Non-Power Reactor (NPR) License Renewal Rulemaking

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Regulatory Basis Document

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Abbreviations

ACRS	Advisory Committee on Reactor Safeguards
AEA	Atomic Energy Act
ALARA	As-Low-As Reasonably Achievable
ANS	American National Standard
ARC	Army Reactor Council
ATR	Advanced Test Reactor
CFR	Code of Federal Regulations
DOD	Department of Defense
DOE	Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESF	Engineered Safety Feature
FSAR	Final Safety Analysis Report
GALL	Generic Aging Lessons Learned
HEU	Highly Enriched Uranium
IAEA	International Atomic Energy Agency
INL	Idaho National Laboratory
INPO	Institute of Nuclear Power Operators
ISG	Interim Staff Guidance
LEU	Low Enriched Uranium
MHA	Maximum Hypothetical Accident
MW(t)	Megawatt Thermal
NRC	U.S. Nuclear Regulatory Commission
OMB	Office of Management and Budget
PM	Project Manager
PRA	Probabilistic Risk Assessment
RAI	Request for Additional Information
RTR	Research and Test Reactor
SAR	Safety Analysis Report
SER	Safety Evaluation Report
SNM	Special Nuclear Material
SRM	Staff Requirements Memorandum
SSC	Structures, Systems, and Components
TEDE	Total Effective Dose Equivalent
TRTR	National Organization of Test, Research, and Training Reactors
USQ	Unreviewed Safety Questions

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Executive Summary

The five commissioners of the U.S. Nuclear Regulatory Commission (NRC or Commission) and other stakeholders have voiced concerns with the burdensome nature of the license renewal process for non-power reactors. In response to an NRC staff recommendation, the Commission directed the staff to prepare a regulatory basis to consider a rulemaking to streamline and enhance the non-power reactor license renewal process. This document is the result of that direction.

This study documents the results of research and analysis tasks to gather the information necessary for this regulatory basis. First, the study reviewed all pertinent aspects of the Atomic Energy Act of 1954, as amended (AEA), Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, 10 CFR Part 50, NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors" (Agencywide Document Access and Management System (ADAMS) Accession Numbers ML042430055, ML042430048), and other regulatory guidance that impacts non-power reactor licensing or license renewal. The purpose of this review was to identify existing constraints and limitations within the current regulatory framework. As a result of this analysis, the study identified four limitations, or "regulatory constraints," related to the existing license renewal process and other regulations: (1) reliance on initial licensing regulations for license renewal; (2) lack of periodic updates to the safety analysis report (SAR); (3) inadequate "timely renewal" provision in 10 CFR 2.109; and, (4) constraints in existing rule language.

Second, the study analyzed the organization and structure of the current NRC regulations that are applicable to both power and non-power reactors to evaluate the potential benefit of segregating non-power reactor regulations into a dedicated Part or Section of the NRC's regulations.

Third, public meetings were held with stakeholders to solicit feedback on concepts and questions related to the license renewal process. The feedback and comments from the public meetings have allowed the NRC to address stakeholder questions and respond to comments early in the process and make appropriate revisions to the regulatory basis.

Fourth, the study undertook a benchmark analysis on other U.S. government agencies (i.e., the Department of Energy (DOE) and the Department of Defense (DOD)), as well as the International Atomic Energy Agency (IAEA), that currently oversee non-power reactors. The benchmarking analysis compared the processes and methodologies used by these organizations to ensure continued safe operation of the reactor and connected systems with NRC processes.

The results of these research efforts and analyses were used to identify and evaluate a range of options to streamline the license renewal process for non-power reactors. These options include a no-action alternative, a non-rulemaking alternative, as well as three rulemaking alternatives. The rulemaking alternatives include three different approaches to addressing the inefficiencies associated with the current process: one option would "fine tune" the current process while also making it more robust; the other two rulemaking options would create a completely new approach by eliminating license terms and renewal.

The regulatory basis analyzes the technical, legal, and policy issues; impacts on public health, safety, and security; impacts on licensees; impacts on the NRC; stakeholder feedback; as well as other considerations. Based on the outcomes of these analyses, a rulemaking appears to be warranted.

Depending on the type of rulemaking the NRC staff decides to pursue, there are a number of recommendations/topics for which the staff may wish to seek Commission approval. These include the following: extending Interim Staff Guidance (ISG) concepts to the preparation of license renewal applications (see Section 7.3); requiring periodic updates of the SAR (see Section 7.4); continuing with the current license renewal paradigm for non-power reactors, or pursuing an alternative paradigm that replaces license terms and license renewals with enhanced inspections or periodic safety reviews and periodic updates to the SARs (see Section 7.5); and addressing some or all of the constraints in existing rule language that extend beyond license renewal (see Section 7.6). (In order to address the constraints in the existing regulations, the NRC would have to undertake additional research efforts that were beyond the scope of this document. See related discussion in Section 5.)

Commission direction will be warranted for two reasons. First, some of the options presented in this document – i.e., those that would address constraints in the existing rule language beyond license renewal – would step outside the bounds of the Commission's staff requirements memoranda (SRMs). Second, the options that would streamline the license renewal process would result in new burdens on non-power reactor licensees, although the staff expects the *overall burden on licensees to decrease*.

1. Introduction

Non-power reactors, which also are referred to as research and test reactors, are nuclear reactors primarily used for research, training, service, and development. These reactors contribute to various fields of science including physics, chemistry, biology, medicine, geology, archeology, and environmental sciences.

The NRC regulates 42 research and test reactors of which 31 are currently operating. The others are in the process of decommissioning (i.e., removing radioactive material from the facility) or awaiting decommissioning. The decommissioning reactor licensees possess residual radioactive material but no longer operate the reactors. Most research reactors are at universities or colleges in the United States. The only operating test reactor regulated by the NRC is owned by the National Institute of Standards and Technology (NIST). Several other research and test reactors are operated by the DOE and DOD and are not regulated by the NRC. Sections 103 (for commercial or industrial purposes) and 104.a. and c. (for medical therapy and research and development activities) of the AEA establish the NRC's authority to license non-power reactors. At the same time, Sections 104.a. and c. require that the Commission impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public, and permit the widest amount of effective medical therapy possible and widespread and diverse research and development.

As part of its oversight of the 31 operating non-power reactor facilities, the NRC administers an initial licensing process, followed by a license renewal process for those that seek to continue operating beyond their initial license term. Beginning in late 2001, the NRC deferred work on a number of license renewal applications because of higher priority work related to the security initiatives instituted after the terrorist attacks of September 11, 2001. As time passed, the number of unprocessed renewals increased and the NRC found itself facing a significant backlog of license renewal applications ("the backlog").

Once the backlog developed and persisted, the Commission and other stakeholders voiced concerns not only about the backlog of non-power reactor license renewal applications, but also about the burdensome nature of the non-power reactor license renewal process itself.

The Commission issued SRM-M080317B, entitled, "Briefing on State of NRC Technical Programs" (ML080940439), which directed the NRC staff to "examine the license renewal process for non-power reactors to identify and implement efficiencies that will streamline this process while ensuring that adequate protection of public health and safety are maintained."

On October 24, 2008, in SECY-08-0161, "Review of Research and Test Reactor License Renewal Applications" (ML082550140), the NRC staff provided the Commission with plans to improve the license renewal application review process for non-power reactors. SECY-08-0161 described feedback from a public meeting that the NRC staff held with stakeholders to gather input on the current process, ways it could be improved, and the options the NRC staff were considering for improving the review process. In the SECY paper, the NRC staff described five methodologies for streamlining the license renewal process:

- Alternate Safety Review Approach: This methodology would limit the review of license renewal applications to changes to the facility, compliance with the current regulations, previous NRC analysis, and the inspection process.

- Graded Approach: This methodology would base the areas of review on the relative risk associated with the facilities applying for a renewed license. This would ensure safe operation by identifying the inherent risk associated with the various facilities and minimizing those risks.

- Generic Analysis Approach: This methodology would require the NRC to review and approve a generic design. Licensees with a similar design would confirm that their facility is bounded by the generic analysis.

- Generic Siting Analysis: This methodology would require the NRC to develop a generic communication that contains information related to each of the sites. The licensees could then reference this generic communication in their license renewal submittals.

- Extended License Term: This methodology would permit extended/indefinite terms for non-power reactor licensees if licensees can demonstrate that there are no aging concerns.

The Commission issued SRM-SECY-08-0161, dated March 26, 2009 (ML090850159), and instructed the NRC staff to proceed with several actions. First, the Commission directed staff to immediately implement short-term program initiatives to address the backlog of license renewal applications. The Commissioners indicated that the NRC staff should complete the review of outstanding applications within 18 months. Second, the Commission instructed the staff to develop an Interim Staff Guidance (ISG) document that employs the graded approach used by staff to streamline the license renewal application process. Third, the Commission directed the NRC staff to submit a long-term plan for an enhanced non-power reactor license renewal process. The Commission requested that the plan include development of a basis for redefining the scope of the process as well as a recommendation regarding the need for rulemaking and guidance development.

In response to the Commission's first two requests on short-term actions, the staff conducted several public meetings with stakeholders, developed "Interim Staff Guidance on the Streamlined Review Process for License Renewal for Research Reactors" (ML092240244), and allocated additional NRC staff and contractor staff to review applications in the backlog.

To address the Commission's third request regarding long-term plans, the NRC staff issued SECY-09-0095 (ML091410581), dated June 24, 2009, to provide the Commission with a long-term plan for enhancing the non-power reactor license renewal process and a draft of the ISG. The NRC staff's long-term plan focused on rulemaking and development of coordinating guidance. In the plan, the NRC staff proposed to develop a draft regulatory basis to support proceeding with rulemaking to streamline and enhance the non-power reactor license renewal process.

In response to SECY-09-0095, the Commissioners issued SRM-M090811 (ML092380046), dated August 26, 2009, entitled "Staff Requirements Memorandum – Briefing on Research and Test Reactor (RTR) Challenges." In response to the NRC staff's long-term plan, which included the possibility of rulemaking, the Commissioners directed staff to "accelerate the rulemaking to establish a more efficient, effective and focused regulatory framework, and inform the Commission of the resources needed and impacts on other activities."

This regulatory basis document responds to the Commission direction by identifying regulatory constraints associated with the license renewal process as well as regulatory issues beyond license renewal. The document presents various options to address the regulatory constraints associated with the license renewal process and other constraints associated with existing regulations. Changes in regulations needed to resolve the identified issues are explained, and legislative, regulatory, legal, policy, implementation, and other issues the NRC might need to consider are discussed. Each option is described and the likely impacts, including the nature and magnitude of expected benefits and costs are identified. Based on this analysis, the regulatory basis concludes that a rulemaking is warranted.

Methodology

This study reflects the results of several lines of research and analysis to gather the information necessary for the regulatory basis. First, it reviewed all pertinent aspects of the AEA, 10 CFR Part 20, 10 CFR Part 50, NUREG-1537, and other pertinent regulatory guidance that impacts non-power reactor licensing or license renewal. The purpose of this review was to identify existing constraints and limitations within the existing regulatory framework. The analysis also included significant insights from NRC staff. Further detail on the regulatory review, including a table with the results of the analysis, is provided in Table 1 (see Section 3).

Second, the study analyzed the organization and structure of the current regulations in 10 CFR Chapter I (Parts 1-199) that are applicable to nuclear reactors to evaluate the benefit of segregating non-power reactor regulations into a dedicated Part or Section of Chapter I.

Third, additional research was conducted on other government agencies and governing organizations (i.e., DOE, DOD, and IAEA) that currently operate non-power reactors in order to conduct a benchmarking analysis of the processes and methodologies used by these organizations to ensure continued safe operation of the reactor and connected systems. (Further detail on the benchmarking analysis is provided in Appendix 1.)

Fourth, public meetings were held with stakeholders to solicit feedback on concepts and questions related to the license renewal process. Appendix 2 provides summaries of these meetings.

The remainder of this regulatory basis document is organized as follows:

- Section 2 summarizes the current license renewal application process.

- Section 3 describes the constraints that exist within non-power reactor regulatory framework, and explains why a rulemaking is needed to remedy these issues. Some of the issues are specific to the license renewal process, while other issues go beyond license renewal.

- Section 4 provides an analysis of each of the options identified to make the license renewal process more efficient, effective, and focused.

- Section 5 considers options identified to address non-power reactor regulatory issues beyond those associated with license renewal.

- Section 6 addresses the applicability of the NRC's requirements for backfit analysis, Regulatory Flexibility Act analysis, environmental analysis, and Safety Goal Evaluation

to the recommended rulemaking and also whether there is a need for a peer review of the regulatory basis.

- Section 7 presents the conclusions of the analysis.

2. Current License Renewal Process

This section provides background on the current license renewal application process.

Before 1975, license renewals for non-power reactors were accomplished by an administrative license amendment. In 1975, the NRC legal staff determined that the duration of an operating license can only be extended by a license renewal and that the license renewal process for a non-power reactor was analogous to reissuance of the license. The scope of license renewal applications and license reviews were essentially the same as those for an original license. Beginning in 1996 when the NRC issued NUREG-1537, the NRC recommended that licensees follow the guidance in Part 1 of that document, which prescribes the content for non-power reactor SARs.

Current Process (ISG)

Since October 2009, the NRC staff has reviewed license renewal applications according to the "Interim Staff Guidance on the Streamlined Review Process for License Renewal for Research Reactors." The ISG presents a streamlined review process that the NRC staff developed to address a backlog in license renewal applications and continues to apply to current license renewal application reviews. The ISG identifies the following three sections of the SAR as the most safety-significant: (1) reactor design and operation; (2) accident analysis; and (3) technical specifications. The ISG also calls for the NRC staff to review information on radiation protection, waste management programs, and financial requirements.[1] The ISG process uses a graded approach based on the licensed power level of a facility.[2]

- Facilities with licensed power of less than 2 megawatts thermal (MW(t)) undergo a review that focuses on the most safety-significant aspects of the renewal application (i.e., reactor design and operation, accident analysis, and technical specifications) and considers the decisions and precedents set by past NRC reviews. There are currently 26 facilities that are licensed at under 2 MW(t).

- Facilities with licensed power levels of 2 MW(t) and greater undergo a full review using the Standard Review Plan in NUREG-1537. In other words, the applications receive a full review as if they were for a new license. Currently, this applies to five facilities.

[1] The ISG provides the NRC staff with flexibility to examine other areas of the application, if necessary.

[2] The Regulatory Basis considered other graded approaches, but concluded that the approach in the ISG, coupled with extra streamlining features, is an appropriate decision-point for the graded approach. The technical basis for the 2 MW(t) threshold is stated as follows in the ISG: "A power level of 2 MW(t) or greater is a longstanding regulatory demarcation of risk. The inspection program uses this power level to define Class I reactors, where the staff completes the inspection program on an annual cycle rather than biennially, as is the case for reactors with a power level of less than 2 MW(t). In addition, these facilities have emergency planning zones that extend beyond the facility boundary, unlike lower powered RTRs. This demarcation also recognizes that fission product inventories increase with power levels. Fission product inventory is related to the potential dose under accident conditions. This demarcation is also consistent with insights gained from the RTR security assessments. Reactors at or above this power level have enhanced security requirements and need to protect against sabotage, in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 73.60(f)" (ADAMS Accession Number ML092240244, pp. 1-2).

Lessons Learned in Piloting the ISG

As an outcome of the ISG piloting process, the staff identified and addressed a variety of issues that are summarized here as lessons learned. These lessons learned have not yet been incorporated into the guidance, however:

(1) *Licensee Loss of Licensing Basis*. The NRC staff discovered through the license renewal process that for most licensees, the documentation describing the details of their licensing basis, including their design basis calculations, could not be provided. As stated in NUREG-1537, Part 2, "the NRC staff encourages non-power reactor licensees to maintain current SARs on file at the NRC after initial licensing or license renewal by submitting replacement pages along with applications for license amendment and along with the annual report that summarizes changes made without prior NRC approval under 10 CFR 50.59." Based on the NRC staff's experience with the SARs submitted as part of license renewal applications, this guidance was not heeded by most non-power reactor licensees. Moreover, it was difficult for many licensees to document the necessary updates long after the fact (due to staff turnover and other factors). Section 3.2 discusses this issue in more detail.

(2) *Use of an Acceptance Review Process.* To improve the quality of license renewal applications received from licensees, the license renewal process could benefit from added steps and tools (e.g., checklists, templates):

- Letters sent to licensees in advance of application deadlines that would provide content expectations for an acceptable license renewal application.
- Checklist in NUREG-1537 to identify the required components of an SAR.
- "Template" for technical specifications. The format and content would be consistent with NUREG-1537 and ANSI/ANS-15.1-2007, "The Development of Technical Specifications for Research Reactors."

(3) *Use of Past Safety Evaluations.* Although the ISG allows the NRC staff to apply past safety evaluations of the facility as an acceptable basis for some parts of the license renewal application, these past safety evaluations sometimes proved to be insufficient. Revised implementation guidance could clarify when past safety evaluations are acceptable for use.

(4) *Lack of Sufficient Detail on Relevant Aging Related Topics.* A number of aging related issues need to be more clearly addressed in license renewal applications. During the license renewal application reviews, the NRC staff issued requests for additional information (RAIs) on a variety of aging related topics:

- pool leaks,
- heat exchanger failures,
- embedded or underground piping leaks,

- containment or confinement integrity,
- active and passive ECCS component water,
- primary coolant storage tank integrity,
- emergency electric power supply,
- changes in critical dimensions or tolerances of safety related components affecting reactivity or cooling,
- changes in topography or flora on site affecting environmental monitoring or effluent control points,
- TRIGA fuel cladding that is more than 40 years old, and
- obsolescence of security and notification systems infrastructure.

(5) *Thermal-hydraulics and Neutronics Characteristics.* License renewal applications provided the NRC staff with a body of information on thermal-hydraulics and neutronics characteristics for a large set of TRIGA configurations. This information could be documented in guidance for use in future license renewals to minimize the amount of computer analysis required (i.e., by applying a generic analysis approach to the license renewal process). As a result, licensees with TRIGA configurations could confirm that their facility is bounded by the generic thermal-hydraulics and neutronics characteristics. However, evaluations by the DOE in support of the Reduced Enrichment for Research and Test Reactors program determined that this approach is very difficult to put into practice because of the significant variables involved in the calculations.

Collectively, these topics resulted in many rounds of RAIs during license renewal and created additional burden on both licensees and the NRC staff. Permanently addressing these topics could help mitigate burden on both licensees and the NRC staff in the future. The regulatory constraints that contributed to some of these lessons learned are discussed in the next Section.

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3. Regulatory Constraints

The legislation, regulations, guidance documents, industry standards, and staff documentation related to license renewal applications (including requests for additional information that are pertinent to non-power reactor licensing and license renewal applications) contain requirements, policies, and procedures that impact, constrain, or limit the license renewal process for non-power reactors. All of these serve to constrain the regulatory process used for the renewal of non-power reactor licenses. A full regulatory review of these license renewal-related documents is presented in Table 1 at the end of this section.

There also are regulatory constraints associated with requirements not directly related to license renewal. This section discusses both license renewal-related regulatory constraints and other regulatory constraints related to non-power reactors.

3.1 Regulatory Constraint #1: Reliance on initial licensing regulations for license renewal

The first regulatory constraint associated with the license renewal process is the reliance on initial licensing regulations. Unlike power reactor licensees, non-power reactor licensees are not subject to explicitly-identified license renewal regulatory requirements. The current non-power reactor license renewal process is essentially the same as for initial licensing of the facility. As a result, non-power reactor license renewal applications must comply with the same general standards and criteria as an application for a new license.

There are two concerns with this regulatory design. First, imposing initial licensing requirements for license renewal is considered inefficient by some stakeholders. There may be areas of the initial application that can be excluded from the license renewal application. In fact, the ISG developed by the NRC staff focuses the review of license renewal applications submitted for non-power reactors with power levels less than 2 MW(t) on three sections of the SAR. These sections, which are identified as the most safety-significant, are: (1) reactor design and operation; (2) accident analysis; and (3) technical specifications. The ISG also calls for the NRC staff to review information on radiation protection, waste management programs, and financial requirements.

Second, there is a lack of a regulatory basis for the current approach to license renewal. That is, the NRC staff is unable to point to a regulation that establishes the license renewal process.

How a Rulemaking Can Resolve this Constraint

A license renewal rulemaking could resolve this regulatory constraint by codifying regulations specific to the license renewal process. Such a rulemaking would establish clear requirements that specify the scope of license renewal applications relative to applications for initial licenses. A rulemaking also could streamline the license renewal application process by narrowing the scope of the application, or eliminating license terms (and license renewal).

Technical, Legal, and Policy Issues

To address this regulatory constraint, there are several policy issues that the NRC might need to consider. First, if the NRC decides to adopt license renewal regulations, then it would need to decide where in the CFR to place the new requirements. Traditionally, non-power reactor regulations have been embedded within power reactor regulations. However, it may be more effective and efficient to segregate any new regulations into a separate Part or Subpart. The issue of segregating non-power reactor regulations is addressed in Sections 4.3 and 5.5.

Second, if the NRC limits the scope of license renewal applications, a determination of whether to adopt the approach used in the ISG or to implement some other approach would need to be made. This issue is addressed further in Sections 4.2 and 4.3 of this document. In addition, if the NRC limits the scope of license renewal applications, the appropriateness of additional recordkeeping or reporting requirements to provide assurance that the facility's licensing basis remains intact would need to be considered. This issue is addressed in Sections 4.2, 4.3, 4.4, and 4.5.

3.2 Regulatory Constraint #2: Lack of periodic updates to the SAR

A second regulatory constraint related to the license renewal process is that, unlike power reactor licensees, non-power reactor licensees are not required to update their SARs periodically. Licensees generally did not update documentation of their licensing bases during the initial license period. In these cases, the scope of a license renewal application review could not be narrowly focused because it was first necessary to understand the changes that had occurred with regard to the design and operational characteristics of the plant. That is, the license renewal process had to document the current licensing basis at a similar scope and depth to the initial licensing, as a fundamental early step in the renewal process. An insufficiently prepared SAR and license renewal application, therefore, results in an unnecessarily burdensome process for both the licensees and NRC staff. This has led to inefficiencies and has been a significant factor in exacerbating the backlog.

How a Rulemaking Can Resolve this Constraint

By requiring, through regulation, periodic updates to the SAR, the NRC staff can ensure that a facility's licensing basis is not lost over time. This could provide additional assurance in the continued safe operation of facilities.

Technical, Legal, and Policy Issues

According to Sections 104.a. and c. of the AEA, the Commission may impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public, and permit widespread and diverse research and development. As a result, any regulatory change that results in additional burden on non-power reactors would need to be scrutinized by the NRC staff to ensure that it is consistent with the AEA's minimum regulation standard. To address this regulatory constraint directly, the NRC would need to implement a requirement that would create a new recordkeeping and reporting burden (i.e., updating the SAR and submitting it to the NRC). This issue is addressed in Sections 4.2, 4.3, 4.4, and 4.5.

3.3 Regulatory Constraint #3: "Timely renewal" provision in 10 CFR 2.109

A third regulatory constraint related to the license renewal process is the current "timely renewal" provision in 10 CFR 2.109. Under the current regulations, licensees are allowed to submit license renewal applications as late as 30 days before the expiration of the existing license. The regulation allows a non-power reactor to continue operation as long as the NRC has received a renewal application within 30 days before the expiration of the existing license. This provision presents a challenge to license renewal efforts because thirty days has not provided a sufficient amount of time for NRC staff to adequately assess whether or not the license renewal application is acceptable for review. Because of this, deficiencies in applications had to be addressed through the license renewal RAI process. The inadequacy of the 30-day period was highlighted in the numerous instances where a license renewal application did not contain the requisite information. Consequently, the staff issued more RAIs than would otherwise have been required if the schedule had permitted an adequate acceptance review and sufficient time for licensees to address any deficiencies found. This resulted in an increased burden on both the licensees and NRC staff. If given more time, the NRC staff would be able to reject or refuse to accept an insufficient application without causing an immediate shutdown of the reactor.

How a Rulemaking Can Resolve this Constraint

By changing the "timely renewal" provision to require license renewal applications further in advance of license expiration, the number of RAIs issued during the formal review could be reduced. This would streamline the license renewal process by reducing the overall burden on both licensees and NRC staff.

Technical, Legal, and Policy Issues

To address this regulatory constraint, the NRC would need to determine how much time to allow for conducting an adequate acceptance review and for licensees to address deficiencies, if found. This issue is addressed in Section 4.3.

3.4 Regulatory Constraint #4: Constraints in Existing Rule Language

This study identified five "technical" issues with the existing regulations that apply to non-power reactors. These issues go beyond license renewal because they apply more generally to non-power reactors or non-power reactor licensing.[3] The five technical issues are described as follows.

3.4.1 Organization and Presentation of Non-Power Reactor Licensing Requirements

First, NRC's non-power reactor licensing regulations are spread across 10 CFR Chapter I, beginning in Part 2 and ending in Part 171. Many of the licensing regulations apply both to power reactors and non-power reactors and are integrated together. Absent an updated "roadmap" (such as the one contained in NUREG-1537, which is outdated) non-power reactor licensees have to read through each of these Parts in its entirety to determine which licensing requirements apply to their facilities. The regulatory structure and organization make it difficult to identify all of the regulations applicable to non-power reactors. Therefore, it is reasonable for the NRC to consider the benefit gained from segregating some or all of the non-power reactor licensing requirements into fewer places in Chapter I.

In addition, several NRC guidance documents and various standards issued by the American National Standards Institute apply to non-power reactors. The most consolidated source of information regarding non-power reactor licensing is within a guidance document (i.e., NUREG-1537), but it can be difficult linking the guidance to specific regulatory requirements.

How a Rulemaking Can Resolve this Constraint

A rulemaking would address this regulatory constraint by segregating the non-power reactor licensing regulations into a separate Part or Subpart to clearly identify the applicable requirements.

Technical, Legal, and Policy Issues

If the NRC takes this approach, how to present the newly segregated regulations would need to be considered. For example, there could be a separate Part or Subpart in Chapter I that includes regulatory references to the relevant non-power reactor licensing requirements. In addition, the NRC would need to decide whether to update or enhance NUREG-1537's current "roadmap."

[3] In other words, they impact licensing and only impact license renewal because it currently uses the same process.

3.4.2 Lack of a Technical Basis for the Definition of Testing Facility

Second, several sections of the regulations apply to testing facilities only. The technical basis for this limited applicability generally is based on safety significance. The definition for a testing facility uses a power level threshold of greater than 10 MW(t), but the technical basis associated with this threshold is not documented.

For the purposes of streamlined license renewal reviews, the ISG uses the power level of 2 MW(t) or greater, which is a longstanding regulatory demarcation of risk. The ISG explains:

> "The inspection program uses this power level to define Class I reactors, where the staff completes the inspection program on an annual cycle rather than biennially, as is the case for reactors with a power level of less than 2 MW(t). In addition, these facilities have emergency planning zones that extend beyond the facility boundary, unlike lower powered RTRs. This demarcation also recognizes that fission product inventories increase with power levels. Fission product inventory is related to the potential dose under accident conditions. This demarcation is also consistent with insights gained from the RTR security assessments. Reactors at or above this power level have enhanced security requirements and need to protect against sabotage, in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 73.60(f)."

The technical basis for the 10 MW(t) threshold should be documented to ensure that the rule applies suitable technical standards to the appropriate types or classes of non-power reactors. Rule sections with limited applicability include 10 CFR 50.30(f), 50.58(a), 50.71(b), Appendix C to Part 50, 51.20(b)(2), 51.21, and Part 100.

How a Rulemaking Can Resolve this Constraint

As a first step, the NRC would need to determine if the 10 MW(t) threshold is an appropriate regulatory demarcation of risk for testing reactors. If the NRC's research and analysis determines that this threshold is not appropriate, then a rulemaking would allow the NRC to address this constraint by updating the definition of testing facility and documenting the technical basis for the new threshold.

Technical, Legal, and Policy Issues

To achieve this, the NRC would need to conduct further research in order to establish or document a technical basis for the definition of testing facility.

3.4.3 Inconsistent Definitions and Terminology

Third, the definitions and terminology in 10 CFR 50.2, 10 CFR 50.22, and 10 CFR 170.3 associated with non-power reactors have some inconsistencies and can result in challenges in the application of the regulations. For example, *testing facility* is defined under 10 CFR 50.2 and 10 CFR 170.3, however the definitions are worded slightly differently.

How a Rulemaking Can Resolve this Constraint

A rulemaking would allow the NRC staff to clarify the terms and definitions for *research reactor, testing facility, non-power reactor, and commercial non-power reactor*.

Technical, Legal, and Policy Issues

To achieve this, the NRC staff would need to conduct further research and analysis in order to establish or document a technical basis for some of the definitions. For example, a commercial non-power reactor is defined at 10 CFR 50.22 as a facility in which more than 50 percent of the annual cost of owning and operating the facility is devoted to the production of materials, products, or energy for sale or commercial distribution, or to the sale of services, other than research and development or education or training. This definition is problematic when a facility does not meet the definition of "commercial" in consecutive years. The regulations do not explain how to classify these facilities when there are year-to-year percentage changes.

The NRC staff also would need to sort out the interdependencies of the definitions in Part 50. For example, the definition of non-power reactor in § 50.2 refers to test reactor, but test reactor is not defined in § 50.2. In 10 CFR 100.3, testing reactor is defined as "a testing facility as defined in § 50.2." The definition of testing facility refers to a reactor described in § 50.21(c) but the definition of non-power reactor refers to a reactor licensed under § 50.21(c) or § 50.22. These interdependencies need clarification in order to eliminate inconsistencies among the definitions.

3.4.4 Lack of Separate Accident Dose Standards for Research Reactors

Fourth, the accident dose standards in 10 CFR Part 100 apply to testing reactors and not research reactors. The regulations lack separate accident dose standards for research reactors. The staff currently can apply only the standards in 10 CFR Part 20 to research reactors, and cannot apply more specific standards for accidents. The NRC Atomic Safety and Licensing Appeal Board has suggested that Part 20 dose standards are too low for research reactors, but the Part 100 dose standards are too high. Therefore, research reactors require a dose standards scheme that is analogous in structure to the Part 100 requirements for testing facilities.

How a Rulemaking Can Resolve this Constraint

A rulemaking would provide the NRC with the opportunity to develop appropriate accident dose standards for non-power reactors, beyond those that already exist for testing facilities.

Technical, Legal, and Policy Issues

To address this regulatory constraint, the NRC would need to conduct further research and analysis in order to identify appropriate dose standards and establish a technical basis for them.

3.4.5 Applicability of Section 50.59 to Permanently Shutdown Non-Power Reactors Without Fuel

Fifth, the wording of 10 CFR 50.59(b) creates an issue concerning the applicability of 10 CFR 50.59 to permanently shutdown non-power reactors where the fuel has been removed from the site. The regulation states that 10 CFR 50.59 is applicable to licensees "whose license has been amended to allow possession of nuclear fuel but not operation of the facility." This wording requires the NRC staff to add license conditions identical to those anticipated by 10 CFR 50.59 even though fuel has been removed from the site and there is no further need for possession. It is important to maintain the applicability of Section 50.59 to these non-power reactors because there could be changes needed even though the reactor is shutdown and without fuel (e.g., radiation protection methods or radioactive waste management).

How a Rulemaking Can Resolve this Constraint

A rulemaking would allow the NRC staff to revise 10 CFR 50.59(b) so that the section would apply to non-power reactors who have removed fuel from their sites and thereby avoid the need for a license condition.

Technical, Legal, and Policy Issues

There are no technical, legal, or policy issues associated with a change to this regulation.

Table 1: Regulatory Review

This regulatory review identifies constraints and limitations in the existing regulatory framework and assesses how they contribute to the issues the NRC staff have faced during the license renewal process for non-power reactors. Pertinent regulations for the non-power reactor license renewal process include 10 CFR 2.109, "Effect of Timely Renewal Applications"; 10 CFR Part 20, "Standards for Protection Against Radiation"; 10 CFR 50.33, "Contents of Applications – General Information"; 10 CFR 50.34, "Contents of Construction Permit and Operating License Applications – Technical Information"; 10 CFR 50.36, "Technical Specifications"; 10 CFR 50.54, "Conditions of Licenses"; 10 CFR 50.75, "Reporting and Recordkeeping for Decommissioning Planning"; 10 CFR Part 73, "Physical Protection of Plants and Materials"; and 10 CFR Part 100, "Reactor Site Criteria" (for test reactors only). Pertinent guidance for the review of non-power reactor license renewal includes NUREG-1537, Parts 1 and 2, dated February 1996. The regulatory review also encompassed office instructions, the ISG, industry standards, staff documentation related to license renewal applications including requests for additional information, and 10 CFR Parts 19, 30, 51, 70, 170, and 171, in order to fully evaluate all of the applicable requirements and identify the full realm of non-power reactor licensing requirements and guidance.

The study also considered several other documents including the SECY papers relevant to the non-power reactor license renewal process and the "Non-Power Reactor Project Manager's Handbook" (ML020950886). Also, the review considered staff analyses in SECY papers, lessons learned documentation, and discussions with NRC non-power reactor project managers. The following table provides findings from the regulatory review.

Table 1. Documented Review of Selected Existing Legislation, Regulations, and Guidance

Citation	Text Excerpt	Description	Constraints and Limitations
AEA, Section 103(c)	"Each such license shall be issued for a specified period, as determined by the Commission, depending on the type of activity to be licensed, but not exceeding forty years from the authorization to commence operations and may be renewed upon the expiration of such period."	This section of the AEA establishes the license term for commercial reactors, which *may* include non-power reactors.	These provisions limit the license term for non-power reactors that are class 103 licensees.

Citation	Text Excerpt	Description	Constraints and Limitations
AEA, Section 104(a)	"The Commission is authorized to issue licenses to persons applying therefore for utilization facilities for use in medical therapy. In issuing such licenses the Commission is directed to permit the widest amount of effective medical therapy possible with the amount of special nuclear material available for such purposes and to impose the minimum amount of regulation consistent with its obligations under this Act to promote the common defense and security and to protect the health and safety of the public."	This section of the AEA establishes the NRC's authority to license facilities for use in medical therapy, which could include non-power reactors. It authorizes the Commission to impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public.	The language used in the AEA is a fundamental constraint that the NRC faces with regard to any potential regulatory change for non-power reactors. If a regulatory change is needed, then the new requirement will need to be evaluated to make sure it complies with the minimum regulation criterion set forth in the AEA.
AEA, Section 104(c)	"The Commission is authorized to issue licenses to persons applying therefore for utilization and production facilities useful in the conduct of research and development activities of the types specified in section 31 and which are not facilities of the type specified in subsection 104b. The Commission is directed to impose only such minimum amount of regulation of the licensee as the Commission finds will permit the Commission to fulfill its obligations under this Act to promote the common defense and security and to protect the health and safety of the public and will permit the conduct of widespread and diverse research and development."	This section of the AEA establishes the NRC's authority to license research and test reactors. It allows the Commission to impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public, and permit widespread and diverse research and development.	The language used in the AEA is the fundamental constraint that the NRC faces with regard to any contemplated regulatory change for non-power reactors. If a regulatory change is needed, then the new requirements will need to be evaluated to make sure they comply with the minimum regulation criterion set forth in the AEA.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR Part 2	10 CFR 2.1: “This part governs the conduct of all proceedings, other than export and import licensing proceedings described in part 110, under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, for -- (a) Granting, suspending, revoking, amending, or taking other action with respect to any license, construction permit, or application to transfer a license; (b) Issuing orders and demands for information to persons subject to the Commission's jurisdiction, including licensees and persons not licensed by the Commission; (c) Imposing civil penalties under Section 234 of the Act; (d) Rulemaking under the Act and the Administrative Procedure Act; and (e) Standard design approvals under part 52 of this chapter.” 10 CFR 2.109(a): “if at least 30 days before the expiration of an existing license authorizing any activity of a continuing nature, the licensee files an application for a renewal or for a new license for the activity so authorized, the existing license will not be deemed to have expired until the application has been finally determined.”	This part discusses the procedures for various actions, such as the issuance, amendment, transfer, or renewal of a license. One provision (10 CFR 2.109(a)) allows a non-power reactor to continue operating until the NRC makes a final decision on the renewal, so long as the licensee submitted the renewal application 30 days before expiration.	In general, the provisions in 10 CFR Part 2 do not significantly constrain or limit the license renewal process. Although Part 2 does require hearings and public notice for certain licensing actions, these requirements do not appear to be the source of inefficiencies in the non-power reactor license renewal process. However, 10 CFR 2.109(a) does not ensure that the NRC staff will have sufficient time to address low-quality non-power reactor license renewal applications except by rejecting them, in which case the licensee would have to cease operations on the date the license expires. If the license renewal application is submitted further in advance of the license expiration, then the NRC staff has more time to evaluate and comment on the acceptability of the application, and the licensee can address those concerns before having to cease operations.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR Part 20	"The regulations in this part establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the Nuclear Regulatory Commission."	These requirements provide the basis for a finding that a renewed license will be in compliance with the regulations. In particular, licensees must demonstrate that the radiation protection program and waste management will be conducted in compliance with the regulations in 10 CFR Part 20. In addition, research reactors' accident analyses are compared to 10 CFR Part 20 criteria.	Because much of the accident analysis is geared toward the maximum hypothetical accident (MHA) and radiological consequences, licensees are expected to provide detailed analysis in the SAR for meeting these 10 CFR Part 20 requirements. The current regulations constrain and limit the license renewal process because licensees are not *required* to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated." In addition, another issue that should be considered is the applicable regulations for accident analyses at research reactors versus test reactors. Accident analyses for research reactors are evaluated relative to 10 CFR Part 20 criteria, while testing reactor criteria are in 10 CFR Part 100. Research reactors should have specific accident dose limits.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50. 2	*"Non-power reactor* means a research or test reactor licensed under §§ 50.21(c) or 50.22 of this part for research and development." "*Testing facility* means a nuclear reactor which is of a type described in § 50.21(c) of this part and for which an application has been filed for a license authorizing operation at: (1) A thermal power level in excess of 10 megawatts; or (2) A thermal power level in excess of 1 megawatt, if the reactor is to contain: (i) A circulating loop through the core in which the applicant proposes to conduct fuel experiments; or (ii) A liquid fuel loading; or (iii) An experimental facility in the core in excess of 16 square inches in cross-section."	These definitions, in conjunction with the definitions in 10 CFR 170.3 and 10 CFR 50.22, identify the entities affected by the licensing requirements.	These regulatory definitions do not significantly constrain or limit the license renewal process. However, the terminology is considered inconsistent and may contribute to difficulty interpreting the regulations. The definition for a commercial non-power reactor (as specified in Section 50.22) also contributes to confusion and could be clarified. For example, the definition of non-power reactor in § 50.2 refers to test reactor, but, test reactor is not defined in § 50.2. In 10 CFR 100.3, testing reactor is defined as "a testing facility as defined in § 50.2." The definition of testing facility refers to a reactor described in § 50.21(c) but the definition of non-power reactor refers to a reactor licensed under § 50.21(c) or § 50.22, which is an inconsistency. In addition, with regard to the definition of testing facility, the 10 megawatt threshold affects the licensing process used for testing facilities. However, the technical basis for this threshold is not documented.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.10	"(b) Requirement for license. Except as provided in §50.11 of this chapter, no person within the United States shall transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, or use any production or utilization facility except as authorized by a license issued by the Commission. (c) Requirement for construction permit, early site permit authorizing limited work authorization activities, combined license, or limited work authorization. No person may begin the construction of a production or utilization facility on a site on which the facility is to be operated until that person has been issued either a construction permit under this part, a combined license under part 52 of this chapter, an early site permit authorizing the activities under paragraph (d) of this section, or a limited work authorization under paragraph (d) of this section. (d) Request for limited work authorization. (1) Any person to whom the Commission may otherwise issue either a license or permit under Sections 103, 104.b, or 185 of the Act for a facility of the type specified in §§ 50.21(b)(2), (b)(3), or 50.22 of this chapter, or a testing facility, may request a limited work authorization …."	This section describes the requirement of a license and allows for testing facilities to request limited work authorizations for construction activities.	These requirements do not significantly constrain or limit the license renewal process.
10 CFR 50.20	"Licenses will be issued to named persons applying to the Commission therefore, and will be either class 104 or class 103."	This section states that a Part 50 license is either class 104 (medical therapy and research and development licenses) or class 103 (commercial licenses).	These requirements do not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.21	"A class 104 license will be issued, to an applicant who qualifies, for any one or more of the following: to transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, or use. (a) A utilization facility for use in medical therapy; or (b)(1) A production or utilization facility the construction or operation of which was licensed pursuant to subsection 104b of the Act prior to December 19, 1970; (2) A production or utilization facility for industrial or commercial purposes constructed or operated under an arrangement with the Administration entered into under the Cooperative Power Reactor Demonstration Program, except as otherwise specifically required by applicable law; and (3) A production or utilization facility for industrial or commercial purposes, when specifically authorized by law. (c) A production or utilization facility, which is useful in the conduct of research and development activities of the types specified in section 31 of the Act, and which is not a facility of the type specified in paragraph (b) of this section or in § 50.22."	This section defines the types of facilities covered by a class 104 license. Non-power reactors fall under Section 50.21(a) and (c).	These requirements do not significantly constrain or limit the license renewal process. However, this section defines the majority of non-power reactor facilities that would be affected by a rulemaking.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.22	"A class 103 license will be issued, to an applicant who qualifies, for any one or more of the following: To transfer or receive in interstate commerce, manufacture, produce, transfer, acquire, possess, or use a production or utilization facility for industrial or commercial purposes; *Provided, however,* That in the case of a production or utilization facility which is useful in the conduct of research and development activities of the types specified in section 31 of the Act, such facility is deemed to be for industrial or commercial purposes if the facility is to be used so that more than 50 percent of the annual cost of owning and operating the facility is devoted to the production of materials, products, or energy for sale or commercial distribution, or to the sale of services, other than research and development or education or training."	This section defines the types of facilities covered by a class 103 license.	These requirements do not significantly constrain or limit the license renewal process. However, this section defines commercial non-power reactors, which contributes to confusion and could be clarified. Application of this regulation could be problematic. For example, if a non-power reactor meets the definition of "commercial" one year and then the next does not, it is not clear what steps would need to be taken from year-to-year.
10 CFR 50.30(f)	"Environmental report. An application for a construction permit, operating license, early site permit, combined license, or manufacturing license for a nuclear power reactor, testing facility, fuel reprocessing plant, or other production or utilization facility whose construction or operation may be determined by the Commission to have a significant impact in the environment, shall be accompanied by an Environmental Report required under subpart A of part 51 of this chapter."	This paragraph requires an environmental report to be submitted as required under subpart A of 10 CFR Part 51 as part of a testing facility's license renewal application.	This regulation places a constraint on the testing facility license renewal process by requiring environmental reports. The technical basis for the applicability of this requirement to testing facilities should be confirmed. (Note: the NRC also may request environmental reports for license renewal applications under 10 CFR 51.41.)
10 CFR 50.32	"In his application, the applicant may incorporate by reference information contained in previous applications, statements or reports filed with the Commission: provided, that such references are clear and specific."	This section allows the licensee to incorporate by reference information filed previously with the NRC.	This provision does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.33(a)-(e)	"Each application shall state: (a) Name of applicant; … (e) The class of license applied for, the use to which the facility will be put, the period of time for which the license is sought, and a list of other licenses, except operator's licenses, issued or applied for in connection with the proposed facility."	Paragraphs (a) through (e) require that license renewal applications contain information regarding identity, citizenship, affiliation, and proposed use.	These regulations do not significantly constrain or limit the license renewal process.
10 CFR 50.33(f)	"Each application shall state: …information sufficient to demonstrate to the Commission the financial qualification of the applicant to carry out, in accordance with regulations in this chapter, the activities for which the permit or license is sought. … Applicants to renew or extend the term of an operating license for a non-power reactor shall include the financial information that is required in an application for an initial license."	Paragraph (f) requires information to demonstrate the financial qualification of the licensee to support operation of the non-power reactor facility for the duration of the license period. The financial information required for license renewal must include the financial information that is required in an application for an initial license.	These regulations do not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.33(k)	"(1) For an application for an operating license or combined license for a production or utilization facility, information in the form of a report, as described in § 50.75, indicating how reasonable assurance will be provided that funds will be available to decommission the facility."	Paragraph (k) requires a report pursuant to 10 CFR 50.75, "Reporting and Recordkeeping for Decommissioning Planning," indicating how reasonable assurance will be provided that funds will be available to decommission the facility.	The current regulations constrain and limit the license renewal process because licensees are not required by regulation to update this information over time. A decommissioning plan is submitted as part of the initial license application, and licensees commit to updating that plan over time. However, if licensees are not carrying out those updates according to plan, then the information becomes outdated. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal.
10 CFR 50.34(b)	"Final safety analysis report. Each application for an operating license shall include a final safety analysis report. The final safety analysis report shall include information that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components and of the facility as a whole, and shall include the following:…."	Paragraph (b) requires a final SAR, which describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components (SSC) and of the facility as a whole.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.34(c)	"Physical Security Plan. (1) Each applicant for an operating license for a production or utilization facility that will be subject to §§ 73.50 and 73.60 of this chapter must include a physical security plan. (2) Each applicant for an operating license for a utilization facility that will be subject to the requirements of § 73.55 of this chapter must include a physical security plan, a training and qualification plan in accordance with the criteria set forth in appendix B to part 73 of this chapter, and a cyber security plan in accordance with the criteria set forth in § 73.54 of this chapter. (3) The physical security plan must describe how the applicant will meet the requirements of part 73 of this chapter (and part 11 of this chapter, if applicable, including the identification and description of jobs as required by § 11.11(a) of this chapter, at the proposed facility). Security plans must list tests, inspections, audits, and other means to be used to demonstrate compliance with the requirements of 10 CFR parts 11 and 73, if applicable."	Paragraph (c) (in addition to 10 CFR 73.67) requires non-power reactors to include their physical security plan in the renewal application.	According to Section 50.54(p), non-power reactors may not make changes that decrease the effectiveness of physical security plans without prior NRC approval although they may make changes that do not decrease the effectiveness of the plans. As a result, the current regulations do not significantly constrain or limit the license renewal process. Applicability is determined based on special nuclear material (SNM) possession quantities. This regulatory structure could be clarified.
10 CFR 50.34(e)	"Protection against unauthorized disclosure. Each applicant for an operating license for a production or utilization facility, who prepares a physical security plan, a safeguards contingency plan, a training and qualification plan, or a cyber security plan, shall protect the plans and other related Safeguards Information against unauthorized disclosure in accordance with the requirements of § 73.21 of this chapter."	Paragraph (e) requires that non-power reactor licensees protect their security plans in accordance with Section 73.21.	The current regulations do not significantly constrain or limit the license renewal process. However, applicability is determined based on possession quantities. Non-power reactor facilities with less than Section 73.21 quantities protect their plans under 10 CFR 2.390. This regulatory structure could be clarified.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.36	"Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section."	This section provides the requirements for the technical specifications that have to be prepared by applicants for operating licenses including those for all non-power reactors. The NRC staff must review technical specifications during the license renewal process. When reviewing the technical specifications, the NRC staff also reviews the SAR analyses to ensure that the analyses are up to date and correct.	This regulation does not significantly constrain or limit the license renewal process. However, in SECY-09-0095, Enclosure 2, the NRC staff suggested that ANS-15.1 provides a structure for non-power reactors to use to produce consistent technical specification submittals for license renewal. Although NUREG-1537, Part 1, Appendix 14.1 recommends that the format and content of the proposed Technical Specifications follow the recommendations of ANSI/ANS-15.1, license renewal applications do not consistently conform to the guidance in NUREG-1537.
10 CFR 50.38	"Any person who is a citizen, national, or agent of a foreign country, or any corporation, or other entity which the Commission knows or has reason to believe is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government, shall be ineligible to apply for and obtain a license."	This section provides limitations on the entities that may apply for and hold a license under Part 50.	This regulation does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.40(a)	"Except for an early site permit or manufacturing license, the processes to be performed, the operating procedures, the facility and equipment, the use of the facility, and other technical specifications, or the proposals, in regard to any of the foregoing collectively provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in part 20 of this chapter, and that the health and safety of the public will not be endangered."	This paragraph requires the applicant to explain the technical specifications of the facility and equipment so that staff may determine if there is reasonable assurance that the applicant will comply with the regulations.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal. In addition, in SECY-09-0095, Enclosure 2, the NRC staff suggested that ANS-15.1 provides a structure for non-power reactors to use to provide consistent technical specification submittals for license renewal. Although NUREG-1537, Part 1, Appendix 14.1 recommends that the format and content of the proposed Technical Specifications follow the recommendations of ANSI/ANS-15.1, license renewal applications do not consistently conform to the guidance in NUREG-1537.
10 CFR 50.40(b)	"The applicant for a construction permit, operating license, combined license, or manufacturing license is technically and financially qualified to engage in the proposed activities in accordance with the regulations in this chapter."	This paragraph requires non-power reactor renewal applicants to demonstrate they are technically and financially qualified to operate the facility.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.40(c)	"The issuance of a construction permit, operating license, early site permit, combined license, or manufacturing license to the applicant will not, in the opinion of the Commission, be inimical to the common defense and security or to the health and safety of the public."	This paragraph establishes another standard for the issuance of a license renewal. The NRC staff must find that operation of the facility is not harmful to the common defense and security or public health and safety.	This provision does not significantly constrain or limit the license renewal process.
10 CFR 50.40(d)	"Any applicable requirements of subpart A of 10 CFR part 51 have been satisfied."	This paragraph requires that the applicable environmental assessments have been done to satisfy the National Environmental Policy Act.	The current regulations constrain and limit the license renewal process because there is no regulatory requirement to submit updates of this information over time. Annual operating reports provide some information that can be used to update parts of the environmental assessment (EA) or environmental impact statement (EIS).
10 CFR 50.41(a) & (b)	"In determining that a class 104 license will be issued to an applicant, the Commission will, in addition to applying the standards set forth in § 50.40 be guided by the following considerations: (a) The Commission will permit the widest amount of effective medical therapy possible with the amount of special nuclear material available for such purposes. (b) The Commission will permit the conduct of widespread and diverse research and development."	This section provides additional standards to guide licensing of non-power reactor facilities.	These regulations do not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.51(a)	"Each license will be issued for a fixed period of time to be specified in the license but in no case to exceed 40 years from date of issuance. Where the operation of a facility is involved, the Commission will issue the license for the term requested by the applicant or for the estimated useful life of the facility if the Commission determines that the estimated useful life is less than the term requested … Licenses may be renewed by the Commission upon the expiration of the period."	This paragraph establishes the license term requirements for non-power reactor licensees.	This requirement limits the amount of time a license can last to no more than 40 years (including any additional time granted by a license renewal). As a result, licenses that reach the 40-year limit must be re-licensed such that the NRC would issue a new license. However, because Class 104.a. and c. non-power license terms are defined in regulation only (i.e., not in the AEA), the allowable license term may be changed through the regulatory process, if deemed necessary.
10 CFR 50.54(i) & (i-1)	"(i) Except as provided in § 55.13 of this chapter, the licensee may not permit the manipulation of the controls of any facility by anyone who is not a licensed operator or senior operator as provided in part 55 of this chapter. (i-1) Within 3 months after either the issuance of an operating license or the date that the Commission makes the finding under § 52.103(g) of this chapter for a combined license, as applicable, the licensee shall have in effect an operator requalification program. The operator requalification program must, as a minimum, meet the requirements of § 55.59(c) of this chapter. Notwithstanding the provisions of § 50.59, the licensee may not, except as specifically authorized by the Commission decrease the scope of an approved operator requalification program."	These paragraphs establish the need for operator licensing at non-power reactor facilities.	The current regulations constrain and limit the license renewal process because license renewal may be the only time the NRC may have a chance to review ancillary plans and documentation, such as operator requalification plans. Consequently, the license renewal process is more burdensome than it would be if the plans were kept updated. It also contributes to more RAIs during license renewal.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.54(p)	"(1) The licensee shall prepare and maintain safeguards contingency plan procedures in accordance with appendix C of part 73 of this chapter for affecting the actions and decisions contained in the Responsibility Matrix of the safeguards contingency plan. The licensee may not make a change which would decrease the effectiveness of a physical security plan, or guard training and qualification plan, or cyber security plan prepared under § 50.34(c) or § 52.79(a), or part 73 of this chapter, or of the first four categories of information (Background, Generic Planning Base, Licensee Planning Base, Responsibility Matrix) contained in a licensee safeguards contingency plan prepared under § 50.34(d) or § 52.79(a), or part 73 of this chapter, as applicable, without prior approval of the Commission. A licensee desiring to make such a change shall submit an application for amendment to the licensee's license under § 50.90. 2) The licensee may make changes to the plans referenced in paragraph (p)(1) of this section, without prior Commission approval if the changes do not decrease the safeguards effectiveness of the plan. The licensee shall maintain records of changes to the plans made without prior Commission approval for a period of 3 years from the date of the change, and shall submit, as specified in § 50.4 or § 52.3 of this chapter, a report containing a description of each change within 2 months after the change is made. …"	This paragraph requires licensees that meet SNM quantity possession thresholds to prepare and maintain a safeguards contingency plan, the physical security plan, guard training and qualification plan, and cyber security plan.	According to Section 50.54(p), non-power reactors may not make changes that decrease the effectiveness of security plans without prior NRC approval. They may make changes to their plans without NRC approval as long as the changes do not decrease the effectiveness of the plans. Licensees must notify the NRC within 30 days of changes to plans that do not require prior NRC approval. Consequently, the current regulations do not significantly constrain or limit the license renewal process. However, applicability is determined based on SNM possession quantities (per 10 CFR 73.60). This regulatory structure could be clarified.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.54(q)	"A licensee authorized to possess and/or operate a research reactor or a fuel facility shall follow and maintain in effect emergency plans which meet the requirements in appendix E to this part. … The research reactor and/or the fuel facility licensee may make changes to these plans without Commission approval only if these changes do not decrease the effectiveness of the plans and the plans, as changed, continue to meet the requirements of appendix E to this part. This nuclear power reactor, research reactor, or fuel facility licensee shall retain a record of each change to the emergency plan made without prior Commission approval for a period of 3 years from the date of the change. Proposed changes that decrease the effectiveness of the approved emergency plans may not be implemented without application to and approval by the Commission. The licensee shall submit, as specified in § 50.4, a report of each proposed change for approval. If a change is made without approval, the licensee shall submit, as specified in § 50.4, a report of each change within 30 days after the change is made."	This paragraph requires research reactor licensees to have an emergency plan.	According to Section 50.54(q), non-power reactors may not make changes that decrease the effectiveness of emergency plans without prior NRC approval. They may make changes that do not decrease the effectiveness of the plans. Licensees must notify the NRC within 30 days of changes to plans that do not require prior NRC approval. The applicability of current emergency preparedness regulations is confusing and difficult to discern. Therefore, these requirements constrain and limit the license renewal process.
10 CFR 50.55	"Each construction permit is subject to the following terms and conditions; each early site permit is subject to the terms and conditions in paragraph (f) of this section; each manufacturing license is subject to the terms and conditions in paragraphs (e) and (f) of this section; and each combined license is subject to the terms and conditions in paragraphs (e) and (f) of this section until the date that the Commission makes the finding under § 52.103(g) of this chapter"	This section addresses the conditions of construction permits, early site permits, combined licenses, and manufacturing licenses.	This provision does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.56	"Upon completion of the construction or alteration of a facility, in compliance with the terms and conditions of the construction permit and subject to any necessary testing of the facility for health or safety purposes, the Commission will, in the absence of good cause shown to the contrary, issue a license of the class for which the construction permit was issued or an appropriate amendment of the license, as the case may be."	This section provides for the issuance of a license upon completion of construction or alteration of a facility.	This provision does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.57	"(a) Pursuant to § 50.56, an operating license may be issued by the Commission, up to the full term authorized by § 50.51, upon finding that: (1) Construction of the facility has been substantially completed … and (2) The facility will operate in conformity with the application as amended, the provisions of the Act, and the rules and regulations of the Commission; and (3) There is reasonable assurance (i) that the activities authorized by the operating license can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the regulations in this chapter; and (4) The applicant is technically and financially qualified to engage in the activities authorized by the operating license …. (5) The applicable provisions of Part 140 of this chapter have been satisfied; and (6) The issuance of the license will not be inimical to the common defense and security or to the health and safety of the public. (b) Each operating license will include appropriate provisions with respect to any uncompleted items of construction …. (c) An applicant may … make a motion in writing … for an operating license authorizing low-power testing (operation at not more than 1 percent of full power for the purpose of testing the facility), and further operations short of full power operation…."	This section contains the requirements associated with the issuance of an operating license. Paragraph (a) references the full license term, as established by Section 50.51(a).	This provision does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.58(a)	"Each application for a construction permit or an operating license for a facility which is of a type described in § 50.21(b) or § 50.22, or for a testing facility, shall be referred to the Advisory Committee on Reactor Safeguards for a review and report. An application for an amendment to such a construction permit or operating license may be referred to the Advisory Committee on Reactor Safeguards for review and report. Any report shall be made part of the record of the application and available to the public, except to the extent that security classification prevents disclosure."	This paragraph requires licensing actions related to test reactor licensees to be referred to the Advisory Committee on Reactor Safeguards (ACRS) for review.	This regulation places a constraint on the testing facility license renewal process by requiring an ACRS review, which could slow down the license renewal process. The technical basis for the applicability of this requirement to testing facilities should be confirmed.
10 CFR 50. 59(a)-(b)	"a) Definitions for the purposes of this section:… (b) This section applies to each holder of an operating license issued under this part or a combined license issued under part 52 of this chapter, including the holder of a license authorizing operation of a nuclear power reactor that has submitted the certification of permanent cessation of operations required under § 50.82(a)(1) or § 50.110 or a reactor licensee whose license has been amended to allow possession of nuclear fuel but not operation of the facility."	These paragraphs establish the applicability of NRC's changes, tests, and experiments requirements to non-power reactor licensees.	These regulations do not significantly constrain or limit the license renewal process, but do place additional burden on the NRC when the licensee has removed all reactor fuel from the site and has a possession-only license amendment. For example, the requirement under Section 50.59(b) has introduced a license maintenance constraint for certain non-power reactors. Specifically, the phrase, "whose license has been amended to allow possession of nuclear fuel but not operation of the facility," creates a burden on the NRC to issue license amendments in cases where a non-power reactor's fuel is removed from the site and the licensee has a possession-only license amendment.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.59(c)-(d)	(c)(1) A licensee may make changes in the facility as described in the final safety analysis report (as updated), make changes in the procedures as described in the final safety analysis report (as updated), and conduct tests or experiments not described in the final safety analysis report (as updated) without obtaining a license amendment pursuant to Sec. 50.90 only if:…. (2) A licensee shall obtain a license amendment pursuant to Sec. 50.90 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would: …. (3) In implementing this paragraph, the FSAR (as updated) is considered to include FSAR changes resulting from evaluations performed pursuant to this section and analyses performed pursuant to Sec. 50.90 since submittal of the last update of the final safety analysis report pursuant to Sec. 50.71 of this part…. (d)(1) The licensee shall maintain records of changes in the facility, of changes in procedures, and of tests and experiments made pursuant to paragraph (c) of this section. … (2) The licensee shall submit…a report containing a brief description of any changes, tests, and experiments, including a summary of the evaluation of each. A report must be submitted at intervals not to exceed 24 months….”	These paragraphs apply every time a non-power reactor wants to make a change or conduct an experiment or test. Some of the changes, experiments, and tests require a modification to the license. Licensees are required to maintain records of changes in the facility, of changes in procedures, and of tests and experiments. The licensees must maintain written evaluations providing the bases for the determination that the change, test, or experiment does not require a license amendment. This section also requires licensees to provide the NRC with a report (at least once every 24 months) describing changes in the facility, changes in procedures, and tests and experiments.	This license maintenance activity can constrain and limit the license renewal process because if the licensee does not update the final safety analysis report (FSAR) documentation to account for the license modifications over time, then this task must be completed at the time of license renewal. This update at the time of license renewal could represent a significant burden on the licensee and could affect the quality of license renewal applications.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.64(b)	"(1) The Commission will not issue a construction permit after March 27, 1986 for a non-power reactor where the applicant proposes to use highly enriched uranium (HEU) fuel, unless the applicant demonstrates that the proposed reactor will have a unique purpose as defined in § 50.2. (2) Unless the Commission has determined, based on a request submitted in accordance with paragraph (c)(1) of this section, that the non-power reactor has a unique purpose, each licensee authorized to possess and use HEU fuel in connection with the reactor's operation shall: (i) Not initiate acquisition of additional HEU fuel, if low enriched uranium (LEU) fuel acceptable to the Commission for that reactor is available when it proposes that acquisition; and (ii) Replace all HEU fuel in its possession with available LEU fuel acceptable to the Commission for that reactor, in accordance with a schedule determined pursuant to paragraph (c)(2) of this section. (3) If not required by paragraphs (b) (1) and (2) of this section to use LEU fuel, the applicant or licensee must use HEU fuel of enrichment as close to 20% as is available and acceptable to the Commission."	This paragraph describes the requirements concerning the use of HEU in non-power reactors.	These regulations do not significantly constrain or limit the license renewal process (although they do restrict the operations of affected non-power reactors).

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.71(b)	"With respect to any production or utilization facility of a type described in § 50.21(b) or 50.22, or a testing facility, each licensee and each holder of a construction permit shall submit its annual financial report, including the certified financial statements, to the Commission, as specified in § 50.4, upon issuance of the report. However, licensees and holders of a construction permit who submit a Form 10-Q with the Securities and Exchange Commission or a Form 1 with the Federal Energy Regulatory Commission need not submit the annual financial report or the certified financial statement under this paragraph."	This paragraph requires testing facilities and power reactor licensees to submit to the NRC a copy of their annual financial statement for the purpose of assuring their financial qualification to operate the plant.	These regulations only require testing facilities, and not other non-power reactors, to submit annual financial reports to the NRC. The technical basis for the applicability of this requirement to testing facilities should be confirmed.
10 CFR 50.75	"This section establishes requirements for indicating to NRC how a licensee will provide reasonable assurance that funds will be available for the decommissioning process."	This section provides the decommissioning financial assurance requirements for non-power reactor licensees.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal.
10 CFR 50.90	"Whenever a holder of a license, including a construction permit and operating license under this part, and an early site permit, combined license, and manufacturing license under part 52 of this chapter, desires to amend the license or permit, application for an amendment must be filed with the Commission, as specified in §§ 50.4 or 52.3 of this chapter, as applicable, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications."	This section describes the requirements for amending a license.	This provision does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 50.91	"The Commission will use the following procedures for an application requesting an amendment to an operating license under this part … or for a testing facility, except for amendments subject to hearings governed by 10 CFR part 2, subpart L. … (a) Notice for public comment."	This section states the requirements for when a public notice must be published regarding a license amendment, such as a renewal. This requirement applies to test reactors, but not to other non-power reactors.	This provision does not significantly constrain or limit the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
Appendix C to Part 50	"This appendix is intended to appraise applicants for construction permits and combined licenses for production or utilization facilities of the types described in § 50.21(b) or § 50.22, or testing facilities, of the general kinds of financial data and other related information that will demonstrate the financial qualification of the applicant to carry out the activities for which the permit or license is sought. The kind and depth of information described in this guide is not intended to be a rigid and absolute requirement. In some instances, additional pertinent material may be needed. In any case, the applicant should include information other than that specified, if the information is pertinent to establishing the applicant's financial ability to carry out the activities for which the permit or license is sought. … III. Annual Financial Statement Each holder of a construction permit for a production or utilization facility of a type described in § 50.21(b) or § 50.22 or a testing facility, and each holder of a combined license issued under part 52 of this chapter, is required by § 50.71(b) to file its annual financial report with the Commission at the time of issuance. This requirement does not apply to licensees or holders of construction permits for medical and research reactors."	This appendix describes the kinds of information applicants for construction permits and combined licenses must submit to demonstrate the necessary financial qualifications. In Section III., medical and research reactor licensees are exempt from submitting annual financial reports.	These regulations only require construction permit applicants for testing facilities to submit annual financial reports to the NRC. However, medical and research reactors are exempt from this requirement. The technical basis for the applicability of this requirement to testing facilities should be confirmed.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 51.20(b)(2)	"(b) The following types of actions require an environmental impact statement or a supplement to an environmental impact statement: (2) Issuance or renewal of a full power or design capacity license to operate a nuclear power reactor, testing facility, or fuel reprocessing plant under part 50 of this chapter, or a combined license under part 52 of this chapter."	This subparagraph requires an environmental impact statement to accompany license renewal applications for test reactors, but not for research reactors.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal. In addition, there are different environmental review requirements for test reactors and research reactors. The technical basis for the applicability of this requirement to testing facilities should be confirmed.
10 CFR 51.21	"All licensing and regulatory actions subject to this subpart require an environmental assessment except those identified in § 51.20(b) as requiring an environmental impact statement, those identified in § 51.22(c) as categorical exclusions, and those identified in § 51.22(d) as other actions not requiring environmental review. As provided in § 51.22(b), the Commission may, in special circumstances, prepare an environmental assessment on an action covered by a categorical exclusion."	This section indicates that an environmental assessment is required for license renewal applications for research reactors and not test reactors.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal. In addition, there are different environmental review requirements for test reactors and research reactors. The technical basis for the applicability of this requirement to testing facilities should be confirmed.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 51.22	"Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review."	This section identifies actions that do not require environmental reviews.	This provision does not significantly constrain or limit the license renewal process.
10 CFR 51.41	"The Commission may require an applicant for a permit, license, or other form of permission, or amendment to or renewal of a permit, license or other form of permission, or a petitioner for rulemaking to submit such information to the Commission as may be useful in aiding the Commission in complying with section 102(2) of NEPA. The Commission will independently evaluate and be responsible for the reliability of any information which it uses."	This section allows the NRC to request an environmental report for the license renewal process.	This provision does not significantly constrain or limit the license renewal process.
10 CFR Part 73	"This part prescribes requirements for the establishment and maintenance of a physical protection system which will have capabilities for the protection of special nuclear material at fixed sites and in transit and of plants in which special nuclear material is used."	This part delineates the physical security requirements with which non-power reactors must comply.	This part constrains and limits the license renewal process because the applicability of the regulations to non-power reactors is confusing and difficult to discern.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR Part 100	"The purpose of this part is to establish approval requirements for proposed sites for stationary power and testing reactors subject to part 50 or part 52 of this chapter."	This part contains the standards and criteria for testing facility sites.	These regulations do not significantly constrain or limit the license renewal process. However, one issue that should be considered is 10 CFR Part 100 applies to test reactors and not research reactors. There is a need for research reactor-specific dose standards. An NRC Atomic Safety and Licensing Appeal Board suggested on May 8, 1972 that Part 20 dose standards are too low for research reactors, but the Part 100 dose standards are too high. Therefore, research reactors require a dose standards scheme that is equivalent in structure to the Part 100 requirements for testing facilities.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 170.3	*"Research reactor* means a nuclear reactor licensed by the Commission under the authority of subsection 104c of the Act and pursuant to the provisions of § 50.21(c) of this chapter for operation at a thermal power level of 10 megawatts or less, and which is not a testing facility as defined by paragraph (m) of this section." "*Testing facility* means a nuclear reactor licensed by the Commission under the authority of subsection 104c of the Act and pursuant to the provisions of § 50.21(c) of this chapter for operation at: (1) A thermal power level in excess of 10 megawatts; or (2) A thermal power level in excess of 1 megawatt, if the reactor is to contain: (i) A circulating loop through the core in which the applicant proposes to conduct fuel experiments; or (ii) A liquid fuel loading; or (iii) An experimental facility in the core in excess of 16 square inches in cross-section."	These definitions identify the type of entity affected by the fee requirements.	These regulatory definitions do not significantly constrain or limit the license renewal process. However, the terminology may contribute to difficulty interpreting the regulations. For example, some terms are defined in multiple sections and are not necessarily consistent. Consistency in definitions throughout the CFR is needed.

Citation	Text Excerpt	Description	Constraints and Limitations
10 CFR 170.21(c)	"Applicants for construction permits, manufacturing licenses, operating licenses, import and export licenses, approvals of facility standard reference designs, re-qualification and replacement examinations for reactor operators, and special projects and holders of construction permits, licenses, and other approvals shall pay fees for the following categories of services…"	This requirement establishes fees for non-power reactors.	This provision does not significantly constrain or limit the license renewal process.
NUREG-1537, Parts 1 and 2 (ML042430055 and ML042430048)	"Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," February 1996	This guidance document provides detailed guidance for the format and content of non-power reactor license renewal applications. The guidance also contains the standard review plan used by the NRC staff. There are no underlying technical requirements in Part 50 that directly tie to license renewal guidance in NUREG-1537. The regulatory basis for NUREG-1537 is Part 20, which simply requires that non-power reactors stay within dose limits.	While piloting the ISG review process, the NRC staff found that renewal applications often times did not include the level of detail recommended in the guidance. As a result, renewal applications had to be revised substantially relative to the original license application. This was a time consuming process for both licensees and the staff.
Interim Staff Guidance (ML092240244)	"Interim Staff Guidance on the Streamlined Review Process for License Renewal for Research Reactors," October 2009	This guidance presents a streamlined review process that the staff is applying to license renewal applications in the backlog that involve reactors with power levels less than 2 MW(t).	This new process is not reflected in current regulations. It is a pilot initiative on the behalf of the NRC staff. The staff have developed lessons learned that could lead to improvement in the overall license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
NUREG-1757, Volume 3 (ML032471471)	"Consolidated NMSS Decommissioning Guidance, Financial Assurance, Recordkeeping, and Timeliness," September 2003	This guidance document provides more detailed decommissioning guidance than that contained in NUREG-1537.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated.
DG-2004 (ML092400206)	"Emergency Planning for Research and Test Reactors," March 2010	This draft regulatory guide provides an acceptable method for use in complying with the NRC's regulations on the content of emergency plans for research and test reactors.	The current regulations constrain and limit the license renewal process because licensees are not required to update this information over time. Consequently, the license renewal process is more burdensome than it would be if the information were kept updated. It also contributes to more RAIs during license renewal.
	"Non-Power Reactor Project Manager Handbook," September 1998 (ML020950886)	This document serves as the "ready reference" for non-power reactor Project Managers (PMs). It describes the PM's functions and responsibilities.	The Non-Power Reactor PM Handbook states, "The current NRC position is that renewal of an NPR license is equivalent to reissuance of the license. Therefore, license renewal applications should comply with the same general standards and criteria as an application for a new license." This is the primary constraint on the license renewal process.
ANSI/ANS-15.1-2007	"The Development of Technical Specifications for Research Reactors"	This standard identifies and establishes content of technical specifications that are acceptable to the NRC. The guidance provides all relevant items and information for the technical specifications.	This guidance does not present any significant constraints or limitations on the license renewal process.

Citation	Text Excerpt	Description	Constraints and Limitations
ANSI/ANS-15.16-2008	“Emergency Planning for Research Reactors”	This standard identifies the elements of an emergency plan that describe the approach to coping with emergencies and minimizing the consequences of accidents at research reactor facilities.	This guidance does not present any significant constraints or limitations on the license renewal process. Note: Regulatory Guide 2.6 (ML003740234) endorses ANSI/ANS 15.16-1982.

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4. Options for License Renewal

This section provides an analysis of five options for addressing the regulatory constraints associated with the current license renewal process.

Option 1 is the "no action" alternative. Option 2 is a non-rulemaking approach to further streamline the license renewal process. Option 3 entails use of rulemaking to further streamline the license renewal process. Option 4 proposes a rulemaking to replace license terms and license renewal with periodic safety reviews. Option 5 involves a rulemaking to replace license terms and license renewal with an enhanced NRC review and inspection program.

As a side note, it may be of interest to understand how these options relate to the five methodologies described by the NRC staff in SECY-08-0161, "Review of Research and Test Reactor License Renewal Applications" (and summarized in Section 1 of this document). Four of the methodologies are represented in the options considered in this section, as shown in Table 2.

Table 2. Methodologies Mapped to Regulatory Basis Options

Streamlining Methodology	Options Employing the Methodology
Graded Approach	Option 2, Option 3
Generic Analysis Approach	Option 2, Option 3
Generic Siting Approach	n/a
Alternate Safety Review	Option 4, Option 5
Extended License Terms	Option 4, Option 5

Options 2 and 3 involve a graded approach to streamlining the license renewal process because both incorporate the graded review process from the ISG, and potentially involve graded content in applications. Options 2 and 3 also include lessons learned from the ISG process (see Section 2 for a discussion of these lessons learned), one of which involves the development of generic analyses to streamline the license renewal process.

The periodic safety reviews under Option 4 and the enhanced NRC inspections under Option 5 employ the alternate safety review methodology because these options would include reviews of: (1) changes to facilities, (2) compliance with current regulations, (3) previous NRC analysis, and (4) inspections. Options 4 and 5 also apply the extended license terms methodology because both options involve indefinite terms for non-power reactor licensees if licensees can

demonstrate, via periodic safety reviews or NRC inspections, that there are no aging or other concerns.

These options are discussed in more detail in the following sections.

In addition, the study considered a number of non-rulemaking approaches to resolve the regulatory constraints described in Section 3: issuance of a generic communication; revision of regulatory guidance documents; revision of a Standard Review Plan; issuance of plant-specific exemptions; clarification of inspection modules; revision of enforcement guidance; and issuance of orders. However, these alternatives would be inappropriate because the primary constraints on the license renewal process relate to the regulations themselves (see Section 3). The non-rulemaking approaches cannot impose new regulatory requirements upon licensees. As a result, these alternatives cannot resolve the constraints.

4.1 Option 1: No action

4.1.1 Description of the option

Under this option, the NRC staff would continue with the existing license renewal process as described in current regulations and guidance, including the ISG and NUREG-1537. The staff would not pursue any changes to the current process and would not incorporate any lessons learned from piloting the ISG.

Under the current process, licensees submit license renewal applications covering all of the chapters in NUREG-1537. The NRC staff's application review process is graded based on a facility's power level and limited to the most safety-significant elements. This graded approach is described in more detail in Section 2.

By adopting this option, the NRC staff would not address any of the regulatory constraints discussed in Section 3. During the December 19, 2011, public meeting to discuss the options considered in the regulatory basis, stakeholders voiced opposition to this option because it would not factor in any of the lessons learned from license renewal application reviews.

4.1.2 Impacts on public health, safety, and security

Because this option would not change the current process, there would be no increase or reduction in public health, safety, and security.

4.1.3 Impacts on licensees

This option would have no incremental impact on licensees.

4.1.4 Impacts on NRC

This option would have no incremental impact on the NRC.

4.1.5 Stakeholder feedback

During the December 19, 2011 public meeting at NRC Headquarters, stakeholders expressed opposition to the "no action" alternative.

4.1.6 Additional considerations

This option would have no incremental impact on State, local, or Tribal governments.

4.1.7 Summary of advantages and disadvantages

Advantages:

- No incremental burden on licensees.
- No incremental burden on the NRC.

Disadvantages:

- Does not address any regulatory constraints.

4.2 Option 2: No rulemaking for license renewal. Update NUREG-1537 to incorporate a streamlined license renewal process

4.2.1 Description of the option

Under this option, the NRC would update the current license renewal process embodied in the ISG to incorporate the lessons learned from piloting the ISG. The staff would not undertake rulemaking, but would update NUREG-1537 to incorporate guidelines for licensees to follow when preparing license renewal applications, based on the process embodied in the ISG and informed by the lessons learned. In addition, the NRC would incorporate additional streamlining features into guidance to create additional efficiencies in the process. The current process embodied in the ISG, lessons learned, and the additional streamlining features are briefly summarized below. Further, this option would include updating the regulatory citations at the end of NUREG-1537 to provide an up-to-date "roadmap" of the applicable licensing regulations. Although these revisions to NUREG-1537 would not require rulemaking, there would be opportunity for stakeholder input during the guidance development process.

By adopting this option, the NRC staff would partially address Regulatory Constraint #1, reliance on initial licensing regulations.[4] Although there would be no changes to the underlying regulations, this option would create within NUREG-1537 new guidance specific to the license

[4] See Section 2.1.

renewal process. Section A.2 of Appendix 3 summarizes in general terms how this option might be implemented.

Additional Streamlining Features

In addition to the streamlined review process described above, this option also could consist of up to two more features:[5]

(1) Streamlined license renewal applications. This feature would extend the ISG concept to license renewal applications, thereby reducing the scope of the applications for non-power reactors with power levels less than 2 MW(t) to the most safety-significant sections of the SAR (i.e., reactor design and operation; accident analysis; technical specifications, and radiation protection). Under this extension, license renewal applications would have to include only these sections as well as any other sections of the SAR that have changed since initial licensing or the last renewal. In other words, licensees would not have to submit anything that the staff would not review.

By adopting this feature, the NRC staff would partially address Regulatory Constraint #1, reliance on initial licensing regulations and implementation guidance.

(2) Periodic updates to the SAR. This feature would include guidance for non-power reactor licensees to periodically update their SARs, possibly in a manner that is similar to what already is required for power reactors in § 50.71(e).[6] While reviewing license renewal applications, it became evident that licensees generally had not maintained updated documentation of their licensing bases during the past license period. In such cases, the scope of a license renewal application review could not be narrowly focused (e.g., on issues that are most significant to safety), but also included issues related to updating the licensing basis similar in scope and depth to the initial licensing. To ensure that a facility's licensing basis is not lost over time, the NRC staff could issue guidance calling for periodic updates to non-power reactor SARs that would be submitted to the NRC every two years. Relative to power reactors, non-power reactors' SARs generally will require more limited updates than those of power reactors.

[5] The additional streamlining features under Option 2 are "building blocks" that can be added for enhanced streamlining of the license renewal process.

[6] Section 50.71(e) states that: "Each person licensed to operate a nuclear power reactor … shall update periodically, as provided in paragraphs (e) (3) and (4) of this section, the final safety analysis report (FSAR) originally submitted as part of the application for the license, to assure that the information included in the report contains the latest information developed." Section 50.71(e)(4) states that after an initial update to the FSAR, power reactors have to file revisions "annually or 6 months after each refueling outage provided the interval between successive updates does not exceed 24 months. The revisions must reflect all changes up to a maximum of 6 months prior to the date of filling. For nuclear power reactor facilities that have submitted the certifications required by § 50.82(a)(1), subsequent revisions must be filed every 24 months."

By adopting this feature, the NRC staff would address Regulatory Constraint #2, lack of periodic updates to the SAR.

This option as a whole would assess the following priority areas that are addressed by the current license renewal review process: radiation protection program, potential aging degradation, changes in design, and technical specifications. If a licensee submits its security plan, emergency plan, financial qualifications, and operator training and requalification program with the license renewal application because there have been changes, then the NRC would review them. However, if there are no changes to these programs/plans, then the NRC-approved programs/plans remain in place and a focused review would exclude these items. Streamlining the scope of license renewal applications through guidance may not be feasible for some areas of the application. For example, Section 50.33(f)(2) requires the following: "Applicants to renew or extend the term of an operating license for a non-power reactor shall include the financial information that is required in an application for an initial license." In this case, the financial qualifications could not be excluded even if there are no changes. Therefore, the feasibility and effectiveness of this feature could be limited in that regard.

4.2.2 Impacts on public health, safety, and security

This option would result in a (relatively small) benefit with respect to impacts on public health, safety, and security because it would add lessons learned from the ISG process. As an example, adding lessons the staff learned regarding the lack of detail on specific aging related topics in license renewal applications would increase assurance that licensees adequately consider in their license renewal applications all of the relevant aging-related effects on their facilities. However, these additional benefits likely would be minimal because the overall public health, safety, and security risks associated with non-power reactors are small, and because the NRC staff already considers these topics, albeit less systematically, under the current process using RAIs. Additional indirect benefits to public health, safety, and security may arise as a byproduct of the improved regulatory efficiency that would result from clarifying the license renewal process as described in this option.

The additional streamlining features under Option 2 lead to the following impacts on public health, safety, and security:

- Suggesting periodic updates to SARs could eliminate licensing bases becoming outdated. This option could potentially benefit public health, security, and safety by encouraging facilities to keep licensing bases intact, but only to a small degree (commensurate with the risks associated with non-power reactors). Because these changes would be made in guidance, there is no requirement that licensees follow the guidance.

4.2.3 Impacts on licensees

Overall, this option would lead to small-to-modest operational savings to licensees with power levels less than 2 MW(t), primarily because incorporating lessons learned from the ISG process into the guidance may result in a meaningful reduction in the number of RAIs issued by the NRC staff to licensees. As a result, licensees would incur savings associated with this reduction in RAIs. Further, the burden associated with preparing a license renewal application would decrease substantially because the scope of the submittal would be streamlined.

The additional streamlining features under Option 2 lead to the following impacts on licensees:

- There would be a voluntary information collection burden on licensees who choose to periodically submit updated SARs every two years (based on the new guidance). However, as a result of the ongoing license renewal process for non-power reactor licensees, most, if not all licensees will have established updated SARs before this option could take effect. As a result, there should be only minor burden to the licensees to update the SARs on an ongoing basis. In addition, there would be an operational benefit to the licensees of having an updated SAR for reference purposes (i.e., by eliminating the need to refer to multiple documents during operations when the licensee wants to make a change or conduct a new test or experiment). Moreover, any minor burden increase likely would be more than offset by the resulting reduction in burden hours at the time of license renewal, when the SAR would not require extensive updating to address changes spanning longer than two years.

4.2.4 Impacts on NRC

Under this option, there would be a one-time cost to the NRC, followed by ongoing savings, as discussed below.

- Initially, there would be incremental costs for the NRC staff to revise NUREG-1537 to incorporate guidelines for license renewal applications (i.e., from the ISG) and to update them to account for lessons learned. These costs would include public outreach efforts during the guidance development phase and the costs of revising other policies and procedures (e.g., “Non-Power Reactor Project Manager’s Handbook”). After publishing the proposed guidance, the NRC would incur costs associated with public comment resolution and preparation of the final guidance.

- By incorporating lessons learned into the guidance, the staff may be able to reduce the number and rounds of RAIs associated with the license renewal process. This would result in a more efficient process and would save the staff time and resources.

- If this option calls for periodic updates to SARs, NRC staff would incur costs to review and approve additional licensee submittals.

4.2.5 Stakeholder feedback

As described above, there is a regulatory roadmap in NUREG-1537 that has become outdated. During the December 19, 2011, public meeting at NRC Headquarters, stakeholders agreed that an updated roadmap would be useful, but locating it in NUREG-1537 is not essential. In addition, stakeholders suggested that the NRC continue to seek broad input and critique from licensees on the lessons learned from license renewal.

During the September 13, 2011, public meeting at the National Organization of Test, Research, and Training Reactors (TRTR) Annual Conference in Idaho Falls, Idaho, some stakeholders recommended that the NRC provide a generic analysis within NUREG-1537 for the TRIGA reactors. This input is consistent with one of the lessons learned that the NRC should consider as part of this option. However, evaluations by the DOE in support of the Reduced Enrichment for Research and Test Reactors program determined that this approach is very difficult to put into practice because of the significant variability of the calculations.

4.2.6 Additional considerations

This option would not affect State, local, or Tribal governments except to the extent that they are also licensees.[7]

4.2.7 Summary of advantages and disadvantages

Advantages:

- Enhanced clarity of the license renewal process.
- Savings to all licensees resulting from fewer RAIs at the time of license renewal.
- Savings to licensees with power levels less than 2 MW(t) from license renewal applications with a narrower scope.
- Periodic savings to licensees from not having to make extensive updates to SARs at the time of license renewal to address changes spanning longer than two years.
- Savings to NRC resulting from fewer RAIs.

[7] There are 18 public universities that also are NRC licensees: Idaho State University, Kansas State University, North Carolina State University, Ohio State University, Oregon State University, Pennsylvania State University, Purdue University, Texas A&M University, University of California, University of Florida, University of Maryland, University of Massachusetts, University of Missouri, University of New Mexico, University of Texas, University of Utah, University of Wisconsin, and Washington State University.

Disadvantages:

- One-time cost to NRC to revise guidance and Handbook.
- Ongoing costs to licensees to periodically update SARs.
- Ongoing cost to NRC to review updated SARs.

4.3 Option 3: Rulemaking adopting a streamlined license renewal process

4.3.1 Description of the option

Under this option, the NRC staff would undertake a rulemaking to implement a graded-approach to license renewal, consistent with the ISG. This option is similar to Option 2, as discussed in Section 4.2, except the current ISG process, lessons learned, and additional streamlining features would be incorporated into both regulations and guidance. Section 2 provides a description of the current ISG process and lessons learned. The changes in the underlying regulations and guidance would create a robust set of license renewal-specific rules and guidance.

By adopting this option, the NRC staff would fully address Regulatory Constraint #1, reliance on initial licensing regulations.[8]

Additional Streamlining Features

In addition to the streamlined review process described above, this option also could consist of up to four more features:[9]

(1) Streamlined license renewal applications. This feature would extend the ISG concept to license renewal applications, thereby reducing the scope of the applications for non-power reactors with power levels less than 2 MW(t) to the most safety-significant sections of the SAR (i.e., reactor design and operation; accident analysis; technical specifications, and radiation protection). Under this extension, new regulations would state that license renewal applications would have to include only these sections as well as any other sections of the SAR that have changed since initial licensing or the last renewal. In other words, licensees would not have to submit anything that the staff would not review.

By adopting this option, the NRC staff would address Regulatory Constraint #1, reliance on initial licensing regulations and implementation guidance.

[8] See Section 2.1.
[9] The additional streamlining features under Option 3 are "building blocks" that can be added for enhanced streamlining of the license renewal process.

(2) Periodic updates to the SAR. This feature would include a requirement for non-power reactor licensees to periodically update their SARs, possibly in a manner that is similar to what already is required for power reactors in § 50.71(e).[10] While reviewing license renewal applications, it became evident that licensees generally had not maintained updated documentation of their licensing bases during the initial license period. In such cases, the scope of a license renewal application review could not be narrowly focused (i.e., on issues that are most significant to safety), but also included issues related to updating the licensing basis similar in scope and depth to the initial licensing. To ensure that a facility's licensing basis is not lost over time, the NRC staff could develop new regulations to require periodic updates to non-power reactor SARs that would be submitted to the NRC (e.g., every two years). Relative to power reactors, non-power reactors' SARs generally will require more limited updates than those of power reactors.[11]

In addition, a benefit of requiring SAR updates throughout the licensing period would be that the NRC staff could change their current interpretation of Section 50.51, which establishes the license term for non-power reactors. Historically, the NRC has issued initial licenses for at most 20 years. But, with the assurance that facility licensing bases will be maintained with periodic SAR updates, the NRC staff could begin to issue initial licenses for 40 years. This would extend the amount of time between relicensing actions.

By adopting this feature, the NRC staff would address Regulatory Constraint #2, lack of periodic updates to the SAR.

(3) Changes to the timely renewal provision in Title 10 of the Code of Federal Regulations (10 CFR), Section 2.109(a). This enhancement would change the current timely renewal provision in 10 CFR 2.109(a) to allow additional time for the NRC to conduct an adequate acceptance review and allow licensees to improve the quality of the license renewal application before the staff commence the formal review.

The "timely renewal" provision presents a challenge to license renewal efforts because the regulation allows a non-power reactor to continue operation as long as the NRC has received a renewal application within *30 days* before the expiration of the existing license. This requirement does not ensure that the NRC staff will have sufficient time to address low-quality non-power reactor license renewal applications except by rejecting them, in which case the licensee would have to cease operations on the date the license expires. If the license renewal application is submitted further

[10] See footnote 6.
[11] As of April 5, 2012, seven non-power reactors have yet to submit license renewal applications and as a result have not updated their SARs. For any facilities that have not updated their SARs as a result of license renewal, the burden to do so to comply with a new rule would be substantial.

in advance of the license expiration, then the NRC staff and licensee have more time to evaluate and improve the application, respectively.

A revised regulation could change this requirement so that licensees are required to submit license renewal requests well in advance of license expiration (e.g., 2 years before), rather than the current 30 days before expiration. This would allow the NRC to reject or refuse to accept an insufficient application without causing an immediate shutdown of the reactor. In addition, the acceptance review process may substantially reduce the number of RAIs during the application review process.

By including this enhancement, the NRC staff would address Regulatory Constraint #3, timely renewal provision in Section 2.109.

(4) Segregation of non-power reactor license renewal regulations into a separate Part or Subpart of 10 CFR. This feature would not add further requirements on licensees. To implement this enhancement, the NRC would segregate the new license renewal regulations developed under this option into a separate Part or Subpart of 10 CFR Chapter I. The segregated license renewal requirements could be placed within an existing Part (e.g., Part 54) or a new Part (e.g., Part 56). (In contrast, the licensing requirements for non-power reactors currently are spread across many Parts and sections of Chapter I.)

By adopting this feature, the NRC staff would partially address Regulatory Constraint #4, constraints in existing rule language, by streamlining the organization and presentation of license renewal requirements in Chapter I.

Similar to Option 2, this option as a whole would assess the following priority areas that are addressed by the current license renewal review process: radiation protection program, potential aging degradation, changes in design, and technical specifications. If a licensee submits its security program and procedures, emergency plan, financial qualifications, and operator training and requalification program with the license renewal application because there have been changes, then the NRC would review them. However, if there are no changes to these programs/plans, then the NRC-approved programs/plans remain in place and a focused review excludes these items.[12]

4.3.2 Impacts on public health, safety, and security

This option would result in a (relatively small) benefit with respect to impacts on public health, safety, and security because it would incorporate lessons learned from the ISG process. As an example, adding the lessons the staff learned regarding the lack of detail on specific aging related topics in license renewal applications to the guidelines would increase assurance that licensees adequately consider all of the relevant aging-related effects on their facilities in their

[12] Changes would be needed to the current requirements in Sections 50.33 and 50.34, such as Section 50.33(f)(2), which requires financial qualifications from non-power reactors in license renewal applications.

license renewal applications. However, these additional benefits likely would be minimal because the overall public health, safety, and security risks associated with non-power reactors are small, and because the NRC staff already considers these topics, albeit less systematically, under the current process using RAIs. Additional indirect benefits to public health, safety, and security may arise as a byproduct of the improved regulatory efficiency that would result from clarifying the license renewal process as described in this option.

- Requiring periodic updates to SARs would keep licensing bases up-to-date. This option would benefit public health, security, and safety, but only to a small degree (commensurate with the risks associated with non-power reactors), by providing assurance that the facility's licensing basis remains intact.

- Changing the timely renewal provision also would benefit public health, safety, and security. Under the current timely renewal process, the NRC has allowed facilities to continue operations once the license application has been submitted even though it has not been reviewed or accepted for review. By extending the timely renewal requirement to allow more time for the acceptance review process, the NRC could ensure that it has received high-quality license renewal applications from licensees in the event that application reviews extend beyond the initial license term.

- Segregating the new license renewal regulations into a separate Part or Subpart would not lead to any impact on public health, safety, and security.

4.3.3 Impacts on licensees

Overall, this option would lead to small-to-modest operational savings to licensees with power levels less than 2 MW(t) due to resource savings from responding to fewer RAIs.

- The changes to the timely renewal provision likely would result in fewer RAIs in total, although some RAIs would be shifted into the acceptance review period of the license renewal application. Further, the burden associated with preparing a license renewal application would decrease because the scope of the submittal would be streamlined.

- The segregation of the license renewal regulations would slightly decrease the burden associated with preparing a license renewal application because the organization and presentation of applicable rules for preparing license renewal applications would be explicit and clearly identified in 10 CFR Chapter I.

- There would be an additional information collection requirement on licensees associated with periodically submitting updated SARs every two years. However, as a result of the ongoing license renewal process for non-power reactor licensees, most, if not all licensees will have established updated SARs. As a result, there should be only minor burden to the licensees to update the SARs on an ongoing basis. In addition, there would be an operational benefit to the licensees of having an updated SAR for reference

purposes (i.e., by eliminating the need to refer to multiple documents during operations when the licensee wants to make a change or conduct a new test or experiment). Moreover, any increased burden would likely be more than offset by the resulting reduction in effort at the time of license renewal since the SAR would not require extensive updating to address changes spanning longer than two years.[13]

4.3.4 Impacts on NRC

Under this option, there would be a significant one-time cost to the NRC, followed by ongoing savings, as discussed below.

- Initially, there would be incremental costs to the NRC to undertake the rulemaking process. These costs would include the preparation of a proposed rule as well as proposed implementation guidance to incorporate regulations and guidelines for license renewal applications (i.e., from the ISG) and to update them to account for lessons learned. The costs would include staff and contractor time to prepare proposed rule language, draft guidance, supporting analyses (e.g., a regulatory analysis and OMB Paperwork Burden analysis), a Federal Register notice, and public outreach efforts during the rule and guidance development phase. After publishing the proposed rule, the NRC would incur costs associated with public comment resolution and preparation of the final rule, guidance, and supporting documentation for the rulemaking. In addition, the NRC would incur costs to revise other policies and procedures (e.g., "Non-Power Reactor Project Manager's Handbook").

- By changing the timely renewal provision and incorporating lessons learned into the rule and guidance, the staff may be able to reduce the number and rounds of RAIs associated with the license renewal process. This would result in a more efficient process and would save the staff time and resources.

- If this option calls for periodic updates to SARs, NRC staff would incur costs to review and approve additional licensee submittals.

4.3.5 Stakeholder feedback

During the December 19, 2011, public meeting, stakeholders suggested that the NRC seek broad input and critique from licensees on the lessons learned from license renewal.

4.3.6 Additional considerations

This option would not affect State, local, or Tribal governments except to the extent that they are also licensees.[14]

[13] As a first step, the NRC staff would expect licensees to update SARs by incorporating RAI answers from the license renewal process into the SAR.
[14] There are 18 public universities that also are NRC licensees. See footnote 7.

4.3.7 Summary of advantages and disadvantages

Advantages:

- Enhanced clarity of the license renewal process.
- Savings to all licensees resulting from fewer RAIs at the time of license renewal.
- Savings to licensees with power levels less than 2 MW(t) from license renewal applications with a narrower scope.
- Periodic savings to licensees from not having to make extensive updates to SARs at the time of license renewal to address changes spanning longer than two years.
- Savings to NRC resulting from fewer RAIs.
- Small increased assurance of safety.

Disadvantages:

- One-time costs to NRC to revise regulations, guidance, and Handbook.
- Ongoing costs to licensees to periodically update SARs.
- Ongoing cost to NRC to review updated SARs.

4.4 Option 4: Eliminate license terms (and license renewals) and mandate periodic safety reviews

4.4.1 Description of the option

The AEA does not establish a license term limit for Class 104.a. and 104.c. non-power reactor licenses.[15] These licensees, however, are subject to 10 CFR 50.51(a), which states that a license "will be issued for a fixed period of time to be specified in the license but in no case to exceed 40 years from date of issuance." Consequently, a Class 104.a. or 104.c. license can have a term of no more than 40 years under current requirements and the NRC staff currently limits non-power reactor license renewals to 20-year terms. To eliminate license renewals for Class 104.a. or 104.c. non-power reactors, the NRC could undertake a rulemaking that would revise Section 50.51(a) to eliminate the 40-year license terms for these licensees. This approach also would include the following additional features in order to ensure that licenses continue to operate safely at all times:

(1) Periodic updates to the SAR. In conjunction with the eliminated license term requirement, this option also would include a requirement for non-power reactor licensees to periodically update their SARs, similar to what is required for power reactors in § 50.71(e).[16]

While reviewing license renewal applications, it became evident that licensees generally had not maintained updated documentation of their licensing bases during the initial license period. In such cases, the scope of a license renewal application review could not be narrowly focused (i.e., on issues that are most significant to safety), but also included issues related to updating the licensing basis similar in scope and depth to the initial licensing. To ensure that a facility's licensing basis is not lost over time and to ensure that the NRC maintains regulatory oversight that could otherwise be lost through the elimination of NRC review at license renewal, the NRC staff could require periodic updates to non-power reactor SARs which would be submitted to the NRC (i.e., every two years). Relative to power reactors, non-power reactors' SARs generally will require fewer updates than those of power reactors.

(2) Periodic safety reviews (PSRs). The NRC could require PSRs for non-power reactors to maintain their licenses. The PSR concept is taken from the International Atomic Energy Agency (IAEA) and its member states. To complement the other routine and special safety reviews of nuclear power plants, some member states of the IAEA require facilities to undertake systematic safety reassessments, referred to as PSRs, to assess the cumulative effects of plant aging, plant modifications, operating experience, new

[15] Class 104.a. licenses are issued to utilization facilities for use in medical therapy, and Class 104.c. licenses are issued to utilization and production facilities useful in the conduct of certain types of research and development activities. Class 103 and Class 104.b. (commercial or industrial) non-power reactors are excluded from this option because license terms for these facilities are dictated by the AEA.
[16] See footnote 6.

technical developments, and new siting aspects.[17] PSRs include an assessment of plant design and operation against current safety standards and practices, and have the objective of ensuring a high level of safety throughout the plant's operating lifetime. A PSR is a comprehensive, integrated review that considers long-term operational and safety performance trends. The PSR also includes a corrective action plan that is used to resolve findings arising from the review. The scope of the PSR covers all relevant safety issues, taking into account the safety classification of equipment. By design, this streamlining feature applies both the alternative safety review and the extended license term methodologies. PSRs would evaluate changes to facilities, compliance with current regulations, and would consider previous NRC analysis and inspection findings. In addition, PSRs would evaluate aging concerns by assessing the cumulative effects of plant aging.

PSRs have been used to help provide a basis for continued operation beyond the designed lifetime to help identify changes and to communicate more effectively with stakeholders regarding nuclear power plant safety and plant operations that enhance safety. Typically, IAEA member states require PSRs of power reactor facilities every 10 years. Although non-power reactors have reduced risks compared to power reactors, a 10-year periodicity between PSRs is equally reasonable in either case because the scope of the PSR would adjust relative to the applicable level of risk.

To accompany these mandatory regulations, the NRC would need to prepare a regulatory guide providing recommendations and guidance to licensees on acceptable procedures for conducting a PSR for a non-power reactor.[18]

In combination, the use of periodically updated SARs and PSRs would assess the following priority areas that are addressed by the current license renewal review process: radiation protection program, potential aging degradation, changes in design, technical specifications, security program and procedures, emergency plan, financial qualifications, and operator training and requalification program. Each of these elements would be addressed in the updated SAR and/or the scope of the PSR. Another area that needs further consideration by the NRC staff relates to licensee submittals under Section 50.59. Currently, Section 50.59 requires licensees to respond to a series of risk-based questions pertaining to changes, tests, and experiments. However, the NRC staff should consider adding a subsection in Section 50.59 applicable to non-power reactors that includes a more prescriptive set of requirements for the written evaluations performed under Section 50.59.

By adopting all of the features of this option (eliminated license renewal, periodic updates to the SAR, and PSRs), the NRC staff would address Regulatory Constraint #1, reliance on initial

[17] Some of the IAEA member states that use PSRs include Korea, Spain, Hungary, UK, Slovakia, Czech Republic, Ukraine, Germany, and China.

[18] The implementation guidance for PSRs could involve generic approaches for non-power reactors to apply to their facilities. The PSR guidance could be analogous in design to the generic aging management reviews and aging management programs provided to power reactor licensees in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report."

licensing regulations, Regulatory Constraint #2, lack of periodic updates to the SAR, and Regulatory Constraint #3, the "timely renewal" provision in 10 CFR 2.109.

Section A.4 of Appendix 3 provides a draft implementation approach (i.e., draft regulatory text) for this option.

4.4.2 Impacts on public health, safety, and security

This option would result in more up-to-date licensing bases, thereby increasing assurance that public health, safety, and security are adequately protected. This benefit likely would be small because the risk associated with non-power reactors already is low.

4.4.3 Impacts on licensees

This option would lead to both burden increases and decreases on licensees. On balance, this option likely would result in a slight increase in burden on licensees.

- There would be an additional information collection requirement on licensees associated with submitting updated SARs. However, as a result of the ongoing license renewal process for non-power reactor licensees, most, if not all licensees will have established updated SARs. As a result, there should be only minor burden to the licensees to update the SARs on an ongoing basis. In addition, there would be an operational benefit to the licensees of having an updated SAR for reference purposes (i.e., by eliminating the need to refer to multiple documents during operations when the licensee wants to make a change or conduct a new test or experiment).

- This option also would create additional burden on licensees associated with the PSRs. There would be one-time implementation costs associated with developing an appropriate scope and process for the PSRs in accordance with NRC guidance. In addition, there would be ongoing costs (i.e., every 10 years) to perform the PSR and document corrective actions.

- These additional burdens would be partially offset by the elimination of burden associated with the current license renewal process, which for most licensees has included substantial efforts to update their licensing bases often by trying to document changes that occurred numerous years prior. The option, therefore, is expected to eliminate the RAIs that licensees address as part of the license renewal process.

4.4.4 Impacts on NRC

Overall, this option likely would result in a minimal reduction in burden on the NRC.

- By eliminating license renewals and license terms, the significant burden associated with the NRC's review and approval of license renewal applications also would be eliminated. The eliminated burden includes iterations of numerous RAI communications between the NRC and licensees.

- However, this option also introduces additional burdens on the NRC staff. The NRC would incur one-time costs to prepare and issue the proposed and final rulemakings. In addition, there also would be a one-time cost to the NRC to revise non-power reactor licenses to remove the license terms. Finally, there would be a one-time cost to the NRC to prepare regulatory guidance on an acceptable method for conducting PSRs.

- In terms of new operational burden, this option would require periodic updates to SARs. The NRC staff would incur costs to review and approve additional licensee submittals.

- In addition, this option would create a new burden on the NRC staff to review licensee plans for PSRs, as well as the results and corrective actions associated with the PSRs.

In total, however, these additional burdens would be counter-balanced by the complete elimination of burden associated with the current license renewal process. The net effect of all burden increases and reductions likely would result in a minimal net reduction in NRC burden.

4.4.5 Stakeholder feedback

During the December 19, 2011, public meeting at the NRC Headquarters, stakeholders expressed support for the general concepts of this option. One stakeholder suggested that the operational history and low public health, safety, and security risk of existing non-power reactor facilities justifies a rulemaking that would eliminate license terms but implement inspection activities (i.e., PSRs) coupled with updates to SARs. The stakeholder stated that such a rulemaking should be achievable.

4.4.6 Additional considerations

This option would not affect State, local, or Tribal governments except to the extent that they are also licensees.[19]

4.4.7 Summary of advantages and disadvantages

Advantages:

- Savings to licensees from eliminating the need to prepare license renewal applications and having to respond to associated RAIs.

- Savings to the NRC by eliminating the need to evaluate license renewal applications and review responses to RAIs.

Disadvantages:

[19] There are 18 public universities that also are NRC licensees. See footnote 7.

- One-time costs to NRC to undertake rulemaking, revise procedures, prepare a PSR regulatory guide and revise existing non-power reactor licenses.

- Ongoing costs to licensees to periodically update SARs and perform the PSRs.

- Ongoing costs to NRC to review the updated SARs and review and comment on the licensee PSRs.

4.5 Option 5: Eliminate license terms (and license renewals) and mandate an enhanced NRC inspection program

4.5.1 Description of the option

This option is similar to Option 4, as discussed in Section 4.4, except that instead of the licensee conducting a periodic safety review, the NRC would conduct an enhanced inspection. Because this option does not include a license renewal process, the following features would be needed in order to ensure that licenses continue to operate safely at all times:

(1) Periodic updates to the SAR. In conjunction with the eliminated license term requirement, this option also would include a requirement for non-power reactor licensees to periodically update their SARs, similar to what is required for power reactors in § 50.71(e).[20]

While reviewing license renewal applications, it became evident that licensees generally had not maintained updated documentation of their licensing bases during the initial license period. In such cases, the scope of a license renewal application review could not be narrowly focused (e.g., on issues that are most significant to safety), but also included issues related to updating the licensing basis similar in scope and depth to the initial licensing. To ensure that a facility's licensing basis is not lost over time and to ensure that the NRC maintains regulatory oversight that could otherwise be removed through the elimination of NRC review at license renewal, the NRC staff could require periodic updates to non-power reactor SARs which would be submitted to the NRC every two years. Relative to power reactors, non-power reactors' SARs generally will require fewer updates than those of power reactors.

(2) Enhanced inspection program. The NRC would implement an enhanced inspection program for non-power reactors that would evaluate the licensees' ability to maintain their licenses. The inspection program would assess the cumulative effects of plant aging, plant modifications, operating experience, new technical developments, and new siting aspects. The inspection also would include a corrective action plan that would be used to resolve findings arising from the inspection. By design, this streamlining feature applies both the alternative safety review and the extended license term methodologies,

[20] See footnote 6.

as described in Section 1. The enhanced inspections would evaluate changes to facilities, compliance with current regulations, and would consider previous NRC analysis and inspection findings.

Similar to Option 4, the NRC could design these enhanced inspections for a recurring (i.e., 10-year) periodicity.

To accompany these mandatory regulations, the NRC would need to design inspection procedures to scope out the inspection program for non-power reactors.

In combination, the use of periodically updated SARs and enhanced inspections would assess the following priority areas that are addressed by the current license renewal review process: radiation protection program, potential aging degradation, changes in design, technical specifications, security program and procedures, emergency plan, financial qualifications, and operator training and requalification program. Each of these elements would be addressed in the updated SAR and/or within the scope of the inspection program. Another area that needs further consideration by the NRC staff relates to licensee submittals under Section 50.59. Currently, Section 50.59 requires licensees to respond to a series of risk-based questions pertaining to changes, tests, and experiments. However, the NRC staff should consider adding a subsection in Section 50.59 applicable to non-power reactors that includes a more prescriptive set of requirements for the written evaluations performed under Section 50.59.

By adopting all of the features of this option (eliminated license renewal, periodic updates to the SAR, and enhanced inspections), the NRC staff would address Regulatory Constraint #1, reliance on initial licensing regulations, Regulatory Constraint #2, lack of periodic updates to the SAR, and Regulatory Constraint #3, the “timely renewal” provision in 10 CFR 2.109.

Section A.5 of Appendix 3 provides a draft implementation approach (i.e., draft regulatory text) for this option.

4.5.2 Impacts on public health, safety, and security

This option would result in up-to-date licensing bases, thereby increasing assurance that public health, safety, and security are adequately protected. This benefit likely would be small because the risk associated with non-power reactors already is low.

4.5.3 Impacts on licensees

This option would lead to both burden increases and decreases on licensees. On balance, this option would result in a reduction in burden on licensees.

- There would be an additional information collection requirement on licensees associated with submitting updated SARs. However, as a result of the ongoing license renewal process for non-power reactor licensees, most, if not all licensees will have established updated SARs. As a result, there should be only minor burden to the licensees to update the SARs on an ongoing basis. In addition, there would be an operational benefit

to the licensees of having an updated SAR for reference purposes (i.e., by eliminating the need to refer to multiple documents during operations when the licensee wants to make a change or conduct a new test or experiment).

- This option also would create small additional burden on licensees to subject themselves to the enhanced inspections. This ongoing cost (i.e., every 10 years) would consist of interfacing with the NRC inspectors and addressing any corrective actions.

- These additional burdens would be counter-balanced by the elimination of burden associated with the current license renewal process, which for most licensees has included substantial efforts to update their licensing bases often by trying to document changes that occurred numerous years prior. The option, therefore, is expected to eliminate the RAIs that licensees address as part of the license renewal process. This significant reduction in burden in combination with the added burden discussed above likely would result in a net reduction in licensee burden.

4.5.4 Impacts on NRC

Overall, this option likely would result in little change to the burden on the NRC.

- By eliminating license renewals and license terms, the significant burden associated with the NRC's review and approval of license renewal applications also would be eliminated. The eliminated burden includes iterations of numerous RAI communications between the NRC and licensees.

- However, this option also introduces additional burdens on the NRC staff. The NRC would incur one-time costs to prepare and issue the proposed and final rulemakings. In addition, there also would be a one-time cost to the NRC to revise non-power reactor licenses to remove the license terms. Finally, there would be a one-time cost to the NRC to prepare inspection procedures for the enhanced inspection program.

- In terms of new operational burden, this option would require the NRC staff to review periodic updates to SARs.

- In addition, this option would create a new burden on the NRC staff to conduct the enhanced inspections on a periodic basis.

In total, these additional burdens would be counter-balanced by the complete elimination of burden associated with the current license renewal process. The net effect likely would result in little change to the NRC's overall burden.

4.5.5 Stakeholder feedback

During the March 27, 2012 public meeting at the NRC Headquarters, some stakeholders expressed support for the general concepts of this option. The stakeholders expressed support

for a rulemaking that would require periodic updates to SARs coupled with an enhanced inspection program.

4.5.6 Additional considerations

This option would not affect State, local, or Tribal governments except to the extent that they are also licensees.[21]

4.5.7 Summary of advantages and disadvantages

Advantages:

- Savings to licensees from eliminating the need to prepare license renewal applications and having to respond to associated RAIs.

- Savings to the NRC due to the elimination of the need to evaluate license renewal applications and review responses to RAIs.

Disadvantages:

- One-time costs to NRC to undertake rulemaking, revise procedures, prepare inspection procedures, and revise existing non-power reactor licenses.

- Ongoing costs to licensees to periodically update SARs and participate in NRC inspections.

- Ongoing periodic costs to NRC to review updated SARs and conduct the enhanced inspections.

[21] There are 18 public universities that also are NRC licensees. See footnote 7.

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5. Other Options (Beyond License Renewal)

In addition to the license renewal-related options discussed in Section 4, there are five technical issues that go beyond the topic of license renewal but that could be addressed in a standalone rulemaking or as part of a potential license renewal rulemaking. Each technical issue relates to the existing rules applicable to non-power reactors as described in Sections 3.4, Regulatory Constraint #4. All of these issues require a rulemaking solution and, therefore, cannot be addressed by non-rulemaking alternatives (e.g., guidance, Commission Orders, or other generic communications).

Options addressing these issues are analyzed separately from those in Section 4 because they go beyond the Commission's direction to the staff as documented in SRM-M090811. Nonetheless, these options have broad applicability and have an impact on licensing activities, including license renewal. Therefore, this license renewal regulatory basis provides an analysis of these other options.

The following sections describe five options for addressing the various constraints with existing rule language as described in Sections 3.4.1 through 3.4.5. The analysis does not include a discussion of the impacts on licensees, the NRC, or public health, safety, and security because, for the most part, it would be necessary to first conduct additional research to adequately define the design of each option. This additional research and design are beyond the scope of this study.

5.1 Option 6: Revise Section 50.59 to apply to permanently shutdown non-power reactors without fuel

Under this option, the NRC staff would revise the wording in Section 50.59(b) to fix a regulatory gap associated with non-power reactors where fuel has been removed and they are no longer authorized to operate the reactor. The current wording of Section 50.59(b) states:

> "(b) This section applies to each holder of an operating license issued under this part or a combined license issued under part 52 of this chapter, including the holder of a license authorizing operation of a nuclear power reactor that has submitted the certification of permanent cessation of operations required under § 50.82(a)(1) or § 50.110 or a reactor licensee whose license has been amended to allow possession of nuclear fuel but not operation of the facility."

Most non-power reactors return their fuel to the DOE after permanent shutdown. In these cases, the facility license is normally amended to not allow possession of nuclear fuel and operation of the facility. Because of the wording in Section 50.59(b), the regulation is not applicable to these facilities. Consequently, the licensee and the NRC staff must process a license amendment adding to the license language excerpted from Section 50.59. By revising Section 50.59 to eliminate the need to amend a license, the

NRC could eliminate the burden associated with processing license amendments to maintain the applicability of Section 50.59.

Section A.6 of Appendix 3 provides a draft implementation approach (i.e., draft regulatory text) for this option.

5.2 Option 7: Revise definitions and terminology

Under this option, the NRC would pursue a rulemaking to clarify or revise the following definitions and terminology. In each case, there are inconsistencies that contribute to difficulty in interpreting the regulations.

- *10 CFR 50.2* defines the terms "non-power reactor" and "testing facility." The definition of "non-power reactor" uses the terms "research or test reactor," but a "test reactor" is not defined in the CFR. "Testing facility" is defined in Sections 50.2 and 170.3, but the definitions differ slightly. The term is defined twice in 10 CFR because Parts 50 and 170 address different topics (i.e., licensing requirements and fees, respectively).
- *10 CFR 50.22* defines the types of facilities covered by a class 103 license, which is a "commercial non-power reactor." This definition identifies a commercial non-power reactor as one that "is to be used so that more than 50 percent of the annual cost of owning and operating the facility is devoted to the production of materials, products, or energy for sale or commercial distribution, or to the sale of services, other than research and development or education or training." This definition is problematic when a facility does not meet the threshold of "commercial" during consecutive years. The regulations are not clear in terms of what steps would need to be taken when there are year-to-year changes in status.
- *10 CFR 170.3* defines the terms "research reactor" and "testing facility." "Testing facility" is defined in Sections 50.2 and 170.3, but the definitions differ slightly, as noted above.

The NRC may need to conduct further research in order to document or develop a technical basis for the definitions or terms.

5.3 Option 8: Document a technical basis for the definition of testing facility revising the definition, if appropriate

The definition for "testing facility" uses a power level threshold of greater than 10 MW(t). However, the technical basis associated with this 10 MW(t) threshold, while generally based on safety significance, is not documented. The technical basis should be documented to ensure that the rule applies appropriate technical standards to the appropriate types or classes of non-power reactors. The NRC should conduct further research in order to document this technical basis. If necessary, the NRC should revise the definitions to align the requirements with the documented technical basis. Affected requirements include:

- *10 CFR 50.30(f)* requires, for a test reactor, that an environmental report to be submitted as required under subpart A of 10 CFR Part 51 as part of the license application.

- *Section 50.58(a)* requires licensing actions related to test reactor licensees to be referred to the ACRS for review.
- *Section 50.71(b)* requires testing facility licensees to submit to the NRC a copy of their annual financial statement for the purpose of assuring their financial qualification to operate the plant.
- *Appendix C to Part 50* describes the kinds of information applicants for construction permits and combined licenses must submit to demonstrate the necessary financial qualifications. In Section III, medical and research reactor licensees are exempt from submitting annual financial reports.
- *Section 51.20(b)(2)* requires applications for test reactors to include an environmental impact statement.
- *Section 51.21* indicates that applications for research reactors include an environmental assessment.
- *10 CFR Part 100* contains the standards and criteria for testing facility sites (see related Option 9).

5.4 Option 9: Establish appropriate dose criteria for research reactors

Under this option, the NRC would develop accident dose criteria for use by research reactors. Currently, there are accident dose criteria for test reactors but not for research reactors. Consequently, the NRC uses certain dose criteria in Part 20 to evaluate research reactor accident analyses. The dose criteria in 10 CFR Part 20 are restrictive and were not meant for application to accident doses. Use of these criteria in future accident analyses, whether for existing or new research reactors, could lead to unnecessarily conservative decisions regarding site selection and engineered safety features (ESF) design. By defining more appropriate accident dose criteria for research reactors, NRC would allow license applicants to make more appropriate decisions regarding site selection and ESF design.

The NRC would need to conduct further research to implement this option.

Section A.9 of Appendix 3 provides a draft implementation approach (i.e., draft regulatory text) for this option.

5.5 Option 10: Segregate RTR licensing regulations

Under this option, non-power reactor licensing regulations (i.e., not just license renewal requirements) could be segregated into a separate Part, Subpart, or section of 10 CFR Chapter I.[22]

[22] This study considered segregating several subsets of requirements applicable to non-power reactors: (1) any new license renewal requirements; (2) licensing requirements; and (3) other requirements (e.g., hearing requests, availability of documents, fees). Neither the first nor the third subsets are discussed above because it became clear that (for subset 1) any new license renewal requirements should be segregated, and that (for subset 3), segregation of so many requirements currently scattered across 10 CFR is more than can be justified to address the constraint. The discussion above, therefore, focuses on the segregation of licensing requirements.

Segregation would, to one degree or another, result in the benefit of increased clarity with regard to the regulatory process. However, it would be associated with certain costs as well:

- One-time cost to the NRC to accomplish and implement the segregation.
- One-time cost to licensees to adjust to the segregation (minor).

The degree to which the benefits and costs are realized might vary depending on how the segregation is implemented. Further consideration by the NRC staff, and consultations with stakeholders, would be needed to determine whether the benefit associated with segregating the licensing requirements would outweigh the costs associated with carrying out the rulemaking. In particular, the costs and benefits of this option may depend on whether or not the rulemaking would address other options besides segregation. If not, then there may be relatively little benefit to be gained from segregation (i.e., because the benefits of segregation would have to justify the entire cost of the rulemaking). If, however, segregation is only one objective of a larger rulemaking, then the benefits may justify the costs.

Section A.10 of Appendix 3 describes in general terms how this option might be implemented.

6. Backfit Analysis, Regulatory Flexibility Analysis, Environmental Analysis, Safety Goal Evaluation, and Peer Review of Regulatory Basis

6.1 Backfit Analysis

The NRC's backfit provisions are found in the regulations at 10 CFR 50.109, 70.76, 72.62, 76.76, and in 10 CFR Part 52. Under Section 50.2, non-power reactors are research or test reactors licensed in accordance with Sections 103 or 104.c. of the AEA and 10 CFR 50.21(c) or 50.22 for research and development. The NRC has determined that the backfit provision in Section 50.109 does not apply to test, research, or training reactors (e.g., "Requirements for Fingerprint-Based Criminal History Records Checks for Individuals Seeking Unescorted Access to Non-power Reactors (Research or Test Reactors)," *Federal Register*, Vol. 77, No. 92, May 11, 2012, p. 27572). Therefore, a backfit analysis would not be needed for a rulemaking to address the non-power reactor license renewal process.

6.2 Regulatory Flexibility Analysis

The Regulatory Flexibility Act, enacted in September 1980, requires agencies to consider the impact of their regulatory proposals on small entities, analyze alternatives that minimize small entity impacts, and make their analyses available for public comment (Regulatory Flexibility Act, Pub. L. No. 96-354, 94 Stat. 1164 (codified at 5 U.S.C. § 601)).

Only one non-power reactor licensee falls within the definition of "small entities" set forth in the size standards established by the NRC in 10 CFR 2.810. Moreover, a rulemaking to address the license renewal process for non-power reactors is expected to result in net benefits to non-power reactors. Therefore, such a rulemaking would not have a significant economic impact on a substantial number of small entities.

6.3 Environmental Analysis

A rulemaking to streamline the license renewal process for non-power reactors would not be a major Federal action significantly affecting the quality of the human environment and, therefore, an environmental impact statement would not be required. The NRC developed regulations that implement the National Environmental Policy Act in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." An environmental assessment likely would conclude that there would not be a significant offsite impact to the public from this action.

6.4 Safety Goal Evaluation

Safety goal evaluations are applicable to regulatory initiatives considered to be generic safety enhancement backfits subject to the substantial additional protection standard at

§ 50.109(a)(3).[23] This regulatory basis describes potential regulatory changes that are unlikely to qualify as generic safety enhancements because they do not significantly affect the likelihood of core damage or spent fuel damage, which generally are the focus of a quantitative safety goal evaluation. Because the change in safety associated with a rulemaking to address the non-power reactor license renewal process cannot be quantified, the regulatory changes cannot be compared to NRC's safety goals.

6.5 Need for Peer Review of the Regulatory Basis

OMB's "Final Information Quality Bulletin for Peer Review"[24] requires each Federal agency to subject "influential scientific information" to peer review prior to dissemination. The OMB defines "influential scientific information" as "scientific information the agency reasonably can determine will have or does have a clear and substantial impact on important public policies or private sector decisions." This regulatory basis document does not contain "influential scientific information." Therefore, there is no need for a peer review of the regulatory basis.

[23] NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission." September 2004.
[24] http://www.whitehouse.gov/sites/default/files/omb/assets/omb/memoranda/fy2005/m05-03.pdf

7. Conclusion

This regulatory basis document analyzes the impacts associated with five options to address the current license renewal process for non-power reactors. In addition, the analysis includes consideration of five additional options that go beyond license renewal and address technical issues in existing non-power reactor regulations.

This section presents the conclusions of the analysis. Several of the conclusions call for the NRC staff to seek Commission approval. Commission approval on these topics is needed for two reasons. First, some of the options presented in this document – i.e., those that would address constraints in the existing rule language (i.e., beyond license renewal) – would step outside the bounds of the Commission's existing SRMs. Second, the options that would streamline the license renewal process would result in new burdens on non-power reactor licensees. Even though the staff expects the *overall burden on licensees to decrease*, any new burdens are likely to draw criticism as violations of Section 104.c. of the AEA.[25] If the Commission directs the staff to pursue rulemaking, the NRC would plan to undertake additional stakeholder outreach as a means of ensuring that overall burden would, in fact, decline.

7.1 Conclusion 1: Rulemaking is warranted

This regulatory basis considered a "no action" option (Option 1), a non-rulemaking option (Option 2), and three different rulemaking options (Option 3, Option 4, and Option 5). Based on an analysis of the impacts, some of the rulemaking options presented in this regulatory basis likely would result in a more efficient and streamlined process than the current one. Therefore, a license renewal rulemaking is warranted.

Section 4.3 of the regulatory basis contains an analysis of Option 3, rulemaking to adopt a streamlined license renewal process. This option would result in one-time implementation costs to NRC, along with ongoing costs associated with updating SARs periodically. However, the option also would enhance clarity of the license renewal process, result in savings to all licensees due to fewer RAIs and the NRC due to fewer RAIs and more limited reviews of applications for facilities with power levels less than 2 MW(t).

Section 4.5 of the regulatory basis presents the analysis of Option 5, rulemaking to eliminate license terms (and license renewals) and mandate an enhanced NRC inspection program. This option would result in one-time implementation costs to NRC, along with ongoing costs to licensees associated with updating SARs periodically. In addition, the NRC would incur periodic costs to conduct enhanced inspections of operating non-power reactors. However, the option also would result in savings to licensees by eliminating the need to prepare license renewal

[25] According to Section 104.c. of the AEA, the Commission may impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public, and permit widespread and diverse research and development. As a result, any regulatory change that results in additional burden on non-power reactors would need to be consistent with the AEA's minimum regulation standard.

applications and having to respond to associated RAIs and savings to the NRC by eliminating the need to evaluate license renewal applications and review responses to RAIs. On balance, this option would result in a reduction in burden on licensees and little change to the burden on the NRC.

7.2 Conclusion 2: If Option 3 is pursued, the rulemaking should include changes to the timely renewal requirement

Under the current regulations, licensees are allowed to submit license renewal applications as late as 30 days before the expiration of the existing license, to continue operation pending the results of the review. Thirty days does not provide a sufficient amount of time for the NRC staff to assess the license renewal application adequately. If the NRC staff is given more time to conduct an acceptance review (e.g., two years), then the NRC would be able to reject or refuse to accept an insufficient application without causing an immediate shutdown of the reactor.

7.3 Conclusion 3: If Option 3 is pursued, the rulemaking should extend ISG concepts to the preparation of license renewal applications

The ISG presents a streamlined review process that the NRC staff developed to address a backlog in license renewal applications and continues to apply to current license renewal application reviews. The ISG process uses a graded approach based on the licensed power level of a facility. However, while this approach focuses the efforts of the NRC staff on the review of the most safety-significant sections of the SAR (i.e., reactor design and operation; accident analysis; technical specifications, and radiation protection), licensees still are required to submit a full license renewal application. The NRC could reduce the burden on non-power reactor licensees by reducing the scope of the license renewal application to only the portions of the applications needed for the staff reviews.

7.4 Conclusion 4: If Option 3 or Option 5 is pursued, the NRC staff should seek Commission approval to require periodic updates of the SAR

Unlike power reactor licensees, non-power reactor licensees are not required to update their SARs periodically. Licensees generally did not update documentation of their licensing bases during the initial license period. In these cases, the scope of a license renewal application review could not be narrowly focused because it was first necessary to understand the changes that had occurred with regard to the facilities and their operations. As a result of the out-of-date SARs, the NRC required numerous rounds of RAIs with licensees to re-establish the licensing basis of the facilities. As discussed in Sections 4.3, 4.4, and 4.5, the NRC could reduce the expected net burden (hours) associated with the license renewal RAI process by requiring non-power reactors to periodically update their SARs. However, while the overall net burden would be expected to decrease, the earliest effects (i.e., effects prior to the next license renewal) would be slight increases in burden. Because Section 104.c. of the AEA states that the Commission may impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public, and permit widespread and

diverse research and development, the NRC staff should seek Commission approval to require periodic updates of the SAR.

7.5 Conclusion 5: The NRC staff should seek Commission direction on whether to continue the current license renewal paradigm for non-power reactors, or to pursue an alternative paradigm that eliminates license terms

The AEA does not establish a license term limit for Class 104.a. and 104.c. non-power reactor licenses. However, 10 CFR 50.51(a) states that a license "will be issued for a fixed period of time to be specified in the license but in no case to exceed 40 years from date of issuance." The NRC could eliminate license terms for these non-power reactors and implement an alternative to license renewal that would ensure continued safe operations. Specifically, the NRC could replace the current license renewal process with an enhanced NRC inspection program and periodic updates to SARs, as discussed in Section 4.5. Inspections would occur every 10 years and would assess the cumulative effects of plant aging, plant modifications, operating experience, new technical developments, and new siting aspects. This new approach would, for all non-power reactors, eliminate the burden associated with the license renewal process but would introduce smaller ongoing burdens. However, on the whole, this option is expected to reduce the overall burden on licensees.

7.6 Conclusion 6: The NRC staff should seek Commission approval to fix some or all of the constraints in existing rule language beyond license renewal

SRM-M090811 directed the staff to "accelerate the rulemaking to establish a more efficient, effective and focused regulatory framework" for license renewal. However, as the regulatory basis for this effort progressed, a number of constraints came to light that relate to non-power reactor regulations, but not to license renewal specifically. These constraints are discussed in Section 3.4, and options to correct the constraints are summarized below (ordered by ease of fix, from easiest to most difficult) and discussed in greater detail in Section 5. In order to address some or all of these issues in the same rulemaking effort as the one streamlining license renewal, thereby achieving various efficiencies in the rulemaking process, the NRC staff should seek approval from the Commissioners on addressing these existing regulatory constraints that are not covered by a Commission SRM.

1. Applicability of Section 50.59 to permanently shutdown non-power reactors without fuel. The wording in Section 50.59(b) requires the NRC staff to issue license amendments in cases where a non-power reactor's fuel is removed from the site and the authority to possess the fuel is removed from the license in order to maintain its applicability. Amended wording could correct this issue and reduce the burden on NRC staff and licensees.

2. Inconsistent definitions and terminology. The definitions and terminology in 10 CFR 50.2, 10 CFR 50.22, and 10 CFR 170.3 associated with non-power reactors are inconsistent and hinder the proper interpretation of the regulations. For example, testing facility is defined under 10 CFR 50.2 and 10 CFR 170.3 but the wording in the definitions is slightly different. A rulemaking would allow the NRC staff to clarify the terms and definitions for research reactor, testing facility, non-power reactor, and commercial non-power reactor.

3. Lack of a technical basis for the definition of testing facility. Several sections of the regulations apply to testing facilities only. The definition for testing facility uses a power level threshold of greater than 10 MW(t), but the technical basis associated with this threshold is not documented. The NRC staff should document the technical basis to ensure that the rule applies appropriate technical standards to the appropriate types or classes of non-power reactors. If necessary, the NRC should revise the rule to be consistent with the technical basis.

4. Lack of dose standards for research reactors. The accident dose standards in 10 CFR Part 100 apply to test reactors and not research reactors. The regulations lack accident dose standards for research reactors. The staff currently apply the standards in 10 CFR Part 20 to research reactors, and cannot apply more specific standards for accidents. A research project, followed by rulemaking, would provide the NRC with the opportunity to develop appropriate accident dose standards for research reactors.

5. Organization and presentation of non-power reactor licensing requirements. Existing non-power reactor requirements are integrated together with licensing requirements for power reactors, even though requirements for non-power reactors are considerably fewer due to the lower public health, safety, and security risks associated with non-power reactors. This regulatory design leads to difficulty in identifying applicable requirements. The NRC could conduct rulemaking to consolidate and organize the non-power reactor requirements to improve regulatory efficiency. This regulatory basis has determined that, at a minimum, any new *license renewal requirements* should be organized in a segregated fashion. However, a rulemaking to segregate *all licensing requirements* applicable to non-power reactors also may be reasonable, particularly if included within a non-power reactor rulemaking initiated for other reasons (e.g., to streamline the license renewal process). On the other hand, a rulemaking that has as its sole purpose the segregation of non-power reactor licensing requirements may not generate sufficient benefits (relative to non-rulemaking alternatives) to justify the effort.

7.7 Conclusion 7: Select or refine an option for rulemaking

After receiving direction from the Commission, the NRC staff should select or refine an option for rulemaking. The ultimate shape of the rulemaking will depend on how the Commission responds to the NRC staff's request, and on the availability of resources to conduct additional analyses for the rulemaking topics that go beyond license renewal (e.g., to develop dose

standards for research reactors). In addition, the rulemaking should address as many of the regulatory constraints as possible. Table 3 summarizes each of the options analyzed in the regulatory basis relative to the regulatory constraints that the options are intended to address.

Table 3: Summary of Options and the Regulatory Constraints They Address

	Regulatory Constraints							
Options	Constraint 1: Reliance on initial licensing regulations & implementation guidance for license renewal	Constraint 2: Lack of periodic updates to SAR	Constraint 3: "Timely renewal" provision in 10 CFR 2.109	Constraint 4: Constraints in Existing Rule Language				
				Applicability of Section 50.59	Definitions and terminology	Rule applicability	Dose standards for research reactors	Organization & presentation of requirements
#1: No action								
#2: No rulemaking	✓	✓						
#3: Rulemaking adopting streamlined license renewal	✓	✓	✓					✓
#4: Eliminate license terms, add PSRs	✓	✓	✓					
#5: Eliminate license terms, add enhanced inspections	✓	✓	✓					
#6: Revise Section 50.59				✓				
#7: Revise definitions and terminology					✓			
#8: Clarify the applicability of requirements						✓		
#9: Establish dose criteria for research reactors							✓	
#10: Segregate licensing regulations								✓

Appendix 1: Benchmarking Analysis

Purpose

The primary purpose of this research is to determine whether the approaches used by other Government agencies should be further investigated by the NRC in its efforts to improve the RTR license renewal regulatory framework.

Approach

To obtain information, staff conducted telephone interviews with a number of staff from DOE and DOD who are responsible for or familiar with reactor regulation within their respective agencies. These individuals work for the Army Reactor Program within DOD, or for one of several relevant DOE offices (i.e., Office of Nuclear Safety Policy and Assistance, the Office of Science, and the Office of Nuclear Energy). The interviews occurred in November 2011. Staff also reviewed a number of regulations and policies issued by DOD, DOE, and the IAEA.

Organization of Report

The remainder of the report consists of three sections:

- Section 2 summarizes relevant findings related to the Army Reactor Program;
- Section 3 summarizes relevant findings related to DOE reactor oversight;
- Section 4 summarizes relevant findings related to the IAEA.

Army Reactor Program

Background and Overview

At its peak, the Army Reactor Program oversaw eight nuclear power plants and two research reactors. The Army Reactor Program currently has one operating nuclear research reactor at the White Sands Missile Range in New Mexico. Five other reactors are ready for decommissioning, including:

- The SM-1 reactor (deactivated), which was 2 MWe, is located in Fort Belvoir, Virginia.
- The MH-1A reactor (deactivated), which was 10 MWe, is mounted on the Sturgis, a barge converted from a Liberty ship, and moored in the Panama Canal Zone during operation. The Sturgis is currently located at the Reserve Fleet moored in the James River, Virginia.
- The SM-1A reactor (deactivated), which was 2 MWe, is located in Fort Greely, Alaska.
- The Aberdeen Pulse Radiation Facility (deactivated), is located at the Aberdeen Proving Ground in Maryland.

- The Diamond Ordnance Radiation Facility at Walter Reed Hospital (deactivated) was a research reactor used for medical research. Equipment at this facility has been completely removed, but the structure requires decommissioning.

Army Regulation 50-7 establishes the Army Reactor Program, and defines the rules and responsibilities associated with the program. The program borrows heavily from the NRC's regulations and guidance, including, in particular, NUREG-1537.

The Army Reactor Program uses a permitting process to initiate, oversee, and decommission its reactors. This process is outlined in Army Regulation 50-7.

Although higher levels of authority within the Army approve permits for reactor facilities, the Army Reactor Office issues the permits. Commanders within the Army that seek to obtain a permit for a facility must submit a formal request to the Army Reactor Office. The Army requires permit requests for construction, loading and testing, operations, special circumstances, and decommissioning of reactor facilities. For each of these permits, the site must submit a Safety Analysis Report (SAR). According to Army Regulation 50-7, the SAR must follow the format specified in the NRC's NUREG-1537.

The Army Reactor Program reviews the SAR. This review involves making sure that the guidelines in NUREG-1537 have been followed. An Army Reactor Program representative indicated that it is unusual for SARs to vary from the guidance in NUREG-1537. The facility's technical specifications are then derived from the SAR, similar to the NRC's process.

The Army Reactor Program typically is able to review and approve permit applications within four to six weeks, regardless of the type of permit (i.e., construction, load and test, operational, special, or decommissioning).[26] Each permit establishes a suspense date, which defines the term of the permit. There is no typical term for a permit. Permit periods vary from facility to facility. If a facility requests an extension of its permit period, it must provide the same information required for the initial permit.

Army's Process Analogous to License Maintenance

Throughout the lifespan of a reactor, the Army's oversight involves reviewing new permit requests for a facility (e.g., for a facility that is transitioning from operations to decommissioning), reviewing unreviewed safety questions (USQs), requiring periodic updates to the SAR, conducting inspections of facilities, and reviewing mandatory reports from facilities. Each of these activities is described below.

New Permit Requests

The Army Reactor Office requires updated permits when special circumstances arise. These updated permits require updated SARs. For example, the Army is planning to make some changes to the White Sands reactor facility, and part of that upgrade involves safety equipment. To complete this upgrade, the Army Reactor Office requires the site to conduct a Special Safety Analysis Report that must be reviewed and approved by the Army Reactor Council (ARC). The

[26] An Army Reactor Program representative explained that his organization is much smaller than the NRC and the communication process with sites is less formal than the NRC's process. These factors lead to quicker reviews and approvals relative to the NRC's license application and renewal processes.

ARC makes a recommendation on whether or not to issue the special permit. This requirement is one tool the Army may use to oversee changes in operations at permitted facilities.

Unreviewed Safety Questions (USQs)

Similar to the NRC's Section 50.59 reviews, the Army imposes an Unreviewed Safety Questions (USQ) process on its reactor facilities. "Positive" USQs are those that (1) increase the probability or severity of an accident or malfunction of equipment important to the safety analysis; (2) introduce the possibility of an accident or malfunction which was not previously considered; or (3) reduce the margin of safety as defined in the basis of an technical specification. Positive USQs require an amendment to the permit, which must be approved by the ARC.

Periodic Updates to the SAR

According to Section 2-4 of Army Regulation 50-7, facilities must periodically update their SARs. The permit holder is required to review and periodically update the SAR in order to address cumulative changes to the facility or other relevant conditions that could affect the facility's safety basis.[27]

Inspections

The Army Reactor Office also inspects permitted facilities. On an annual basis, representatives of the ARC visit permitted operating facilities. The inspection lasts for approximately a week during which the ARC reviews operations, conducts drills (offsite response), and reviews tests. The findings are documented in a report which may consist of action items and recommendations. If the findings involve safety-related issues, the Army Reactor Office can suspend the permit.

Reporting Requirements

The Army Reactor Office receives quarterly reactor operating reports and an annual summary of reactor operations. The annual reports summarize reactor system use, corrective maintenance, unscheduled shutdowns, reportable occurrences,[28] and changes and tests. In practice, the Army Reactor Office requires the quarterly and annual reports from all of its facilities until they are decommissioned.

Benchmarking Analysis

The Army Reactor Program borrows heavily from NRC's non-power reactor regulatory program. Although the permitting process is different than the NRC's licensing process, the underlying guidance for preparing the SAR is the same.

One feature of the Army Reactor Program does not conform to the NRC's process. The NRC does not have a requirement for non-power reactors to update their SARs over time. However, by regulation, the Army requires their facilities to periodically update SARs.

[27] The Army Reactor Program regulations do not identify an acceptable periodicity for updating SARs.
[28] Section 6-3 requires the reactor facility director to report "in a timely manner" any events or conditions that could have a significant impact on reactor safety or security.

Recommendations for the Regulatory Basis

The NRC should consider the Army Reactor Program benchmark as a potentially effective option for streamlining the license renewal process. Requiring licensed non-power reactors to periodically update their SARs (e.g., every two years) would address the current lack of periodic updates to SARs and to other reports. The regulatory basis should consider the technical, legal, and policy issues associated with adopting such requirements for NRC licensees.

DOE Reactor Oversight

Background and Overview

Over time, the DOE has overseen several large reactors, including the Savannah River site. However, most of DOE's large reactors have been shut down. The Advanced Test Reactor (ATR) at the Idaho National Laboratory (INL) is DOE's largest currently operating reactor. The ATR operates at a maximum power level of 250 megawatts thermal (MW(t)). DOE owns and regulates the reactors in its fleet, while DOE contractors operate the facilities. The regulations in 10 CFR Part 830 formulate DOE's nuclear safety management program.

The DOE has developed a hazard categorization system for its test reactors. The purpose of the hazard categories is to establish a graded approach for the preparation of SARs. DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports," explains that the "objective of a graded approach is to proportion SAR requirements for analysis, evaluation, and documentation to the potential hazards associated with operating DOE nuclear facilities."

Although the framework of the regulatory process does not differ based on hazard, the criteria that facilities need to meet vary according to hazard. Specifically, all of DOE's test reactors must prepare an SAR, but the depth of the analysis in the SAR will vary depending on the hazard categorization. There are three hazard categories and facilities must conduct a "hazard analysis" in order to determine their hazard category. Hazard Category 3 facilities have hazard analyses that show the potential for only significant localized consequences. Hazard Category 2 facilities have hazard analyses that show the potential for significant on-site consequences. Hazard Category 1 facilities have hazard analyses that show the potential for significant off-site consequences.

The requirements for the content and format of an SAR are described in Appendix A to 10 CFR Part 830. DOE contractors prepare the SARs for the facilities they operate and submit them to DOE for review and approval.

DOE Standard 1104 describes DOE's review process and expectations for the preparation of the Safety Evaluation Reports (SERs) that document the review and provide the basis for DOE's approval for operation.

SARs for a new facility have an extensive preparation process, from conceptual design to final operation. DOE's allotted time for SAR review and approval are sometimes set by contract requirements made on behalf of DOE to an operating contractor.

DOE does not define operational lifetimes for its reactors in terms of years of operation. Instead, the DOE facilities have a mission length. As a result, the facility lifetime is based on its

mission. A facility's lifetime changes as mission length changes. Once a mission is fulfilled, the facility is decommissioned.

DOE's Process Analogous to License Maintenance

Once a facility's SAR is approved by DOE, there are several on-going processes that the DOE pursues during the lifespan of a reactor to maintain safety, including evaluation of unreviewed safety questions (USQs), requiring annual updates to the SAR, updating the reactor core, and conducting inspections of facilities. Each of these activities is described below.

Unreviewed Safety Questions

First, the DOE uses an USQ process, which is similar to the NRC's 10 CFR 50.59 process. As defined in 10 CFR 830.203, the USQ process applies when there is (1) a temporary or permanent change in the facility as described in the existing documented safety analysis; (2) a temporary or permanent change in the procedures as described in the existing documented safety analysis; (3) a test or experiment not described in the existing documented safety analysis; or (4) potential inadequacy of the documented safety analysis because the analysis potentially may not be bounding or may be otherwise inadequate. According to the regulation, contractors must seek DOE approval of USQs before pursuing the change because they are outside of the approved safety basis.

Annual Updates to the SAR

In 10 CFR 830.202, the DOE requires annual updates to the SAR. DOE reviews and approves the updated SARs.

Related to this requirement, the contractor at the ATR developed a probabilistic risk assessment (PRA) for the site. DOE does not require PRAs for its reactors, but a study by the National Academy of Science recommended PRAs for DOE's large reactors. The PRA is nearing completion, and the ATR contractor plans to integrate the PRA into its SAR. DOE staff believe that the PRA will provide a comprehensive tool to assess changes in the plant and will contribute to a better understanding of how certain changes affect core damage frequency.

Updates to the Reactor Core

DOE changes the entire core and internals of the ATR every seven years. As a result, aging issues associated with the core can be minimized because a new reactor is installed every seven years.

Inspections

The DOE has a tiered approach to inspections and safety appraisals. In general, higher-risk sites receive greater inspection scrutiny. The on-site contractor conducts safety inspections and evaluations. For example, at the ATR, the contractor established an independent oversight function within its organization. In addition, INPO provides periodic reviews of various issues at the ATR. External bodies, like INPO, can often trigger additional reviews and inspections as issues are detected.

The DOE also uses facility representatives, who are similar to NRC's resident inspectors at nuclear power plants. The facility representatives observe contractor operations and compliance and have annual assessment plans that are used to inspect the facilities.

Benchmarking Analysis

The DOE's methods and processes for overseeing non-power reactors are inherently different than the NRC's because DOE owns the facilities and the facilities are not separate entities (such as the NRC's licensees). As a result, some of the DOE's regulatory approaches are not readily applicable to the NRC.

However, similar to the Army Reactor Program, the DOE requires periodic updates to a facility's SAR. The DOE requires annual updates that must be submitted to the agency for review and approval. The NRC does not have a requirement for non-power reactors to update their SARs over time.

Recommendations for the Regulatory Basis

The NRC should consider the DOE benchmark as a potentially effective option for streamlining the license renewal process. Requiring licensed non-power reactors to periodically update their SARs would address the current lack of periodic updates to SARs and to other reports. The regulatory basis should consider the technical, legal, and policy issues associated with adopting such requirements for NRC licensees.

With regard to requiring PRAs, a requirement for non-power reactor licensees to conduct PRA studies would not provide a benefit commensurate with the cost and effort required. In addition, such a requirement would not be consistent with the "minimum regulation" criterion in the AEA. However, there may be benefit from an effort by NRC to qualitatively characterize the risk characteristics of these reactors.

Probabilistic risk assessments are complex studies requiring substantial effort and cost. Given the simplicity of non-power reactor designs, the complexity and cost of the analysis would be proportionately smaller relatively to a power reactor. However, any systematic application of this methodology would require rigor and would be costly for non-power reactors. Moreover, PRAs submitted to the NRC in a licensing context would require the application of quality assurance standards, which could be burdensome to non-power reactor licensees. The result would be a level of effort and cost that outweighs the potential benefits. A possible alternative approach would be for the NRC to conduct or sponsor a study of the risk aspects associated with various non-power reactor designs. The study could be performed in a more qualitative and generic fashion. The results of the study could be used by licensees during licensing actions. The regulatory basis should consider the technical, legal, and policy issues associated with conducting such a study.

A requirement for PRA studies at NRC-licensed non-power reactors would not provide a benefit commensurate with the cost and effort required. Further, it would not be consistent with the "minimum regulation" criterion in the Atomic Energy Act. However, there may be benefit from an effort by NRC to qualitatively characterize the risk characteristics of these reactors.

International Atomic Energy Agency (IAEA)

Background and Overview

Nuclear reactors operated within member states of the International Atomic Energy Agency (IAEA) receive routine reviews of plant operations that occur after modifications to hardware and procedures, significant events, new operating experience, and changes in plant management. The facilities also receive special reviews that follow major events of safety significance. These reviews are the primary means of verifying the safety of the plants. However, these routine reviews and reactive safety reviews are generally focused reviews and do not consider changes in safety standards and operating practices, the cumulative effects of plant aging, plant modifications, feedback of operating experience and new developments in science and technology.

IAEA's Process Analogous to License Maintenance

In order to complement the routine and special safety reviews, some member states of the IAEA perform systematic safety reassessments, referred to as periodic safety reviews (PSRs), to assess the cumulative effects of plant aging and plant modifications, operating experience, new technical developments and new siting aspects. The PSRs include an assessment of plant design and operation against current safety standards and practices, and have the objective of ensuring a high level of safety throughout the plant's operating lifetime. It should be noted that the licenses issued by most member states do not contain a specific license term, and the PSRs have not been implemented solely for the purpose of license renewal.

The IAEA issued a Safety Guide in 1994 to provide guidance to those member states requiring PSRs. Based on the member states' experiences in performing PSRs, IAEA issued a revised Safety Guide in 2003. PSRs have been used to help provide a basis for continued operation beyond the designed lifetime, to communicate more effectively with stakeholders regarding nuclear power plant safety, and to help identify changes to plant operation that enhance safety.

The typical interval between PSRs is 10 years. During this period, significant changes may occur. For example, regulations may evolve, and there may be advances in worldwide safety methodologies and analysis tools. Ten years provides sufficient time for the identification of trends and the drawing of conclusions based on operational and safety records.

A PSR is a comprehensive, integrated review that considers long-term operational and safety performance trends. A PSR is complementary to the ongoing regulatory oversight and inspection processes and to the licensee's ongoing programs, procedures, and processes needed to safely operate the plant. The PSR also includes a corrective action plan that is used to resolve findings arising from the review.

The scope of the PSR is comprehensive, covering all relevant safety issues and taking into account the safety classification of equipment. The licensee and regulator agree upon the scope prior to commencing the review and may differ between the first and subsequent PSRs.

The nuclear power plant licensee has primary responsibility for performing the PSR. The licensee manages and provides technical leadership for the PSR and may use support from external consultants, where appropriate.

The state regulator approves the scope of the PSR, tracks the review process, and assesses the results and corrective actions.

The organization of a PSR is generally grouped into five different categories with several areas of concentration in each category as follows:

I. Plant

- Plant design
- Actual condition of systems, structures and components (SSC)
- Equipment qualification
- Aging

II. Safety analysis

- Deterministic safety analysis
- Probabilistic safety analysis
- Hazard analysis

III. Performance and feedback of experience

- Safety performance
- Use of experience from other plants and research findings

IV. Management

- Organization and administration
- Procedures
- The human factor
- Emergency planning

V. Environment

- Radiological impact on the environment

Overall, the use of PSRs provides a variety of advantages to both the regulator and to licensees. First, some member states gather information through the PSRs that is needed for plant licensing decisions. The PSRs also provide assurance that the plant is safe to continue operating, subject to the implementation of any corrective actions. The PSRs also provide information to the licensee on where plant improvements and updates are needed. Member states also provide information from the PSRs to the public to demonstrate nuclear safety. Licensees benefit by avoiding more frequent regulatory action by conducting periodic reviews of performance.

Benchmarking Analysis

The IAEA's PSR process is different from the NRC's license renewal process because it is used by several IAEA member states that do not have a license terms. Instead of having a license renewal process, member states use the results of PSRs, among other factors, to decide whether or not to allow continued operations. If the NRC were to adopt this option, then license

renewal (and license terms) could be eliminated, although it would substitute certain costs associated with PSRs. The NRC staff likely would want additional assurances that the reactor's licensing basis is not lost between PSRs. As a result, the periodic burden associated with the current license renewal process (e.g., every 20 years) may be spread over time with periodic reporting requirements (e.g., annual updates to SARs) and PSRs occurring every 10 years, which could yield a net reduction in burden for the licensees.

Recommendations for the Regulatory Basis

The NRC should consider the IAEA benchmark as a potentially effective option for streamlining the license renewal process. Requiring licensed non-power reactors to conduct PSRs would address the NRC's current reliance on initial licensing regulations and implementation guidance for license renewal. Specifically, by implementing a process like the IAEA's PSRs, the NRC would no longer require licensees to submit license renewal applications. Instead, a periodic safety review would serve as a basis for allowing operations to continue. The regulatory basis should consider the technical, legal, and policy issues associated with adopting requirements for PSRs and other periodic reporting requirements in place of the current license renewal application process. One issue that should be examined is the tradeoff between the burden associated with the license renewal application process and the periodic PSR burden. In addition, the regulatory basis also should examine the regulator's role in the conduct of PSRs.

Conclusion

The processes used by the Army Reactor Program, DOE, and IAEA provide benchmarks for the NRC staff to consider. Although these agencies do not provide a wholesale methodology that could be used to replace the NRC's existing license renewal process, each agency lends particular methods that could yield efficiencies for the NRC's non-power reactor license renewal process.

Specifically, both the Army Reactor Program and the DOE benchmarks indicate that periodic updates to SARs could result in some efficiencies for licensees and NRC staff (due to fewer RAIs during the license renewal process).

In addition, the IAEA benchmark introduces PSRs as a tool that could be used in an alternative approach to license renewal. The efficiency gained from this approach, however, may be offset by additional features that may need to be imposed by the NRC to ensure that the reactor's licensing basis is not lost between PSRs (e.g., periodic updates to SARs).

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Appendix 2: Stakeholder Outreach

Public Meeting #1

On September 13, 2011, the NRC held a public meeting in Idaho Falls, Idaho, to provide information about the NRC's efforts to streamline non-power reactor license renewal and to provide stakeholders and the public an opportunity to discuss NRC's efforts and ask questions.

This appendix summarizes the stakeholder comments received during the public meeting.

How often do you refer to NRC regulations?

One licensee stated that it depends on what is going on and the review that is taking place. Licensees refer to regulations when there is something going on with the facility. A specific action generally triggers the look at regulations.

Three quarters of the stakeholders in the room indicated that they have referred to the guidance in NUREG-1537. Of these individuals, half said they have used the guidance. Speaking to the license applicants in the room, the NRC staff asked how many find the regulations convoluted and hard to follow. A high percentage of these individuals raised their hands.

One stakeholder stated that Part 20 is not difficult to follow, but the other regulations are tough to follow.

Another licensee stated that Part 50 is vague unless someone points you to the sections that apply.

Another stakeholder identified Part 73 as an example of a difficult regulation. The stakeholder stated that Part 73 jumps around and has exceptions. The structure does not flow.

Two stakeholders explained that NUREG-1537, Part 2 (NRC's SRP) is much more helpful than Part 1 (format and content). The stakeholders used Part 2 to prepare license renewal applications, not Part 1.

Another stakeholder suggested that Part 1 is easy to read, but difficult to implement. The guidance in Part 1 asks questions like, "Why did you choose this fuel?" But, the relevant question is, "Why is your fuel acceptable?" This stakeholder indicated that the guidance needs to be clarified to better describe what is acceptable to the NRC staff.

Is the organization of the regulations an impediment?

A stakeholder indicated that there are no non-power reactor-specific regulations, so they are not the cause of the constraint. The current structure makes you go through Part 50 section by section to figure out which requirements apply.

Another stakeholder stated that NUREG-1537 is working. The licensee suggested that the NRC should be referring to the design basis criteria in the guidance, not Part 50.

One stakeholder indicated that the regulations cover licensing and post-licensing actions, while NUREG-1537 only addresses initial licensing actions. So, the mapping from NUREG-1537 to the regulations is not complete.

Another stakeholder explained that there are regulations that licensees use often, which are familiar. Then there also are regulations licensees do not look at all that often.

A stakeholder indicated that it would be helpful to have more clarity of responsibilities, in terms of what licensees have to pay attention to in the regulations and guidance. The commenter suggested that there is a lack of guidance on what licensees need to be referring to.

Another stakeholder asked about NRC-sponsored training for Project Managers, and whether it would be helpful to licensees.

Another stakeholder explained that having clarity on the regulations and their applicability to non-power reactors is helpful, but ultimately, what matters is NRC's interpretation of the regulations, and the Project Manager's opinion. If licensees do not know how the NRC is interpreting the regulations, then licensees cannot be sure of what is required under the regulations.

One stakeholder recommended that the NRC stick to updating NUREG-1537, and provide tools to help licensees interpret the current regulations.

Another stakeholder responded that he would like to see both – an update of the regulations and NUREG-1537. The stakeholder recommended segregation of Parts 50 and 73.

One stakeholder suggested that in the long term, for the next round of license renewals, it would be helpful to have a segregated Part 50 for non-power reactors. But in near term, the staff should focus on updating NUREG-1537.

One stakeholder indicated that part of the difficulty is the broad range of facilities. The commenter suggested that, similar to material licensees, the NRC staff need to develop regulatory guidance to address each type of facility.

Another stakeholder responded that the appendix in NUREG-1537 is helpful, but it is not the "gospel." The stakeholder indicated that it is a quick reference guide.

A stakeholder suggested that a chapter by chapter reference tool would be useful to licensees. This tool would show how each chapter of the acceptance review ties back to the regulations and how the regulations tie to the acceptance criteria.

Another stakeholder stated that regulations are technology-neutral, and the acceptance criteria for design is technology-specific. Between the two, there is a lot of interpretation.

What are the benefits of segregating license renewal requirements? Segregating all licensing requirements?

One stakeholder stated that RAIs were hard to follow. The stakeholder did not know what constituted a complete answer to the RAI. The stakeholder suggested that the regulations are too complicated because they do not indicate what level of analysis is enough to satisfy the requirements.

What specific technical fixes are needed to the regulations? To the guidance?

A stakeholder suggested: If the regulations are not broken, do not try to fix them. When you open up the regulations to change, you can create new interpretations. The current regulations may not be great, but at least we know how to interpret them today. When you start to revise them, there may be scope creep. I like the idea of research reactor regulations sitting on their own. The NRC needs to work on guidance for how the regulations as written should be interpreted.

Another stakeholder suggested that the NRC could create a generic guidance document for TRIGAs as a new kind of a tool.

What improvements or changes are needed to NUREG-1537 in particular?

One stakeholder commented that the regulations are high-level and vague, which provides flexibility to licensees. The guidance, however, gets more specific, and as a result, you lose the flexibility.

Another stakeholder commented that Part 1 is general, and Part 2 is where the “meaty” guidance is.

Yet another stakeholder mentioned that a hyperlink in the guidance to the CFR might be helpful.

<u>Public Meeting #2</u>

On December 19, 2011, the NRC held a public meeting in Rockville, Maryland, to gather comments and discuss the proposed options for developing the regulatory basis for streamlining non-power reactor license renewal, along with emergency preparedness rulemaking issues.

Discussion on no action alternative

A commenter stated that lessons learned should be incorporated into any change to the license renewal process. But, the commenter asked whose lessons learned would be incorporated. The stakeholder suggested that the NRC and licensees share their perspectives on lessons learned.

If you take a poll of the community, they would conclude that the process needs work. Therefore, I do not believe that Option 1 is a viable option. [There were indications of general agreement with this statement by other stakeholders around the table.]

Discussion on non-rulemaking approaches

A commenter stated that for research reactors, it is unclear why license renewal applications have to include the same material as an initial application. The commenter explained that if nothing has changed, then licensees should not have to re-do analyses. The commenter asked for a process that simplifies license renewal for the majority of facilities.

Another commenter explained that there is confusion regarding the list of topics in NUGEG-1537 because there is no context of how they apply. Non-power reactor regulatory guidance does not provide much guidance on why or how a regulation applies.

Another commenter suggested that stakeholders would benefit from the NRC clarifying what is required by regulation and what is suggested/preferred by NRC guidance.

A stakeholder explained that licensees have trouble understanding what regulations are applicable to non-power reactors.

Discussion on rulemaking adopting a streamlined license renewal process

One commenter stated that there is anxiety about rulemaking. The commenter suggested that the existing regulations for licensing use prudent engineering judgments.

Another stakeholder supported rulemaking because the current reliance on guidance has not worked well.

Another stakeholder explained that licensees are concerned about rulemaking because there is uncertainty about the scope and costs imposed on licensees.

A stakeholder stated that licensees want an improved license renewal process, but any new rules need to be specific.

Another stakeholder asked that SAR updates not include requests from the NRC staff to re-do complicated analyses.

Other stakeholders expressed concern that updated SARs would lead to many time-consuming RAIs from the NRC staff.

Another commenter suggested that updated SARs will not help the license renewal process.

A stakeholder suggested that license renewal be simplified by license extension. The commenter explained that this may require periodic updates to the SAR. Another commenter agreed that periodic updates to SARs would be an acceptable trade off for an eliminated license renewal process.

Discussion on Options 4 and 5: Rulemaking eliminating license terms (and license renewal)

Stakeholders asked what would be involved in the periodic safety reviews and what would be required.

Public Meeting #3

On March 27, 2012, the NRC held a public meeting in Rockville, Maryland, to brief the Commission on the research and test reactors license renewal process, including the status and activities to complete the review of the current backlog, and activities and plans for research and test reactors license renewal rulemaking. A panel of external stakeholders also briefed the Commission.

The Commission asked a variety of questions, including whether or not the external stakeholders would favor a rulemaking addressing the license renewal process. The stakeholder panel unanimously favored a rulemaking that would replace license renewals with an enhanced NRC inspection program coupled with periodic updates to SARs.

Public Meeting #4

On June 20, 2012, the NRC held a public meeting in Rockville, Maryland, to gather comments and discuss the preliminary draft regulatory basis for streamlining non-power reactor license renewal. Additional comments are being sought on the draft regulatory basis in the Federal Register via a thirty day comment period.

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