have caused improvements in the aging management program so that future degradation will be detected before the equipment function is impacted again. Any of these scenarios are examples of aging management programs that have been effective at managing aging in the past, and should manage aging in the future.

A key aspect of the different types of operating experience as described above is that in all three, the oversight process, whether it be the licensee's oversight process or the Commission's oversight process, has been successful at maintaining function, or at detecting and restoring the lost function. The history of most plants will include examples of all three scenarios

For other aging management programs, there may be little, or no, operating experience. An aging management program may have been initiated only a short time before the submittal of a license renewal application. This could be because there has not been any degradation of the equipment, and the program was only newly instituted as a precautionary measure by the licensee to provide additional assurance that the equipment was not degrading. Other aging management programs could be recently instituted because aging was discovered at the plant, or at another plant, and there is little if any information because the aging management program has only recently been put in place.

II. Level of Detail

The level of detail needed in the application to make the demonstration will be a function of several variables which may include regulatory oversight, how closely or directly the program is tied to the aging effect, and the operating experience available.

An aging management program which is well understood by the NRC, is clearly tied to the aging effect, and for which there is extensive operating experience will require only a very brief discussion in the license renewal application. "Brief" in this context is not a one or two sentence discussion. Sufficient information must be provided so that the link is clear. A program that has received very little attention by the NRC, that contributes to the management of the effect of aging on a secondary level, and for which there is little information validating the effectiveness of the program will require a much more extensive discussion explaining how the program will manage the effect of aging such that the intended function will be maintained. These two cases are at opposite extremes of the range of the level of detail needed in the application to make the demonstration.

Other programs that fall between these two extremes will require a level of detail in the application that is adequate to allow a reviewer to conclude that the aging management program provides reasonable assurance that the effects of aging will be adequately managed.

Demonstration Example

“Service Water System Problems Affecting Safety-Related Equipment (Generic Letter 89-13)”

This is an example of a program or programs implemented as a result of commitments made in response to Generic Letter 89-13. In the industry’s approach to making the demonstration for license renewal, these programs are adequate aging management programs requiring minimal description in the applications. The basis for this conclusion is that the programs are in place and the regulatory oversight process ensures they will continue into the renewal period. The conclusion is also based on specific actions identified in the generic letter.

While the Generic Letter covers the entire service water system, this example focuses on a specific commodity group - heat exchangers.

Overview of Generic Letter 89-13

The NRC issued Generic Letter 89-13 July 18, 1989 to *require licensees and applicants to supply information about their respective service water systems to assure the NRC of such compliance and to confirm that the safety functions of their respective service water systems are being met.* Specifically the letter recommended the following actions:

- I. Implement and maintain an ongoing program of surveillance and control techniques to significantly reduce the incidence of flow blockage problems as a result of biofouling.
- II. Conduct a test program to verify the heat transfer capability of all safety related heat exchangers cooled by service water.
- III. Establish a routine inspection and maintenance program that ensures erosion, corrosion, protective coating failure, silting, and biofouling cannot degrade the performance of the safety-related systems supplied by service water.
- IV. Confirm that the service water system will perform its intended function in accordance with the licensing basis of the plant.
- V. Confirm that maintenance practices, operating and emergency procedures, and training that involves the service water system are adequate to ensure that safety-related equipment cooled by the service water system will function as intended and that operators of this equipment will perform effectively.

All the recommend actions in the Generic Letter touch on heat exchangers. However, Action II is specifically focused on heat exchangers. Action II is implementing a test program to verify the

heat transfer capability of all safety-related heat exchangers cooled by service water. The Generic Letter explains why this testing is necessary:

“Operating experience and studies indicate that closed-cycle service water systems, such as component cooling water systems, have the potential for significant fouling as a consequence of aging-related in-leakage and erosion or corrosion.”

The Letter then goes on to discuss a program acceptable to the NRC for heat exchanger testing.

The first element of the NRC’s program is scope - all safety-related heat exchangers.

Next the program discusses initial baseline testing.

As a part of the initial test program, a licensee or applicant may decide to take corrective action before testing. Tests should be performed for the heat exchangers after the corrective actions are taken to establish baseline data for future monitoring of heat exchanger performance

Then the program outlines expectations for the continuing program for periodic retesting.

In implementing the continuing program for periodic retesting of safety-related heat exchangers cooled by service water in open-cycle systems, the initial frequency of testing should be at least once each fuel cycle, but after three tests, licensees and applicants should determine the best frequency for testing to provide assurance that the equipment will perform the intended safety functions during the intervals between tests and meet the requirements of GDC 44, 45, and 46. The minimum final testing frequency should be once every 5 years.

As in the initial test program, tests should be repeated after any corrective actions are taken to establish baseline data for future monitoring of heat exchanger performance.

The parameters that need to be monitored are also identified. These include, cooling water flow and inlet and outlet temperatures during the modes of operation in which cooling water is flowing through the heat exchanger. For each measurement, the licensee is to verify that the cooling water temperatures and flows are within design limits. These results are trended to ensure that flow blockage or excessive fouling accumulation does not exist.

In summary, the Generic Letter identifies the aging of concern (age-related in-leakage, fouling, erosion, and corrosion), and discusses a program for dealing with that aging. The program as described in the Generic Letter, has many of the attributes of an aging management program. The scope is well defined (all safety-related heat exchangers). The program includes monitored parameters, trending, and timely corrective action with a confirmation process.

Attachment 1 is a flow diagram showing the relationship of the Generic Letter to the license renewal demonstration. Attachment 2 is a draft section of a license renewal application.

Heat Exchangers
LICENSE RENEWAL APPLICATION

System

Service Water

Component Subject to Aging Management Review

All safety related heat exchangers in the service water system

Intended Function

Heat transfer capability

Aging Effects

Loss of heat transfer

Aging Management Program⁸

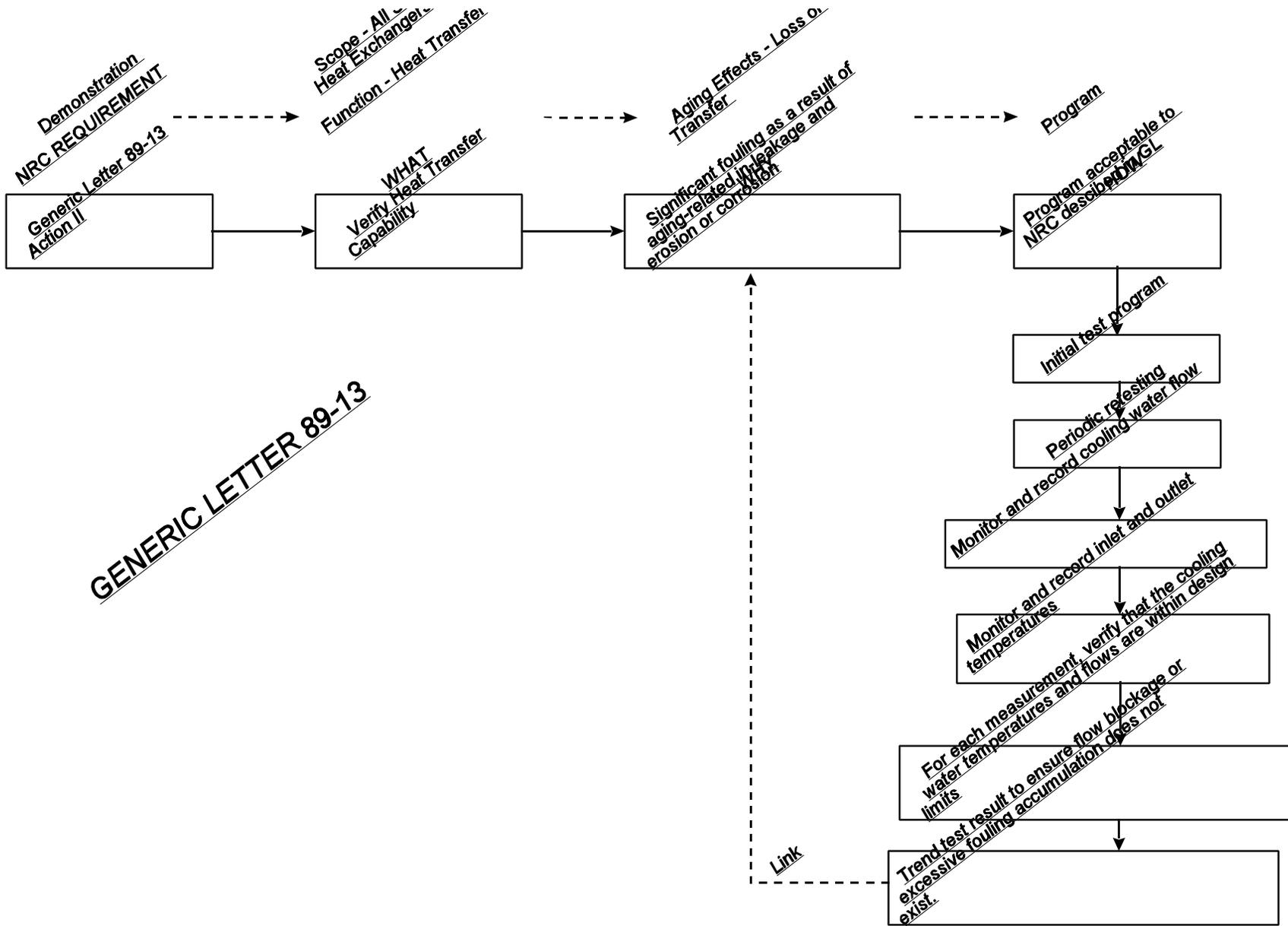
The NRC issued Generic Letter 89-13 July 18, 1989 to *require licensees and applicants to supply information about their respective service water systems to assure the NRC of such compliance and to confirm that the safety functions of their respective service water systems are being met.* Action II in the generic letter is a recommendation to conduct a test program to verify the heat transfer capability of all safety related heat exchangers cooled by service water.

A testing program acceptable to the NRC is also discussed in the Generic Letter. As documented in our response to the generic letter, PLANT X has implemented such a program.

Cooling water flows and temperatures are monitored and evaluated to ensure they are within design limits. Corrective actions are initiated if necessary. The parameters are also trended to ensure that flow blockage or excessive fouling accumulation does not exist. Also, NRC conducted an inspection to verify the actions committed to in our response to the generic letter.

The testing program provides reasonable assurance that the heat exchangers will perform their intended function, in accordance with the current licensing basis, in the period of extended operation.

⁸ The description of the aging management program should be consistent with the licensees response to the Generic Letter. The examples is not intended to suggest that a licensee that credits their Generic Letter 89-13 program would write the renewal application exactly in this way.



Appendix B

TYPICAL EXISTING CURRENT LICENSING BASIS PROGRAMS

This appendix is a typical listing of current licensing basis programs that the industry believes most renewal applicants will credit for renewal. These programs also have a regulatory foundation, are subject to inspection and enforcement and, manage aging in the current operating term. Therefore, to the extent they are described in the renewal application, they should receive minimal review.

Appendix B

TYPICAL EXISTING CURRENT LICENSING BASIS PROGRAMS

| <i>Existing Program or Activity</i> | <i>Regulatory Basis</i> |
|--|--|
| 1. Battery Rack Inspections | Improved Technical Specifications (ITS) - SR 3.8.1.3, SR 3.8.3.2, and SR 3.10.1.10 |
| 2. Boric Acid Wastage Surveillance | Commitment to GL 88-05, Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components |
| 3. Chemistry Control Program | Commitments to EPRI Water Chemistry Documents, ITS 5.5.14, ASTM D975, Standard Specification for Diesel Fuel Oils |
| 4. Coatings Program | Commitment to RG 1.54, Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants |
| 5. Containment Inservice Inspection | 10 CFR §50.55a ASME Code, Section XI, Subsections IWE, IWL |
| 6. Containment Leak Rate Test Program | 10 CFR 50, Appendix J and ITS 3.6.1 and 5.5.2. |
| 7. Control Rod Drive Mechanism Nozzle and Other Vessel Closure Penetrations Inspection Program | Commitment to GL 97-01, Degradation of Control Rod Drive Mechanism Nozzle and Other Vessel head Closure Penetrations |
| 8. Crane Inspection Program | 29 CFR XVII, §1910.179, Occupational Safety and Health Administration, Overhead and Gantry Cranes |
| 9. Environmental Qualification | 10 CFR 50.49 |
| 10. FERC Five Year Inspection | 18 CFR Part 12, Subpart D, Safety of Water Power projects and Project Works |
| 11. Fire Protection Program | 10 CFR §50.48 10 CFR 50, Appendix R |
| 12. Heat Exchanger Performance Testing | Commitment in response to GL 89-13, Service Water System Problems Affecting Safety-Related Equipment |
| 13. Inservice Inspection Plan | 10 CFR §50.55a ASME Code Section XI, Subsections IWB, IWC, IWF |
| 14. Inspection Program for Civil Engineering Structures and Components | 10 CFR §50.65 (NEI 96-03 Industry Guideline for Monitoring the Condition of Structures at Nuclear Power Plants) |
| 15. Piping Erosion/Corrosion Program | Commitment in response to BL 87-01, Thinning of Pipe Walls in Nuclear Power Plants; |

Appendix B

TYPICAL EXISTING CURRENT LICENSING BASIS PROGRAMS

| | |
|---|---|
| | Commitment in response to GL 89-08, Erosion/Corrosion-Induced Pipe Wall Thinning |
| 16. Program to Inspect the High Pressure Injection Connections to the RCS | Commitment in response to GL 85-20, Resolution of Generic Issue 69: High Pressure Injection/Make-up Nozzle Cracking in Babcock and Wilcox Plants; BL 88-08, Thermal Stresses in Piping Connected to the Reactor Coolant System |
| 17. Quality Assurance Program | 10 CFR 50, Appendix B |
| 18. RCS Operational Leakage Monitoring | ITS 3.4.13, RCS Operational Leakage |
| 19. Reactor Vessel Integrity Program | 10 CFR §50.60 10 CFR 50 Appendix G, H Technical Specifications - P/T Limits 10 CFR §50.61, Pressurized Thermal Shock |
| 20. Service Water Piping Corrosion | Commitment in response to GL 89-13, Service Water System Problems Affecting Safety-Related Equipment |
| 21. Steam Generator Tube Surveillance Program | ITS 5.5.10, Steam Generator (SG) Tube Surveillance Program |
| 22. System Performance Testing | Commitment in response to GL 89-13, Service Water System Problems Affecting Safety-Related Equipment |

EXAMPLES WHERE EXISTING PROGRAMS SHOULD BE AUGMENTED

Although existing programs are generally adequate in managing aging effects, there are areas where these programs should be augmented. The following table contains some examples:

| EXISTING PROGRAM | AGING MANAGEMENT | COMMENT |
|---|---|--|
| American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, Inservice Inspection (10 CFR 50.55a) | Cracking of small-bore piping, reactor vessel internals, and pressurizer cladding | Section XI does not require inspection of these components for cracking. |
| Reactor Vessel Material Surveillance Program (Appendix H to 10 CFR Part 50) | Neutron embrittlement | The endorsed American Society for Testing and Materials (ASTM) standard does not address surveillance beyond 40 years. |
| Chemistry control (plant technical specifications) | Corrosion | Chemistry program minimizes the potential of corrosion; however, it is only part of the larger aging management program which should also include specific inspections to verify that corrosion is adequately managed. |
| Quality Assurance (Appendix B to 10 CFR Part 50) | Corrective actions | Appendix B does not apply to non-safety-related structures and components that are within the scope of license renewal. |

The above examples are discussed further below:

Small-bore piping

The Nuclear Energy Institute (NEI), in its May 4, 1999, letter, discusses aging management of small-bore piping for license renewal and indicates that it is unnecessary for the staff to require

Attachment 2

new aging management programs. However, small-bore piping in the reactor coolant system has experienced degradation, such as described in Information Notice 97-46,

“Unisolable Crack in High-Pressure Injection Piping.” ASME Code inservice inspection does not require a volumetric inspection of small-bore piping (that is, less than 4-inch diameter) for internal cracking. During a design basis condition, such as a seismic event, small-bore piping could fail due to internal cracking before there is detectable through-wall leakage. Further, in many instances, small-bore piping cannot be isolated from the reactor coolant system and a leak could lead to a small-break loss-of-coolant accident and plant shutdown. Therefore, the staff has requested license renewal applicants to demonstrate that cracking of small-bore piping will be adequately managed for license renewal.

Because aging is a continuous process, the staff is also considering generic implications of potential cracking of small-bore piping for operating reactors. The staff has issued a proposed rule to amend 10 CFR 50.55a on inservice inspection requiring, in part, volumetric inspections of certain small-bore piping (62 FR 63899, December 3, 1997). The staff also issued a draft generic letter for public comment on the subject inspections (63 FR 15233, March 30, 1998). Subsequently, the industry has initiated efforts to address the subject inspections. By letter dated March 26, 1999, NEI indicated that the Electric Power Research Institute (EPRI) Materials Reliability Project has formed an issue task group to study the subject. In April of 1999, the ASME Code, Working Group on Inspection of Systems and Components, prepared a draft “white paper” regarding inspection of small-bore piping that may be subject to thermal fatigue.

Reactor vessel internals

Two of the more important aging effects considered plausible for reactor vessel internal (RVI) components are cracking and loss of fracture toughness. The cracking mechanism is irradiation assisted stress corrosion cracking (IASCC) of stainless steel components. The mechanisms that result in the loss of fracture toughness are neutron irradiation embrittlement of stainless steel components, and the synergistic effects of neutron irradiation embrittlement and thermal embrittlement on cast austenitic stainless steel (CASS) components. The loss of fracture toughness results in a reduction in the ability of the material to tolerate flaws. In itself, loss of fracture toughness is not significant except in cases where the component is flawed. Therefore, examination methods which can detect and characterize cracks can also manage the effects of loss of fracture toughness.

These aging effects are at work throughout the entire operating life of nuclear reactors. However, these effects are cumulative in nature, with the propensity of cracking increasing as a function of time, and the loss of fracture toughness increasing with increased exposure (to neutron flux and high temperature). In particular, increasing the exposure (operating) time results in a greater chance for more and/or longer flaws, whereas the increasing loss of fracture toughness due to increasing the exposure (operating) time results in smaller critical flaw sizes for the components. Therefore, the components may have a population of flaws with increasing length and numbers at the same time when the material’s flaw tolerance has been reduced. This situation is not thought to be a problem for the current license period, but may become an issue at some point during the period of extended operation. Application of an examination method that can detect and characterize the types of cracks that may exist in the RVI components is an effective way to manage the aging.

Cracking of RVI components has been observed and addressed in boiling water reactors (BWRs) over the last few years, and within certain components (baffle-former bolts) at two pressurized water reactors (PWRs) within this calendar year. Regarding the cracking found in PWR plants, the baffle-former bolts have been considered the leading indicator of the propensity for cracking in PWRs, due to the operating conditions (stress and high neutron fluence levels) of the bolts. This finding indicates that other RVI components may begin to demonstrate cracking as the exposure history increases.

Applicants for license renewal currently use Examination Category B-N-3 of Subsection IWB of ASME Code Section XI requirements for examining RVI components. For this examination category, ASME Code Section XI specifies the examination method as a visual, VT-3. The description of visual VT-3 examination in Section XI of the ASME Code is:

“to determine the general mechanical and structural condition of components and their supports, such as the verification of clearances, settings, physical displacements, loose or missing parts, debris, corrosion, wear, erosion, or the loss of integrity at bolted or welded connections.”

As indicated by the description, visual VT-3 examination does not determine conditions such as cracks. Section XI of the ASME Code specifies that visual VT-1 examination should be conducted to determine conditions such as cracks. The BWR cracking described previously was addressed, in part, through the use of supplemental (enhanced VT-1) examination for the detection and characterization of IASCC cracks in BWR RVI components. It is this examination method that the staff concludes is necessary to adequately manage the plausible aging effects in RVI components. Note that this discussion does not apply to certain RVI components which are not accessible for visual examination, such as baffle-former bolts. (Baffle-former bolt cracks have been identified using ultrasonic testing techniques.)

Pressurizer cladding

Applicants for license renewal currently use ASME Section XI requirements for inspection of pressurizer welds. This requirement does not require inspection of the clad for cracking. However, the staff notes that cracking in cladding could potentially propagate into the base metal material and must be addressed by an aging management program. Industry experience at one site has shown that this is an applicable aging effect. The staff maintains that cracking of the stainless steel cladding is a potential aging effect that must be addressed by an aging management program for the period of extended operation. A program to provide a reasonable demonstration of the integrity of the pressurizer cladding could be a one-time inspection for license renewal. The inspection should include the cladding and any attachment welds to the cladding. The additional inspection would provide information on the condition of the cladding or, if cracking is discovered, the condition of the underlying base metal as a result of the cracked cladding. The staff notes that the inspection technique chosen (for example, visual, surface, or volumetric) must be capable of determining the condition of the cladding. Without such additional inspection activities, the staff cannot conclude that all aging effects applicable to the pressurizer vessel cladding have been adequately addressed for license renewal.

Reactor vessel material surveillance program

The regulatory requirement for monitoring the impact of neutron radiation on reactor vessel materials is contained in Appendix H, 10 CFR Part 50. Appendix H, 10 CFR Part 50 requires that the capsule withdrawal program comply with ASTM E-185. ASTM E-185 requires that capsules containing reactor vessel materials and dosimetry be placed inside the reactor vessel and withdrawn periodically to test the irradiated material and dosimetry. The capsule withdrawal schedule is plant-specific and depends upon the edition of the ASTM E-185 standard that applies to the plant. The current existing programs are designed for 40 years of operation.

According to ASTM E-185, one capsule must be withdrawn to provide data at a neutron exposure equivalent to the reactor vessel at the end of its design life. To provide a reactor vessel surveillance program for 60 years of operation, applicants must provide data for neutron exposure equivalent to 60 years of operations. Some license renewal programs address life extension in this regard, but some other license renewal applicants may need to modify their existing program to provide data at a neutron exposure equivalent to the end of the license renewal term.

In addition, plants that have withdrawn all their capsules early in the plant's life or have no in-vessel surveillance capsules and are participating in an integrated surveillance program, will be required to continue monitoring neutron fluence with ex-vessel dosimetry and to maintain the neutron environment of the reactor vessel equivalent to that of the surveillance capsules. (These requirements may not apply to all plants, since some have sufficient capsules to modify their existing withdrawal schedule to remove a capsule near the end of the license renewal period.)

Chemistry control

Although chemistry control will minimize the potential for corrosion, chemistry control is only part of the larger aging management program which should also include specific inspections. For example, the safety injection system is subject to chemistry control. However, corrosion of this system could still occur, particularly for those portions of the system that do not have hydrogen overpressure and/or experience low-flow or stagnant conditions in which impurities in the process fluid may concentrate. Thus, the staff has accepted a one-time inspection of the safety injection system as part of the aging management program for corrosion for license renewal.

Quality assurance

An aging management program should address corrective actions, confirmation that corrective actions have been completed and are effective, and appropriate administrative controls for a formal review and approval process for such corrective actions. The staff finds that Appendix B to 10 CFR Part 50 could be used to provide these program attributes. However, Appendix B to 10 CFR Part 50 does not apply to non-safety-related structures and components that are within the scope of license renewal. Thus, the staff is requesting that an applicant provide a commitment in the final safety analysis report supplement and/or in the plant quality assurance program description that its Appendix B program also apply to non-safety-related structures and components that are subject to an aging

management review for license renewal such that any changes to the programs or activities that may affect their effectiveness in managing aging can be appropriately controlled.

FURTHER DISCUSSION OF OPTIONS

Option 1: Do not review the adequacy of existing programs.

The staff understands that NEI has taken the position that if an applicant simply identifies the aging effects to which a particular structure or component is susceptible, and states that such effects will be managed by a particular existing program, the applicant has presented sufficient information to demonstrate that aging effects will be adequately managed for license renewal. Under NEI's approach, the staff would not be permitted to review the applicant's existing programs in a license renewal review. The staff recognizes that existing programs will usually be found adequate to manage the effects of aging if continued into the period of extended operation. However, there may be areas within existing programs that would not adequately address aging effects that should be managed for license renewal.

The NEI's position is that "the demonstration required for license renewal is continued compliance with current licensing basis programs that manage aging effects plus any new programs to address aging effects not managed by the current licensing basis." NEI believes that "[e]xisting programs that have been found acceptable for the current term should be deemed adequate unless a significant change in the aging effect is expected during the period of extended operation." Because aging is a continuous process and no significant changes are expected for license renewal, this option means that the staff would not review the adequacy of existing programs to manage aging effects for license renewal. NEI indicates that any staff concerns on the adequacy of existing programs should be addressed within the current regulatory process.

NEI contends that this approach is consistent with the rule. The staff disagrees. Since the Commission has already determined that it cannot generically exclude passive, long-lived structures and components from a license renewal review, the staff must review each program relied upon for license renewal, either generically or on a plant-specific basis, to provide the reasonable assurance that their intended functions are adequately maintained during the period of extended operation. For those programs that have been described by the applicant as part of the plant's current licensing basis and reviewed previously by the staff, and that review considered the aging effect the program is now being relied upon to manage, the applicant could reference the previous description and staff review. The staff would have no reason to duplicate the previous review effort. However, the staff believes that the adoption of the NEI approach to define programs adequate because they are existing programs requires a rule amendment.

This option clearly defines that existing programs would not be reviewed in a license renewal review and would significantly reduce the staff and applicant burden. Any potential questions regarding the adequacy of existing programs would be addressed within the current regulatory process. The staff would take generic actions to address aging issues for operating reactors. The resolution of such aging issues would carry forward into the period of extended operation. This would arguably simplify the license renewal process because most of the programs relied on to manage aging effects for license renewal are existing programs. However, based on the

initial license renewal review experience, this approach would not provide a sufficient safety basis for the staff's finding in 10 CFR 54.29. The staff and the initial license renewal applicants have found that about 30 percent of the aging management programs for license renewal required some modifications of existing programs or new programs. Thus, without a review of those programs being relied upon to manage aging for license renewal, including existing programs, the staff believes it will be unable to set forth a basis for its conclusion that actions have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of those structures and components identified as requiring an aging management review. Thus, this option cannot be implemented without a rulemaking to at least amend 10 CFR 54.29. The amended rule could also define "demonstrate" so that an identification of an existing program is sufficient to show that aging management will be adequate. The public could view the license renewal process as unjustifiably narrow in scope and perceive the Commission as granting renewed licenses without a sufficient technical basis.

Option 2: Amend rule to exclude structures and components subject to existing programs.

The Commission could exclude structures and components subject to any existing programs from a license renewal review by amending Part 54. The staff would proceed with rulemaking to explicitly exclude structures and components subject to existing programs by amending 10 CFR 54.21. The amended rule could exclude such structures and components from an aging management review in 10 CFR 54.21(a)(1).

This approach to further exclude structures and components is also consistent with the Statements of Consideration for the license renewal rule as follows: "Additional experience with managing the effects of aging on the function of these structures and components may narrow the selection of structures and components requiring an aging management review for license renewal in the future." (60 FR 22476, May 8, 1995). However, the staff believes that there could be areas within existing programs that may not adequately address aging effects that should be managed for license renewal. Under Options 1 and 2, the staff has to provide a basis for its determination that existing programs are adequate to manage aging effects for the period of extended operation, and that any potential concerns on the adequacy of existing programs would be addressed within the current regulatory process. This basis would have to consider information gained since the promulgation of the 1995 license renewal rule.

This option explicitly credits existing programs by excluding associated structures and components from rule requirements and would significantly reduce the staff and applicant burden. However, the public could view the license renewal process as unjustifiably narrow in scope and perceive the Commission as granting renewed licenses without a sufficient technical basis.

Option 3: Focus staff review guidance in standard review plan on areas where existing programs should be augmented.

As part of the improvement of the standard review plan for license renewal, the staff is engaged in an effort called "Generic Aging Lessons Learned (GALL)," which generically evaluates the adequacy of existing programs to manage aging effects for license renewal.

The GALL effort consists of a generic review of the applicable aging effects of passive, long-lived structures and components, identification of typical existing programs, and review of the attributes of existing programs to manage the applicable aging effects. The effort also considers the staff's experience with the initial license renewal reviews. The GALL report will document the basis on which existing programs are found adequate for license renewal. It will also identify the areas where existing programs should be augmented for license renewal. The staff plans to reference the GALL report in the standard review plan for license renewal as a basis for the adequacy of existing programs. The staff would issue the standard review plan for license renewal for public comment before final publication. The staff would present review guidance in the standard review plan for license renewal to focus its review on the augmented programs. An applicant could similarly reference the GALL report in its license renewal application for managing certain aging effects for specific structures and components and indicate that the existing programs covered by the GALL report are applicable to the plant. The applicant would address areas where existing programs should be augmented.

In license renewal applications, applicants would submit information on specific existing programs that are relied on to manage certain aging effects for particular structures and components within the scope of license renewal, reference the GALL report as the basis for that determination, and indicate that the existing programs described in the GALL report apply to their plants. The staff would follow the guidance in the standard review plan for license renewal to verify that the applicants have identified the appropriate existing programs based on the GALL report. The main focus of the staff's review would be on augmented programs for license renewal. The standard review plan for license renewal would not direct the staff to review the adequacy of existing programs. However, the staff could perform inspections, as part of the license renewal inspection program, to verify that the GALL report is applicable to the applicants' plants. In addition, the application, including the referenced GALL report, are subject to review in individual license renewal proceedings.

This option could be implemented within the existing license renewal rule. There is a reference report that an applicant can use to credit existing programs for license renewal and to identify the areas where existing programs should be augmented for license renewal. In addition, NEI and the staff have identified a list of license renewal issues that are generic to the implementation of the license renewal rule. Many of these issues relate to existing programs. The staff is evaluating these issues for generic resolution. The resolution of these license renewal issues would be documented as improvements to the standard review plan for license renewal. The standard review plan for license renewal would need to provide sufficient technical detail and guidance to the staff to preclude any staff review of the existing programs. The staff would provide staff evaluation criteria in the standard review plan for license renewal that do not review existing programs. The staff management commitment and review discipline, similar to that of the technical specification improvement program, should preclude escalating staff review standards. This option differs from the NEI's approach in that the staff would be identifying areas where existing programs should be augmented for license renewal. The Commission may also be criticized for granting renewed licenses based on generic information. As existing programs evolve over time, the standard review plan for license renewal and the GALL report should be updated to provide additional credit for existing programs, as appropriate.

