Draft Regulatory Analysis for the Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend its regulations by adding a new Part 53, “Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants” (Part 53) to Title 10 of the *Code of Federal Regulations* (10 CFR) and revising existing regulations at 10 CFR Part 26, “Fitness for Duty Programs,” and 10 CFR Part 73, “Physical Protection of Plants and Materials,” to address the possible attributes of future commercial nuclear power plants. The current application and licensing requirements were primarily developed for large light-water and nonpower reactors as outlined in 10 CFR Parts 26, 50, 52, 55, 73, and 100 and therefore may not fully consider the variety of designs for advanced nuclear reactors.

On January 14, 2019, the President signed the Nuclear Energy Innovation and Modernization Act (NEIMA) into law (Public Law 115-439). NEIMA section 103(a)(4) directs the NRC to “complete a rulemaking to establish a technology-inclusive, regulatory framework for optional use by commercial advanced nuclear reactor applicants for new reactor license applications” by December 31, 2027. Consistent with NEIMA, the proposed rule would revise the NRC’s regulations by adding a risk-informed, technology-inclusive, and performance-based regulatory framework for commercial nuclear reactors. This framework would provide increased flexibility for licensing and regulating a variety of reactor technologies and designs.

This document presents a draft regulatory analysis of the proposed amendments, including new 10 CFR Part 53 requirements and revisions to 10 CFR Parts 26 and 73 and the associated regulatory guidance documents, relative to the baseline case (i.e., the no-action alternative).

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ABBREVIATIONS

ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act of 1954, as amended
AERI	alternative evaluation of risk insights
ARCAP	Advanced Reactor Content of Application Project
BOP	behavioral observation program
BLS	Bureau of Labor Statistics (U.S. Department of Labor)
CFR	*Code of Federal Regulations*
COL	combined license
CP	construction permit
CRGR	Committee to Review Generic Requirements
DC	design certification
DG	draft guide
DID	defense in depth
ESP	early site permit
FFD	fitness for duty
FR	*Federal Register*
FSAR	final safety analysis report
FY	fiscal year
GLRO	generally licensed reactor operator
ISG	interim staff guidance
ITAAC	inspections, tests, analyses, and acceptance criteria
LAR	license amendment request
LBE	licensing-basis event
LMP	Licensing Modernization Project
LWR	light-water reactor
ML	manufacturing license
MRO	medical review official
NEI	Nuclear Energy Institute
NEIMA	Nuclear Energy Innovation and Modernization Act
non-LWR	non-light-water reactor (a nuclear power reactor using a coolant other than water)
NPV	net present value
NRC	U.S. Nuclear Regulatory Commission
NUREG	an NRC technical report designation
OL	operating license
OMB	U.S. Office of Management and Budget
PERT	program evaluation and review technique
PMRP	performance monitoring and review program
PRA	probabilistic risk assessment
RG	regulatory guide
RIPB	risk-informed and performance-based
SAR	safety analysis report
SBREFA	Small Business Regulatory Enforcement Fairness Act
SDA	standard design approval
SECY	Secretary of the Commission
SER	safety evaluation report
SMR	small modular reactor
SOC	standard occupational classification (code)
SRM	staff requirements memorandum
SSC	structure, system, and component

TICAP	Technology-Inclusive Content of Application Project
TMI	Three Mile Island

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend its regulations and add a new Part 53, "Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) for the licensing, operation, and decommissioning of new commercial nuclear power plants. In Staff Requirements Memorandum (SRM)-SECY-20-0032, "Staff Requirements—SECY-20-0032—Rulemaking Plan on 'Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors' (RIN-3150-AK31; NRC-2019-0062)," dated October 2, 2020 (NRC, 2020f), the Commission directed the NRC staff to proceed with "a rulemaking to develop the regulatory infrastructure to support the licensing of advanced nuclear reactors."

The NRC's goal in promulgating these regulations is to establish a technology-inclusive regulatory framework for optional use by applicants for new commercial nuclear plants. The regulatory requirements developed in this rulemaking would use methods of evaluation, including risk-informed and performance-based methods, that are flexible and practicable for application to a variety of reactor technologies, including advanced nuclear reactors.

The NRC is aware of several potential applicants for commercial nuclear plants in the coming years that could be impacted by this proposed rule. However, as a simplifying assumption, this regulatory analysis considered one hypothetical applicant. The regulatory analysis indicates that the proposed rule is cost beneficial, and is expected to result in net averted costs to the industry and the NRC of approximately $28.1 million using a 7 percent discount rate and $34.5 million using a 3 percent discount rate. With each additional applicant, the proposed rule becomes even more cost beneficial.

Table ES-*1* Total Benefits (Costs) of Proposed Rule, Alternative 2

Attribute	Costs		
	Undiscounted	7% NPV	3% NPV
Total Industry Costs:	($8,875,000)	($1,373,000)	($3,364,000)
Total NRC Costs:	($11,146,000)	($5,934,000)	($7,570,000)
Total:	($20,021,000)	($7,307,000)	($10,934,000)

Attribute	Benefits		
	Undiscounted	7% NPV	3% NPV
Total Industry Benefits:	$46,413,000	$25,089,000	$32,891,000
Total NRC Benefits:	$15,208,000	$10,312,000	$12,506,000
Total:	$61,621,000	$35,401,000	$45,397,000

Attribute	Net Benefits (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry Net:	$37,540,000	$23,720,000	$29,530,000
NRC Net:	$4,060,000	$4,380,000	$4,940,000
Net:	$41,600,000	$28,100,000	$34,470,000

Note: Globally, there may be differences among tables due to rounding.

1. Introduction

This document presents the regulatory analysis for the proposed rule, Title 10 of the *Code of Federal Regulations* (10 CFR), "Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants" (Part 53).

2. Background, Statement of the Problem, and Objective

On January 14, 2019, the President signed the Nuclear Energy Innovation and Modernization Act (NEIMA) into law (U.S. Congress, 2019). NEIMA directs the U.S. Nuclear Regulatory Commission (NRC) to develop the regulatory infrastructure to support the development and commercialization of advanced nuclear reactors. In SRM-SECY-20-0032, "Staff Requirements —SECY-20-0032—Rulemaking Plan on 'Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN-3150-AK31; NRC-2019-0062),'" dated October 2, 2020 (NRC, 2020f), the Commission directed the NRC staff to proceed with "a rulemaking to develop the regulatory infrastructure to support the licensing of advanced nuclear reactors." This rulemaking would establish a technology-inclusive regulatory framework for optional use by applicants for new commercial nuclear plants, including advanced nuclear reactors. The regulatory requirements proposed in this rulemaking would provide for reasonable assurance of adequate protection of public health and safety, and flexibility to accommodate a variety of reactor technologies.

The NRC described its efforts to prepare for the licensing of commercial nuclear plants in documents such as the report "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," issued December 2016 (NRC, 2016) (Vision and Strategy report), and the Secretary of the Commission (SECY) memorandum SECY-14-0095, "Status of the Office of New Reactors Readiness to Review Small Modular Reactor Applications," dated August 28, 2014 (NRC, 2014).

2.1 Background

Concurrent with large light-water reactor (LWR) deployment and design evolution, the United States and other countries have developed and promoted several different reactor designs that are either light-water small modular reactors (SMRs) with passive safety features or reactors that do not use water as a coolant. This latter category is commonly referred to as non-light-water reactor (non-LWR) technology. Advanced designs using non-LWR technology include, but are not limited to, liquid-metal-cooled reactors, gas-cooled reactors, and molten-salt-cooled reactors. These designs range from a few to hundreds of megawatts in power and may apply modular construction concepts.

<u>Current Regulations for Large Light-Water Reactors</u>

The current regulatory framework for reactor licensing has evolved over the years. This section describes this evolution, lessons learned from new reactor licensing actions, and the potential changes that could improve the efficiency of the licensing process.

Licensing of Nuclear Installations

Historically, the NRC licensed all nuclear power plants under a two-step process described in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." This process requires both a construction permit (CP) and an operating license (OL). To improve regulatory

efficiency and add greater predictability to the process, in 1989, the NRC established alternative licensing processes in 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” which include the issuance of a single combined license (COL). The COL process combines a CP and an OL with conditions for plant operation.

In 10 CFR Part 52, the NRC also included other licensing options. For example, an early site permit (ESP) allows an applicant to obtain NRC approval for a reactor site without specifying the design of the reactor(s) that could be built at that site. A standard plant design can be referenced in a license application under 10 CFR Part 52. The design can be either approved by the NRC staff (a standard design approval (SDA)) or certified by the Commission in a rulemaking (design certification (DC)). Finally, 10 CFR Part 52 also includes a process to grant a license to manufacture a nuclear power plant. Such a plant would be fabricated at one location and then transported and operated elsewhere.

Additional details about both licensing regimes, beyond those given in the following sections, can be found in the “Nuclear Power Plant Licensing Process” backgrounder, issued July 2020 (NRC, 2020e).

10 CFR Part 50 Process

As of 2021, all nuclear power plants operating in the United States were licensed under the process described in 10 CFR Part 50. The NRC and its predecessor, the Atomic Energy Commission, approved construction of these plants between 1964 and 1978, and the NRC granted the most recent OL under 10 CFR Part 50 in 2015.

Under the 10 CFR Part 50 process, a prospective licensee applies first for a CP. The requirements in 10 CFR 50.34(a) outline the information an applicant must submit in a preliminary safety analysis report (SAR) to obtain a CP. The preliminary SAR incorporates by reference or contains the design information and criteria for the proposed reactor and comprehensive data about the proposed site. It also discusses various hypothetical accident situations and the safety features of the plant that would prevent accidents or lessen their effects. In addition, the application must contain a comprehensive assessment of the environmental impact of the proposed plant.

After reviewing the application and determining that the plant design meets all applicable regulations, the NRC then issues a safety evaluation report (SER). Section 189a.(1)(A) of the Atomic Energy Act of 1954, as amended (AEA), requires that a public hearing be held before a CP is issued for a nuclear power plant. The Commission or a three-member Atomic Safety and Licensing Board conducts this public hearing.

Following issuance of the CP, the holder of the permit may apply for an OL. An OL application includes a final safety analysis report (FSAR), with content specified by 10 CFR 50.34(b), describing the facility’s licensing basis. The NRC reviews the FSAR to develop the agency’s final SER. Before issuing an OL or CP, the NRC gives interested persons an opportunity for a hearing if they establish standing and submit an admissible contention as required by 10 CFR 2.309, “Hearing requests, petitions to intervene, requirements for standing, and contentions.” At the end of construction, if the NRC determines that the applicant satisfies the applicable requirements, then the NRC issues the OL, which is valid for a period of no more than 40 years (but can be renewed).

10 CFR Part 52 Process

One of the basic principles underlying 10 CFR Part 52 is promoting the early resolution of technical, regulatory, and licensing issues. As previously mentioned, 10 CFR Part 52 includes alternative licensing processes, including ESPs, COLs, SDAs, DCs, and manufacturing licenses (MLs). These licensing and regulatory processes provide varying degrees of finality for siting and design issues and offer applicants greater flexibility and predictability than does the 10 CFR Part 50 licensing process.

Under the 10 CFR Part 52 regulatory framework, a prospective nuclear power plant operator applies for a COL that authorizes both construction and (after certain criteria are met) plant operation. The application may reference a DC, an SDA, an ML, or an ESP to take advantage of reviews previously completed by the Commission or NRC staff. The NRC includes in the COL the inspections, tests, analyses, and acceptance criteria (ITAAC) that the agency will use to evaluate, after construction, whether the plant has been built as specified in the COL. The AEA requires the NRC to conduct a public hearing before a COL is issued and separately provide an opportunity for the public to request a hearing on the COL application. There also is an opportunity for a hearing after a COL is issued but before fuel loading is authorized. These hearings prior to fuel load are limited to determining whether the acceptance criteria in the license have been met. Notwithstanding whether a hearing is held, the Commission must determine that the acceptance criteria have been met before authorizing operation.

The NRC can approve and certify power reactor designs under 10 CFR Part 52 through a rulemaking, independent of a specific site. A DC application must contain sufficient design information to enable the Commission to reach a conclusion about all safety questions associated with the design. In general terms, a DC application should supply an essentially complete nuclear plant design, except for some site-specific design features. The DC application presents the design basis, the limits on operation, and a safety analysis of the structures, systems, and components (SSCs) of the facility. The scope and contents of a DC application are equivalent to the level of detail found in an FSAR for a power plant licensed under 10 CFR Part 50. An application for a DC also must contain proposed ITAAC for the standard design, which would be used to demonstrate that the plant is satisfactorily built prior to commencing operations.

The NRC prepares an SER that documents its review of the standard design application and the basis for its finding that the design meets applicable regulations. If the NRC determines that the application meets the relevant standards and requirements of the AEA and the NRC's regulations, then the NRC publishes a final rule certifying the design as an appendix to the 10 CFR Part 52 regulations. DCs provide a significant degree of regulatory issue finality to an applicant that references a DC rule in a license application.

Site suitability issues, which may be independent of a specific nuclear power plant design, can be resolved through the issuance of an ESP. An ESP application must address the safety and environmental characteristics of the proposed reactor site and evaluate significant impediments to developing an acceptable emergency plan. An ESP application may also propose complete and integrated emergency plans for NRC review and approval. After reviewing the application, the NRC documents its findings on site safety and emergency planning (if applicable) in a SAR and its findings related to environmental impacts in an environmental impact statement. The process for review and approval of an ESP includes an opportunity for interested persons to challenge the application or the environmental impact statement in a contested hearing. A petitioner must submit a hearing request that demonstrates standing and includes at least one

admissible contention. Before issuing an ESP, the NRC also conducts an uncontested hearing for the ESP. This hearing occurs even if the NRC does not receive a petition from the public requesting a hearing. The ESP is initially valid for no less than 10 years and no more than 20 years and can be renewed for 10 to 20 years. Once an ESP is issued, an applicant can reference it in application(s) for permission to construct and operate nuclear power plants, and issues resolved in the ESP proceeding are governed by the issue finality provisions applicable to ESPs.

An ML enables an entity to receive Commission approval of a final reactor design and authority to construct the reactor at a site other than the site where the nuclear power plant will be operated. Unlike a DC, an ML can provide the NRC's preapproval of the procurement, manufacturing, and quality assurance processes of a specific reactor design. The issue finality provisions applicable to MLs govern the issues resolved in an ML proceeding. The existing requirements governing MLs in 10 CFR Part 52 do not include provisions for loading fuel into the manufactured reactor in the manufacturing facility. In addition, certain requirements currently in 10 CFR Part 52 were written with the understanding that the act of fuel loading is the point at which a reactor commences operation. Nonetheless, the NRC staff has identified possible approaches for authorizing factory fuel loading under the current regulations in Parts 50 and 52 in SECY-24-0008, "Micro-Reactor Licensing and Deployment Considerations: Fuel Loading and Operational Testing at a Factory," dated January 24, 2024.

The NRC staff can also approve standard designs in an SDA. These approvals need not include ITAAC and are not Commission certifications. The issues addressed in an SDA are subject to challenge before the Atomic Safety and Licensing Board or the Commission through the hearing process on a subsequent application referencing the SDA and thus do not have the same level of issue finality as DCs, MLs, and ESPs.

In addition to establishing an alternative process for licensing reactors, the requirements in 10 CFR Part 52 formalized expectations for new designs contained in the Commission's "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants," issued August 1985 (NRC, 1985). Specifically, the 10 CFR Part 52 process demands that new LWR applications contain information that relates to certain items described in 10 CFR 50.34(f), which requires applicants to describe and analyze design features related to the prevention and mitigation of severe accidents, and to submit a description and the results of a probabilistic risk assessment (PRA), among other topics described in that policy statement.

Key Assumptions

For the purposes of this regulatory analysis, the staff assumed that one current rulemaking would be part of the regulatory baseline—in other words, finalized and issued in its current form—and therefore any proposed changes to the NRC's regulations at 10 CFR from this rulemaking are assumed to be in effect. This rulemaking is the "Alternative Physical Security Requirements for Advanced Reactors" proposed rule (NRC, 2022b). The most salient aspects of this other rulemaking are the alternatives to several physical security requirements currently in 10 CFR Part 73, "Physical Protection of Plants and Materials." In addition, the staff assumed for the purposes of the regulatory baseline the continued Commission expectation for applicants under 10 CFR Part 50 to have a PRA, as is required under 10 CFR Part 52. This expectation was outlined in SRM-SECY-15-0002, "Proposed Updates of Licensing Policies, Rules, and Guidance for Future New Reactor Applications" (NRC, 2015).

Recent Experience with New Reactor Licensing

The NRC has engaged in several preapplication interactions with designers of commercial nuclear plants and developed policies and guidance to support the potential licensing of advanced reactor facilities. The NRC first published its policy statement on the regulation of advanced nuclear plants in the *Federal Register* on July 8, 1986 (NRC, 1986), with the objective of providing all interested persons with the Commission's views concerning the desired characteristics of advanced reactor designs. The NRC acknowledged in its "Report to Congress: Advanced Reactor Licensing," issued August 2012 (NRC, 2012), that while the safety philosophy inherent in the current regulations applies to all reactor technologies, the specific and prescriptive aspects of those regulations clearly focus on the current fleet of large LWR facilities. More recently, the NRC's Vision and Strategy report for non-LWRs identified the desirability of a potential long-term rulemaking to establish a regulatory framework for advanced nuclear reactor licensing that would be risk-informed, performance-based, and technology-inclusive (NRC, 2016). The staff described earlier efforts by the NRC to establish a technology neutral (the term used at that time) approach to the regulation of nuclear reactors in an advance notice of proposed rulemaking titled "Approaches to Risk-Informed and Performance-Based Requirements for Nuclear Power Reactors," dated May 4, 2006 (NRC, 2006).

Licensing Modernization Project

The NRC engaged with the Licensing Modernization Project (LMP), led by Southern Company, coordinated by the Nuclear Energy Institute (NEI), and cost-shared with the U.S. Department of Energy. The LMP developed technology-inclusive, risk-informed, and performance-based non-LWR licensing methods and built on interactions with the NRC, feedback from industry, and broadening of the scope to ensure applicability to various non-LWR technologies. Industry and NRC efforts on LMP resulted in the development of the NEI guidance NEI 18-04, Revision 1, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," in August 2019 (NEI, 2019). NEI 18-04, Revision 1, focuses on identifying licensing-basis events (LBEs); categorizing and establishing performance criteria for SSCs; and evaluating defense in depth (DID) for advanced reactor designs. After reviewing this NEI guidance, the staff issued SECY-19-0117, "Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors," on December 2, 2019 (NRC, 2019b). In this SECY, the staff discussed potential policy issues associated with the LMP methodology and recommended that the Commission find that the use of the methodology described in NEI 18-04 is a reasonable approach for establishing key parts of the licensing basis for non-LWRs. In SRM-SECY-19-0117, dated May 26, 2020, the Commission approved the use of this methodology as a reasonable approach to support the licensing of non-LWRs (NRC, 2020c).

In conjunction with the review of the NEI guidance, the NRC published Regulatory Guide (RG) 1.233, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors," in the *Federal Register* on June 9, 2020 (NRC, 2020d). This RG endorses the methodology described in NEI 18-04, Revision 1, as a reasonable approach to support the licensing of non-LWRs. RG 1.233 provides guidance for informing the licensing basis and determining an appropriate level of information for parts of preliminary or final SARs for non-LWRs, for applications for a CP, OL, DC, COL, ML, or SDA. RG 1.233 states the following:

> NEI 18-04 outlines an approach for use by reactor developers to select LBEs, classify SSCs, determine special treatments and programmatic controls, and assess the adequacy of a design in terms of providing layers of DID. The methodology described in NEI 18-04 and this guide also provides a general approach for identifying an appropriate scope and depth of information that applications for licenses, certifications, and approvals should provide. The variety of non-LWR technologies, which use different coolants, fuel forms, and safety system designs, make it necessary to define a methodology as opposed to developing prescriptive guidance on the content of applications, such as that prepared for light-water reactors (LWRs). This methodology also provides a logical and structured approach to identifying the safety or risk significance of SSCs and associated programmatic controls. The methodology's focus on those measures needed to address risks posed by non-LWR technologies will help an applicant provide sufficient information on the design and programmatic controls, while avoiding an excessive level of detail on less important parts of a plant. This approach will in turn lead to more effective and efficient NRC reviews.

Thus, RG 1.233 contains the staff's guidance on using NEI 18-04 to select LBEs, classify SSCs, assess the adequacy of DID in a design, identify appropriate programmatic controls, and help determine the appropriate scope and level of detail for information provided in applications. The RG provides a general framework to support design and application decisions in these areas and contains in-depth staff positions on the various topics within the NEI guidance, along with some acceptable methods of compliance for licensees. Building on the LMP are the industry-led Technology-Inclusive Content of Application Project (TICAP) and the NRC's Advanced Reactor Content of Application Project (ARCAP).

TICAP/ARCAP

TICAP and ARCAP seek to develop technology-inclusive, risk-informed, and performance-based application guidance. The industry-led TICAP's purpose is to develop the content for specific portions of the SAR that would be used to support an advanced reactor application, informed by the guidance found in NEI 18-04, Revision 1. In December 2021, the NRC published a draft white paper, "Guidance for a Technology-Inclusive Content of Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Advanced Reactors," to support ongoing stakeholder interactions to develop TICAP guidance (NRC, 2021). These interactions culminated in the publication of NEI 21-07, Revision 1, "Technology Inclusive Guidance for Non-Light Water Reactors Safety Analysis Report Content for Applicants Using NEI 18-04 Methodology," dated March 1, 2022 (NEI, 2022). The NRC published the final version of the TICAP guidance in March of 2024, in RG 1.253, "Guidance for a Technology-Inclusive Content-of-Application Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for non-Light-Water Reactors" (NRC, 2024b).

The ARCAP guidance is intended to be used for an advanced reactor application for a COL, CP, OL, DC, SDA, or ML. ARCAP is a project that will support the near-term advanced reactor applicants under 10 CFR Part 50 and 10 CFR Part 52, and support the 10 CFR Part 53 related activities in the long-term. The NRC staff developed the "Non-Light-Water Reactor Review Strategy Staff White Paper," issued September 2019, to provide internal guidance for the review of non-LWR applications in the near term (NRC, 2019a). In April 2022, the NRC also published draft white paper interim staff guidance (ISG), "Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications—Roadmap," to support ongoing stakeholder interactions to

develop ARCAP guidance (NRC, 2022a). In March of 2024, the NRC published final versions of the ARCAP ISGs (NRC, 2024c).

2.2 Statement of the Problem

The current application and licensing requirements, developed for large light-water and nonpower reactors as outlined in 10 CFR Part 50 and 10 CFR Part 52, contain technology specific requirements that may lead to unnecessary and potentially prohibitive costs for smaller reactor designs. Therefore, the current regulatory framework may require extensive use of the exemption process for regulations that include prescriptive requirements specific to LWRs. An example can be seen in the functional containment concept that several future applicants are expected to credit as part of their designs. Several exemptions would likely be requested by applicants to implement this concept under the current requirements because of existing assumptions about fission product releases, reactor coolant pressure boundaries, and other LWR-specific concepts that do not translate to certain technologies and fuel types.

2.3 Objective

Through this rulemaking, the staff is proposing to amend the regulations by creating an alternative, technology-inclusive, regulatory framework for licensing commercial nuclear plants, including advanced reactors. The new alternative requirements and implementing guidance would adopt technology-inclusive approaches and include the appropriate use of risk-informed and performance-based techniques, to provide the necessary flexibility for licensing and regulating a variety of nuclear reactor technologies and designs. Pursuant to SRM-SECY-23-0021, “Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN 3150-AK31),” the proposed rule also includes a licensing framework for factory fuel loading and for transportation and installation of a fueled manufactured reactor (NRC, 2024a). This type of activity is not addressed by current NRC regulations, and therefore would have to be handled on a case-by-case basis, as further discussed in Section 5.

The proposed rule’s objectives are to (1) provide reasonable assurance of adequate protection of public health and safety and the common defense and security at reactor sites at which advanced nuclear reactor designs are deployed to at least the same degree of protection as required for current-generation LWRs; (2) protect health and minimize danger to life or property to at least the same degree of protection as required for current-generation LWRs; (3) provide greater operational flexibilities than utilized by the current fleet where supported by enhanced margins of safety that may be provided in advanced nuclear designs; (4) promote regulatory stability, predictability, and clarity; and (5) reduce requests for exemptions from the current requirements in 10 CFR Part 50 and 10 CFR Part 52.

One new aspect of the proposed rule that is not part of current NRC regulations governs the loading of fuel into a manufactured reactor at the manufacturing facility, as introduced in the background section of this RA. An applicant would have to obtain both an ML and a COL under 10 CFR Part 52 to load fuel into a manufactured reactor under the historical NRC position that loading fuel into a reactor is considered part of reactor operation. There are significantly more requirements for obtaining a COL and many would go far beyond those needed to safely load unirradiated fuel into a manufactured reactor at the manufacturing facility. Therefore, it is likely that an applicant choosing to do so under the current regulations and the historical NRC position would seek exemptions from a significant portion of the requirements for COL applicants.

Because of the complexity of writing an entirely new part of the CFR for commercial nuclear plants that have not yet been built in the United States, the NRC conducted significant outreach by holding numerous public meetings on preliminary proposed rule language, as described in the *Federal Register* notice in this rulemaking package (NRC, 2024d).

The framework for the 10 CFR Part 53 proposed rule for commercial nuclear plants is performance-based, technology-inclusive, and risk-informed consistent with NEIMA. The staff built on LMP and other activities such as TICAP/ARCAP by adding regulatory elements for application, licensing, construction, operation, and decommissioning of commercial nuclear plants, in addition to new and modified requirements for fitness for duty (FFD), operator licensing, cybersecurity, access authorization, and siting.

3. Identification and Preliminary Analysis of Alternative Approaches

This section analyzes the alternatives that the NRC considered for meeting the objective of creating a technology-inclusive, risk-informed regulatory framework for applicants for licenses for commercial nuclear plants. The NRC identified two alternatives.

3.1 Alternative 1—No Action

Under the no action alternative, the NRC would not publish 10 CFR Part 53 or modify 10 CFR Parts 26 and 73, which constitute the proposed regulatory framework for advanced nuclear reactors. This alternative would be inconsistent with NEIMA. Advanced reactor applicants would apply under either 10 CFR Part 50 or 10 CFR Part 52. These applicants would not be able to benefit from the more technology-inclusive, risk-informed, and performance-based regulation of the proposed rule. In many areas, applicants would need to submit exemption requests to avoid requirements not developed for non-LWR technology, or not applicable, for their commercial nuclear plants. As described above, Alternative 1 does include LMP because it has already been included in the regulatory baseline by issuance of RG 1.233.

3.2 Alternative 2—Rulemaking to Establish a Technology-Inclusive, Performance-Based Framework

In this rulemaking alternative, the NRC is proposing to amend the regulations by creating an alternative regulatory framework for licensing advanced nuclear reactors. The new 10 CFR Part 53, along with the modifications to 10 CFR Parts 26 and 73, would provide a technology-inclusive, risk-informed, performance-based framework for advanced nuclear reactor applicants (meeting the requirements of NEIMA). This framework would provide applicants and licensees increased flexibility throughout the entire life cycle of a nuclear power plant: design, licensing, operation, and decommissioning.

4. Estimation and Evaluation of Costs and Benefits

This section presents the staff's process for evaluating the expected costs and benefits of each proposed alternative relative to the regulatory baseline (Alternative 1). All costs and benefits are monetized, when possible. The total costs and benefits are then summed to determine whether they constitute a positive benefit. In some cases, costs and benefits are not monetized because meaningful quantification is not possible.

4.1 Identification of Affected Attributes

This section identifies the components of the public and private sectors, commonly referred to as attributes, that are expected to be affected by Alternative 2. This alternative will apply to commercial nuclear plant licensees and applicants. The NRC staff believes that future licensees would be the primary beneficiaries. The staff developed an inventory of the affected attributes using the list in chapter 5, "Details of a Cost-Benefit Analysis," of NUREG/BR-0058, draft Revision 5, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," issued January 2020 (NRC, 2020a).

The rule would affect six attributes:

(1) Industry Operation. This attribute accounts for the projected net economic effect caused by routine and recurring activities required by the alternative on all affected entities. These activities include the reduction of exemption requests from applicants and licensees and the reduction of license amendment requests (LARs) from the licensees.

(2) NRC Implementation. This attribute accounts for the projected net economic effect on the NRC to place the alternative into operation. These activities include the costs to complete and issue the final rule and finalize and issue the associated RGs.

(3) NRC Operation. This attribute accounts for the projected net economic effect on the NRC caused by routine and recurring activities required by the alternative after implementation of the final rule. These activities include the reduction in NRC reviews of exemption requests and LARs.

(4) Regulatory Efficiency. This attribute accounts for regulatory and compliance improvements resulting from the implementation of Alternative 2 relative to the regulatory baseline. Alternative 2 will continue the best practice of regulation through rulemaking instead of exemption requests, where practical. This rulemaking will reduce the effort that the industry would expend generating exemption requests and considering alternative means to accomplish the goals of current regulation.

(5) Improvements in Knowledge. This attribute accounts for increases in knowledge due to advances in reactor design and technology, PRA, and other risk-informed analytical techniques.

(6) Public Confidence. This attribute accounts for the confidence the public has in the NRC's ability to effectively regulate applicants and licensees, including appropriate responses to statutory requirements and continuing to innovate and assess future designs and needs.

Attributes that are not expected to be affected under either of the alternatives include public health (routine), occupational health (accident), occupational health (routine), offsite property, onsite property, industry implementation, other government, general public, safeguards and security considerations, and environmental considerations.

4.2 Analytical Methodology

This section describes the process used to evaluate costs and benefits associated with the alternatives. The benefits would include any desirable changes in affected attributes

(e.g., monetary savings, improved safety, and improved security). The costs would include any undesirable changes in affected attributes (e.g., monetary costs, increased exposures).

Of the six affected attributes, the analysis evaluates three attributes—industry operation, NRC implementation, and NRC operation—on a quantitative basis. Quantitative analysis requires a baseline characterization of the affected society, including factors such as the number of affected entities, the nature of the activities currently performed, and the types of systems and procedures that applicants or licensees would consider or would no longer implement because of the alternatives. Where possible, the NRC calculated costs for these attributes using three-point estimates to quantify the uncertainty. Appendix B includes the detailed cost tables that the NRC used in this regulatory analysis. The NRC evaluated the remaining attributes on a qualitative basis because the benefits are not quantifiable or because the data necessary to quantify and monetize the impacts are not available. For example, the proposed rule language regarding a factory fuel-loaded, manufactured reactor, is discussed on a qualitative basis in Section 5, because the activities associated with this type of reactor are novel and also because the same activities—and more—would occur without the proposed rule, on a case-by-case basis.

The NRC documents its assumptions throughout this regulatory analysis. Appendix A to this regulatory analysis summarizes the key assumptions and inputs.

4.2.1 Regulatory Baseline

This regulatory analysis provides the incremental impacts of the proposed rule relative to a baseline that reflects anticipated behavior if the NRC does not undertake regulatory or nonregulatory action. The regulatory baseline assumes full compliance with existing NRC requirements, including current regulations and relevant orders. Many aspects of reactor licensing, construction, and operation have different costs depending on the characteristics of the reactor, the staff size, and other factors. Therefore, when considering the incremental costs and benefits of this 10 CFR Part 53 proposed rule compared to the regulatory baseline, it is important to consider the costs of the baseline to the specific reactor in question, not to historical costs of the operating fleet. For example, the reduced staff size at a smaller reactor would already have lower training costs relative to a large LWR, and it is important to the accuracy of this regulatory analysis to ensure that is taken into account before incremental costs and benefits are estimated. Section 5 of this regulatory analysis presents the estimated costs and benefits of Alternative 2 relative to this baseline.

4.2.2 Affected Entities

The NRC staff is aware of several applicants that may engage with the agency over the next several years and of varied reactor designs, including SMRs, non-LWRs, microreactors, and others. To simplify the cost model while still fully analyzing the new 10 CFR Part 53 proposed rule language, and because much of this information is proprietary, this regulatory analysis considers one hypothetical reactor under the proposed framework, submitting its application in 2027 once the final rule is expected to be in effect. In this way, the costs and benefits of the proposed rule can be analyzed and the impact of additional applicants can be discussed. The hypothetical applicant for the proposed rule is a generic non-LWR applicant, and the estimates were generated accordingly. This choice represents the type of potential future applicant with which the staff has the most experience, and is considered to be generally representative of future applicants. The baseline costs and benefits of Alternative 2 are calculated for a reactor that does not qualify to use generally licensed reactor operators (GLROs).

4.2.3 Base Year

All monetized costs are expressed in 2023 dollars. The analysis assumes that ongoing costs of operation related to the alternative being analyzed will begin no earlier than 30 days after publication of the final rule unless otherwise stated. The analysis assumes that the final rule will be published in late 2026 or early 2027.

The applicants' one-time and periodic and recurring annual operating expenses are estimated. The values for annual operating expenses are modeled as a constant expense for each year of the analysis horizon. The NRC performed a discounted cash flow calculation to discount these expenses to 2023-dollar values.

4.2.4 Discount Rates

In accordance with NUREG/BR-0058, net present value (NPV) calculations are used to determine how much society will need to invest today to ensure that the designated dollar amount is available in a given year in the future. By using NPVs, costs and benefits are valued to a reference year for comparison, regardless of when the cost or benefit is incurred in time. The choice of a discount rate and its associated conceptual basis is a topic of ongoing discussion within the Federal Government. Based on U.S. Office of Management and Budget (OMB) Circular A-4, "Regulatory Analysis," dated September 17, 2003 (OMB, 2003), and consistent with NRC past practice and guidance, present-worth calculations in this analysis use 3 percent and 7 percent real discount rates. A 3 percent discount rate approximates the real rate of return on long-term Government debt, which serves as a proxy for the real rate of return on savings to reflect reliance on a social rate of time preference discounting concept.[1] A 7 percent discount rate approximates the marginal pretax real rate of return on an average investment in the private sector and is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector. A 7 percent rate is

1 The "social rate of time preference discounting concept" refers to the rate at which society is willing to postpone a marginal unit of current consumption in exchange for more future consumption.

consistent with an opportunity cost[2] of capital concept to reflect the time value of resources directed to meet regulatory requirements.

4.2.5 Labor Rates

For the purposes of this regulatory analysis, the staff applied strict incremental cost principles to develop labor rates that include only labor and material costs directly related to the implementation, operation, and maintenance of the proposed rule requirements. This approach is consistent with the guidance in NUREG/CR-3568, "A Handbook for Value-Impact Assessment," issued December 1983 (NRC, 1983), and with general cost-benefit methodology. The NRC's incremental labor rate for 2023 is $152 per hour.[3]

The staff used the 2023 Bureau of Labor Statistics (BLS) Occupational Employment and Wages data (www.bls.gov), which provide labor categories and the mean hourly wage rate by job type. The labor rates used in the analysis reflect total hourly compensation, which includes wages and nonwage benefits (using a burden factor of 2.4, which is applicable for contract labor and conservative for regular utility employees). The staff used the BLS data tables to select appropriate hourly labor rates for the estimated procedural, licensing, and utility-related work necessary during and after implementation of the proposed alternative. These labor rates include wages paid to the individuals performing the work plus the associated fringe benefit component of labor costs (i.e., the time for plant management exceeding those directly expensed), which are considered incremental expenses. Table summarizes the BLS labor categories the staff used to estimate industry labor costs to implement this proposed rule, and appendix A lists the industry labor rates used in the analysis. The staff also performed an uncertainty analysis, which is discussed in section 5.8.

Table 1 Position Titles and Occupations

Position Title (in This Regulatory Analysis)	Standard Occupational Classification
Managers	General and Operations Managers (111021)
	Industrial Production Managers (113051)
	First-Line Supervisors of Mechanics, Installers, and Repairers (491011)
	First-Line Supervisors of Production and Operating Workers (511011)
Technical Staff	Nuclear Engineers (172161)
	Physicists (192012)
	Nuclear Technicians (194051)
	Industrial Machinery Mechanics (499041)
	Nuclear Power Reactor Operators (518011)
Administrative Staff	Office and Administrative Support Occupations (430000)

2 "Opportunity cost" represents what is foregone by undertaking a given action. If the applicant or licensee personnel were not engaged in producing exemption requests, they would be engaged in other work activities. Throughout the analysis, the NRC estimates the opportunity cost of performing these incremental tasks as the industry personnel's pay for the designated unit of time.

3 The NRC labor rates presented here differ from those developed under the NRC's license fee recovery program (10 CFR Part 170, "Fees for Facilities, Materials, Import and Export Licenses, and Other Regulatory Services under the Atomic Energy Act of 1954, as Amended"). NRC labor rates for fee recovery purposes are designed for full-cost recovery of the services rendered and thus include non-incremental costs (e.g., overhead, administrative, and logistical support costs).

Position Title (in This Regulatory Analysis)	Standard Occupational Classification
	First-Line Supervisors of Office and Administrative Support Workers (431011)
	Office Clerks, General (439061)
Licensing Staff	Lawyers (231011)
	Paralegals and Legal Assistants (232011)

Source: BLS, "May 2023 National Industry-Specific Occupational Employment and Wage Estimates; NAICS 221113 —Nuclear Electric Power Generation" (BLS, 2023).

4.2.6 Sign Conventions

In this analysis, all favorable consequences for the alternative are positive, and all adverse consequences for the alternative are negative. Negative values are shown using parentheses (e.g., negative $500 is displayed as ($500)).

4.2.7 Analysis Horizon

The NRC assumed that each reactor applicant receives the original 40-year operating license and then applies for and receives a 20-year license extension for a total of 60 years. The operating costs of each reactor are estimated individually, based on the anticipated first year of operation.

4.2.8 Cost Estimation

To estimate the costs associated with the evaluated alternatives, the NRC used an engineering-buildup estimating method to deconstruct each requirement down to its mandated activities. For each required activity, the NRC further subdivided the work across labor categories (i.e., managers, technical staff, administrative staff, and licensing staff). The NRC estimated the required level of effort for each required activity and used a blended labor rate to develop bottom-up cost estimates.

The NRC gathered data from several sources and consulted working group members to develop level of effort and unit cost estimates. The NRC applied several cost estimation methods in this analysis. Additionally, the agency used its collective professional knowledge and judgment to estimate many of the costs and benefits. For example, to calculate the estimated averted costs of exemption requests, the NRC used analogous data from previous exemption request submittals to determine the labor categories of the staff who would perform the work and to estimate the amount of time required under each category to complete the work. If data were not available, the NRC used the level of effort method to estimate future costs based on similar steps in the process for which data were available. Additionally, the NRC used the expert-opinion method to fill data gaps when one or more experts were the only available sources of information.

To evaluate the effect of uncertainty in the model, the NRC used a Monte Carlo simulation, which is an approach to uncertainty analysis that expresses input variables as distributions. Section 5.8 describes the Monte Carlo simulation methods in more detail and presents the results.

4.3 Data

This analysis discusses the data and assumptions used in analyzing the quantifiable impacts associated with the alternative. To collect data for this analysis, the NRC used input from subject-matter experts, knowledge gained from past rulemakings, and information obtained during public meetings and from correspondence. The NRC considered the potential differences between the new requirements and the current requirements and incorporated the incremental changes into this regulatory analysis.

5. Results

This section presents the quantitative and qualitative results by attribute for Alternative 2 relative to the regulatory baseline (Alternative 1). As described in the previous sections, costs and benefits are quantified where possible and are shown to be either positive or negative, depending on whether the alternative has a favorable or adverse effect relative to the regulatory baseline. Those attributes that are not easily represented in monetary values are discussed in qualitative terms. This "ex ante cost-benefit analysis"[4] provides helpful information that the NRC can use to decide whether to select an alternative. The potential benefits and costs of the alternatives are analyzed for (1) applicants and licensees and (2) the NRC.[5] The analyses in this section are based on the NRC's assessment and input from stakeholders.

The NRC considered the exemption and guidance alternative, i.e., Alternative 1, to a rulemaking action. Rulemaking would establish a comprehensive regulatory framework that will result in enhanced regulatory stability, predictability, and clarity in the licensing process and provide an opportunity for stakeholder input on the regulatory framework. This is also in keeping with the implementation of the Commission's approved rulemaking plan in SECY-20-0032, "Rulemaking Plan on 'Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN-3150-AK31; NRC-2019-0062),'" dated April 13, 2020 (NRC, 2020b), the Commission's direction in SRM-SECY-20-0032 (NRC, 2020f) and SRM-SECY-23-0021 (NRC, 2024a), and the intent of NEIMA.

This section presents the incremental benefits and costs that the NRC, applicants, and licensees will incur from the rulemaking action. Incremental benefits and costs are calculated values and impacts that are above the baseline condition. The baseline condition for this rulemaking action includes the benefits and costs to comply with the current licensing requirements in 10 CFR Part 50 or 10 CFR Part 52.

To streamline this regulatory analysis, the appendices contain several key parts. Appendix A contains tables with all the inputs to the cost model for this regulatory analysis. Appendix B contains tables with cost estimates of all the proposed rule requirements with incremental costs or benefits relative to the regulatory baseline. Appendix C presents all the regulatory language in the proposed rule that includes new or modified requirements compared to the existing NRC regulations. The table identifies in which section the regulatory language resides, briefly describes the requirement, lists whether the staff expects it to result in incremental costs or benefits, and provides justification for the staff expectations. For regulatory changes that the

4 An "ex ante cost-benefit analysis" is prepared before the implementation of a policy, program, or alternative and can assist in deciding whether to allocate resources to that alternative.

5 The NRC considered the incremental impact of the proposed rule for other entities, including Tribal, State, and local government organizations, but it does not expect such entities to experience incremental costs or averted costs compared to the regulatory baseline.

staff expects would result in significant incremental costs or benefits, the later subsections of this section of the regulatory analysis discuss each item further. For other changes the staff expects would result in minor, or no, incremental costs or benefits, the tables in Appendices B and C serve as the complete discussion in this regulatory analysis.

A significant new set of requirements is proposed in 10 CFR Part 53 for ML applicants and holders and this aspect of the rulemaking is discussed here because the regulatory analysis assesses it qualitatively. These new requirements are outlined in proposed § 53.620, "Manufacturing," paragraph (d), "Fuel loading," and the associated licensing provisions in proposed subpart H of 10 CFR Part 53. These provisions would allow the loading of fuel into a manufactured reactor at the manufacturing site for subsequent transport to a commercial nuclear facility that will operate pursuant to a COL.

Proposed § 53.620(d)(1) would establish limitations on when an ML would authorize possession of a manufactured reactor into which fuel had been loaded at the factory in accordance with a license under 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." This would require the manufactured reactor to include at least two independent physical mechanisms, each of which is sufficient to prevent criticality, assuming optimum neutron moderation and neutron reflection conditions. The proposed requirements in § 53.620(d)(1) further state that, once the fueled manufactured reactor is installed in its place of operation, and the Commission has found that the acceptance criteria in the ITAAC are met under § 53.1452(g), the independent mechanisms to prevent criticality may be removed. Upon initiating the physical removal of any one of the independent mechanisms to prevent criticality, the fueled manufactured reactor will be considered to have commenced operation.

Proposed § 53.620(d)(2) would require holders of 10 CFR Part 70 licenses authorizing the possession and loading of fresh fuel into manufactured reactors to comply with the requirements of 10 CFR Part 70, including those found in subpart H to10 CFR Part 70, for the facilities and activities related to the storage, movement, and loading of fresh fuel in the manufactured reactor. It also requires that all procedures, equipment, and personnel required by the 10 CFR Part 70 license be in place before the receipt of special nuclear material (SNM) at the manufacturing facility. In addition, this provision would require that security programs for any ML that authorizes possession of a manufactured reactor into which the licensee has loaded fuel at the factory meet the performance objectives of 10 CFR 73.67, with some additions and exceptions. These additions and exceptions include requirements for a physical security plan, a cybersecurity plan, and programs and screening of individuals for unescorted access to SNM.

Finally, 10 CFR 53.620(d)(3) would require the loading or unloading of fresh fuel into or from a manufactured reactor, or any changes to the configuration of reactivity control and prevention systems, be performed by a certified fuel handler meeting the requirements in subpart F of Part 53.

Corresponding provisions are contained in proposed § 53.1279(d) for application content for applicants seeking an ML for manufactured reactors that will be fueled at the factory under a 10 CFR Part 70 license, consistent with the requirements in § 53.620(d). These provisions would require the application to include information related to loading fuel and the required independent physical mechanisms to prevent criticality and to otherwise provide assurance that the fueled manufactured reactor can be successfully transported, installed, and operated at a site for which the Commission has issued a COL that authorizes construction and operation of a commercial nuclear plant using the manufactured reactor.

The provisions being included in proposed 10 CFR 53.620(d) and § 53.1279(d) are intended to cover a factory fabrication model that has been suggested for some micro-reactor designs. However, the proposed provisions are not limited to any size or type of reactor. Because the existing requirements governing MLs in 10 CFR Part 52 do not include provisions for loading fuel into the manufactured reactor and the historical NRC position that the act of fuel loading is the point at which a reactor commences operation, an applicant would have to obtain both an ML and a COL under 10 CFR Part 52 to load fuel into a manufactured reactor. There are significantly more requirements for obtaining a COL and many would go far beyond those needed to safely load fresh fuel into a manufactured reactor at the manufacturing facility. Therefore, it is likely that an applicant choosing to do so under the current regulations and the historical NRC position would seek exemptions from a significant portion of the requirements for COL applicants. Because of this, the NRC deemed it prudent to include requirements specific to this deployment model in 10 CFR Part 53 to ensure that these activities would be appropriately regulated from a safety standpoint but without undue burden on potential applicants wishing to load fuel into manufactured reactors under an ML.
The proposal to include specific provisions for factory fuel loading in 10 CFR Part 53 will also benefit the NRC because they would relieve the agency from the burden of processing a large number of exemption requests for applicants seeking to perform such activities in a manufacturing facility under the historical NRC position. In addition, addressing this deployment model through rulemaking allows the NRC to address the technical and policy issues generically and relieves the NRC from having to address these matters on a case-by-case basis. Addressing the issue of factory fuel loading through rulemaking also increases transparency for external stakeholders and allows for greater opportunities for public participation in the formulation of the requirements.

These new requirements also establish considerable costs associated with factory fuel loading and transportation, but these costs are associated with an activity that was not addressed under existing regulations for manufacturing licenses. The NRC expects that approving such activities on a case-by-case basis would result in similar requirements to those in this proposed rule, but with fewer of the aforementioned benefits, and generated the proposed requirements in part by considering what a case-by-case process would entail. For this reason, the regulatory analysis does not provide estimated quantitative costs or benefits for this approach, given that the regulatory baseline costs would be roughly similar, if not greater. The regulatory analysis concludes that the benefits of these provisions being in the proposed 10 CFR Part 53 exceed the benefits of the case-by-case baseline, and therefore the inclusion of these provisions is a net benefit to applicants and the NRC and is not discussed further in this document.

5.1 Industry Operation

This attribute accounts for the projected net economic effect of routine and recurring activities required by the proposed alternative for all affected licensees.

There are several significant industry cost and averted cost drivers in Alternative 2, discussed below.

Significant Industry Cost Drivers

The radiation protection process control program is a new program to be maintained throughout operations. Under existing regulations, this program is traditionally required as a condition in specific NRC licenses instead of a program required by regulation. The program results in costs

to licensees (per licensee) of approximately ($856,000) using a 7 percent NPV and ($2.38 million) using a 3 percent NPV. The integrity assessment program is another new program resulting in costs to each licensee of approximately ($180,000) using a 7 percent NPV and ($413,000) using a 3 percent NPV. Both of these programs are described further in the *Federal Register* notice of this proposed rule and appendix C of this regulatory analysis and reflect the performance-based nature of the proposed rule as opposed to more deterministic approaches in the existing regulatory framework.

In 10 CFR Part 26, one cost driver that represents a significant change to existing requirements is the new requirement for FFD training to be conducted for all personnel involved in construction activities, instead of only certain personnel, with the remaining training requirements occurring before fuel load. This results in both a greater number of personnel being trained and earlier training of all personnel. The staff estimates this new requirement will cost a licensee approximately ($36,000) using a 7 percent NPV and ($45,000) using a 3 percent NPV. The proposed rule would include new performance monitoring and review regulations to help ensure that the FFD program remains effective while enabling the flexibilities afforded by the proposed rule language. The staff estimates that establishing and operating the performance monitoring and review program would result in incremental costs to licensees of approximately ($107,000) using a 7 percent NPV and ($262,000) using a 3 percent NPV.

This proposed rule also requires the periodic assessment (i.e., auditing) of the medical review official (MRO) and laboratory performance, to maintain the performance of the FFD programs. The staff estimates that the evaluation of laboratory and MRO performance would result in incremental costs to licensees of approximately ($27,000) using a 7 percent NPV and ($71,000) using a 3 percent NPV.

Significant Industry Averted Cost Drivers

The proposed rule significantly reduces costs associated with the technical information content of all application types, because of both streamlining of the application processes and removal of entire sections from applications. The staff estimates that the various applications have averted costs to applicants (per application) as follows:

- Early Site Permits: $1.34 million (7 percent NPV) and $1.56 million (3 percent NPV)
- Standard Design Approvals: $940,000 (7 percent NPV) and $1.10 million (3 percent NPV)
- Design Certifications: $10.7 million (7 percent NPV) and $12.4 million (3 percent NPV)
- Manufacturing Licenses: $2.33 million (7 percent NPV) and $2.82 million (3 percent NPV)
- Construction Permits: $2.50 million (7 percent NPV) and $3.02 million (3 percent NPV)
- Operating Licenses: $906,000 (7 percent NPV) and $1.23 million (3 percent NPV)
- Combined Licenses: $3.50 million (7 percent NPV) and $4.23 million (3 percent NPV)

The hypothetical reactor used in this cost estimation assumes an ESP, DC, and COL application. Therefore, the averted costs in this regulatory analysis do not include the averted costs of all the other application types above.

The new earthquake engineering requirements provide flexibility in allowing an applicant to use a risk-informed seismic approach that would not require an exemption from Appendix S, “Earthquake Engineering Criteria for Nuclear Power Plants,” to 10 CFR Part 50. Additional savings should result from the guidance currently under development to support this approach, which leverages the work done with the PRA to inform other aspects of the application. This guidance is assumed to be available by the time the final rule is issued. The staff estimates incremental averted costs of approximately $3.44 million (7 percent NPV) and $4.16 million (3 percent NPV) resulting from these new proposed regulations and guidance. Finally, the proposed cybersecurity requirements for the protection of digital assets would result in licensees having to protect hundreds of fewer assets, resulting in estimated averted costs of $3.41 million (7 percent NPV) and $4.28 million (3 percent NPV).

The staff anticipates that licensees would incur significantly reduced costs from Alternative 2 relative to the regulatory baseline in the training, examination, and proficiency programs for operators, whether a licensee qualifies to use GLROs or not. For a licensee able to meet the requirements to use GLROs, the staff estimates averted costs of approximately $2.92 million (7 percent NPV) and $7.85 million (3 percent NPV) due to the simplified requirements. For a licensee that cannot use GLROs, the staff estimates averted costs of approximately $905,000 (7 percent NPV) and $2.43 million (3 percent NPV) due to the scalable training program requirements. In this regulatory analysis, the staff assumed that a licensee would not qualify for GLROs but would benefit from the scalable training program requirements. As can be seen, a licensee that can qualify for GLROs could avert approximately an additional $2 million (7 percent NPV). As previously discussed in the Regulatory Baseline section of this regulatory analysis, these averted costs are over and above the reduction in costs a reactor with reduced staff size would experience relative to a large LWR. This regulatory analysis must discuss the incremental costs and benefits of the proposed rule language compared to what would be the case under the regulatory baseline for the specific entity in question, and therefore considers these averted costs related to staffing size as a part of the baseline.

The new proposed FFD requirements are expected to avert a significant number of exemption requests that future applicants would otherwise submit to simplify and scale their FFD programs, as appropriate, to the new technology, smaller staff size, and greater safety margins of future designs. The staff estimates that approximately 35 exemption requests for FFD would be submitted per applicant if this proposed rule is not issued. This is estimated to result in averted costs to each applicant of approximately $788,000 (7 percent NPV) and $954,000 (3 percent NPV).

5.2 Total Industry Costs

Table 2 shows the industry totals for a single applicant for a generic non-LWR, which add up to averted costs of approximately $23.7 million at a 7 percent NPV and $29.5 million at a 3 percent NPV.

Table 2 Total Industry Costs

Attribute	Total Industry Averted Costs (Costs)		
	Undiscounted	7% NPV	3% NPV
Implementation Totals:	$0	$0	$0
Operation Totals:	$37,540,000	$23,720,000	$29,530,000
Industry Totals:	**$37,540,000**	**$23,720,000**	**$29,530,000**

Note: Totals may differ within and between tables due to rounding.

5.3 NRC Implementation

The NRC's development and publication of the final rule would result in incremental costs to the agency. These include the costs of writing the *Federal Register* notice, revising guidance, reviewing and addressing public comments on the proposed rule, and developing the final rule. The staff estimates that approximately 40,000 hours are required to develop the final rule and prepare the final guidance across the 2 years (2025 and 2026). Table 3 shows the NRC implementation costs for developing the final rule.

Table 3 NRC Rulemaking (Implementation) Costs

Year	Activity	Number of Actions	Hours	Weighted Hourly rate	Net Benefit (Cost) (2023$)		
					Undiscounted	7% NPV	3% NPV
2025	Respond to Public Comments and Draft Final Rule	1	15,300	$152	($2,326,000)	($2,031,000)	($2,192,000)
2025	Finalize Regulatory Guides	1	5,100	$152	($775,000)	($677,000)	($731,000)
2026	Finalize and Issue Final Rule	1	15,300	$152	($2,326,000)	($1,898,000)	($2,128,000)
2026	Finalize and Issue Regulatory Guides	1	5,100	$152	($775,000)	($633,000)	($709,000)
Net Benefit (Cost) Total					**($6,202,000)**	**($5,239,000)**	**($5,760,000)**

*"Regulatory Guides" includes all guidance related to the proposed rule

5.4 NRC Operation

This attribute accounts for the projected net economic effect of routine and recurring activities required by the proposed alternative for the NRC.

There are several significant NRC cost drivers

and averted cost drivers in the proposed rule, discussed below.

Significant NRC Cost Drivers

The process control program for radiation protection is a program required by regulation, instead of by conditions on NRC licenses, that the NRC will periodically review, resulting in estimated costs to the NRC of approximately ($505,000) using a 7 percent NPV and ($1.40 million) using a 3 percent NPV. Similarly, reviewing the integrity assessment program results in

estimated costs to the NRC of approximately ($135,000) using a 7 percent NPV and ($333,000) using a 3 percent NPV.

Significant NRC Averted Cost Drivers

Similar to the industry averted costs, the proposed rule simplifies and reduces the technical information content of all types of applications, resulting in averted costs (per application) as follows:

- Early Site Permits: $956,000 (7 percent NPV) and $1.11 million (3 percent NPV)
- Standard Design Approvals: $729,000 (7 percent NPV) and $849,000 (3 percent NPV)
- Design Certifications: $5.89 million (7 percent NPV) and $6.86 million (3 percent NPV)
- Manufacturing Licenses: $2.74 million (7 percent NPV) and $3.32 million (3 percent NPV)
- Construction Permits: $1.37 million (7 percent NPV) and $1.66 million (3 percent NPV)
- Operating Licenses: $1.11 million (7 percent NPV) and $1.51 million (3 percent NPV)
- Combined Licenses: $2.74 million (7 percent NPV) and $3.32 million (3 percent NPV)

The hypothetical reactor cost estimation assumes an ESP, DC, and COL application. Therefore, the averted costs in this regulatory analysis do not include the averted costs of all the other application types above.

The averted exemption requests from the new proposed FFD requirements are estimated to result in averted costs to the NRC of approximately $436,000 (7 percent NPV) and $528,000 (3 percent NPV). The greater flexibilities in operator licensing requirements (for licensees not using GLROs), expected to apply to applicants but included as a common requirement, are estimated to result in averted costs to the NRC of approximately $177,000 (7 percent NPV) and $441,000 (3 percent NPV). The GLRO program, for licensees that can utilize it, is estimated to result in averted costs to the NRC of approximately $411,000 (7 percent NPV) and $1.02 million (3 percent NPV).

5.5 Total NRC Costs

Table 4 shows the total NRC implementation and operation costs for the proposed rule. The total averted costs for the NRC are estimated to range from $4.38 million (7 percent NPV) to $4.94 million (3 percent NPV).

Table 4 Total NRC Costs

Attribute	Total NRC Averted Costs (Costs)		
	Undiscounted	7% NPV	3% NPV
Implementation Totals:	($6,200,000)	($5,240,000)	($5,760,000)
Operation Totals:	$10,270,000	$9,620,000	$10,700,000
NRC Totals:	**$4,070,000**	**$4,380,000**	**$4,940,000**

Note: Totals may differ within and between tables due to rounding.

5.6 Total Costs

Table 5 shows the total implementation and operation costs for the industry and the NRC from the proposed rule. These total averted costs are estimated to range from $28.1 million (7 percent NPV) to $34.5 million (3 percent NPV).

Table 5 Combined Total Costs (Alternative 2)

Attribute	Total Averted Costs (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry Implementation:	$0	$0	$0
Industry Operation:	$37,540,000	$23,720,000	$29,530,000
Industry Totals:	*$37,540,000*	*$23,720,000*	*$29,530,000*
NRC Implementation:	($6,200,000)	($5,240,000)	($5,760,000)
NRC Operation:	$10,270,000	$9,620,000	$10,700,000
NRC Totals:	*$4,070,000*	*$4,380,000*	*$4,940,000*
Net:	***$41,610,000***	***$28,100,000***	***$34,470,000***

Note: Totals may differ within and between tables due to rounding.

5.7 Potential Effect on Offsite Governmental Organizations

Offsite governmental organizations would incur the same costs under all alternatives.

5.8 Uncertainty Analysis

The NRC completed a Monte Carlo uncertainty analysis for this regulatory analysis using the specialty software @Risk.[6] The Monte Carlo approach answers the question, "What distribution of net benefits and costs results from multiple draws of the probability distribution assigned to key variables?"

5.8.1 Uncertainty Analysis Assumptions

Because this regulatory analysis is based on estimates of values that are sensitive to plant-specific cost drivers and plant dissimilarities, the NRC provides the following analysis of the variables that have the greatest amount of uncertainty. As noted above, the NRC performed this analysis with a Monte Carlo simulation analysis using the @Risk software program.

Monte Carlo simulations involve introducing uncertainty into the analysis by replacing the point estimates of the variables used to estimate base case costs and benefits with probability distributions. By defining input variables as probability distributions instead of point estimates, the influence of uncertainty on the results of the analysis (i.e., the net benefits) can be effectively modeled.

The probability distributions chosen to represent the different variables in the analysis were bounded by the range-referenced input and the NRC staff's professional judgment. When

6 Information about the @Risk software is available at http://www.palisade.com.

defining the probability distributions for use in a Monte Carlo simulation, summary statistics are needed to characterize the distributions. These summary statistics include (1) the minimum, most likely, and maximum values of a program evaluation and review technique (PERT) distribution,[7] (2) the minimum and maximum values of a uniform distribution, and (3) the specified integer values of a discrete population. The NRC used the PERT distribution to reflect the relative spread and skewness of the distribution defined by the three estimates.

Appendix A contains a table that identifies the data elements, the distribution of the inputs used in the uncertainty analysis.

5.8.2 Uncertainty Analysis Results

The NRC performed the Monte Carlo simulation by repeatedly recalculating the results 10,000 times. For each iteration, the NRC chose the values identified in the table randomly from the probability distributions that define the input variables. The NRC recorded the values of the output variables for each iteration and used these resulting output variable values to define the resultant probability distribution.

For the analysis shown in each figure below, the NRC ran 10,000 simulations in which it changed the key variables to assess the resulting effect on costs and benefits. Figures 1, 2, 3, and 4 analyze the incremental costs and benefits from the regulatory baseline for Alternative 2. The analysis shows that both the industry and the NRC will benefit in terms of cost savings (positive averted costs) if this rule is issued.

7 A PERT distribution is a special form of the beta distribution with specified minimum and maximum values. The shape parameter is calculated from the defined “most likely” value. The PERT distribution is similar to a triangular distribution in that it has the same set of three parameters. Technically, it is a special case of a scaled beta (or beta general) distribution. The PERT distribution is generally considered superior to the triangular distribution when the parameters result in a skewed distribution because the smooth shape of the curve places less emphasis in the direction of skew. Similar to the triangular distribution, the PERT distribution is bounded on both sides and, therefore, may not be adequate for some modeling purposes if the capture of tail or extreme events is desired.

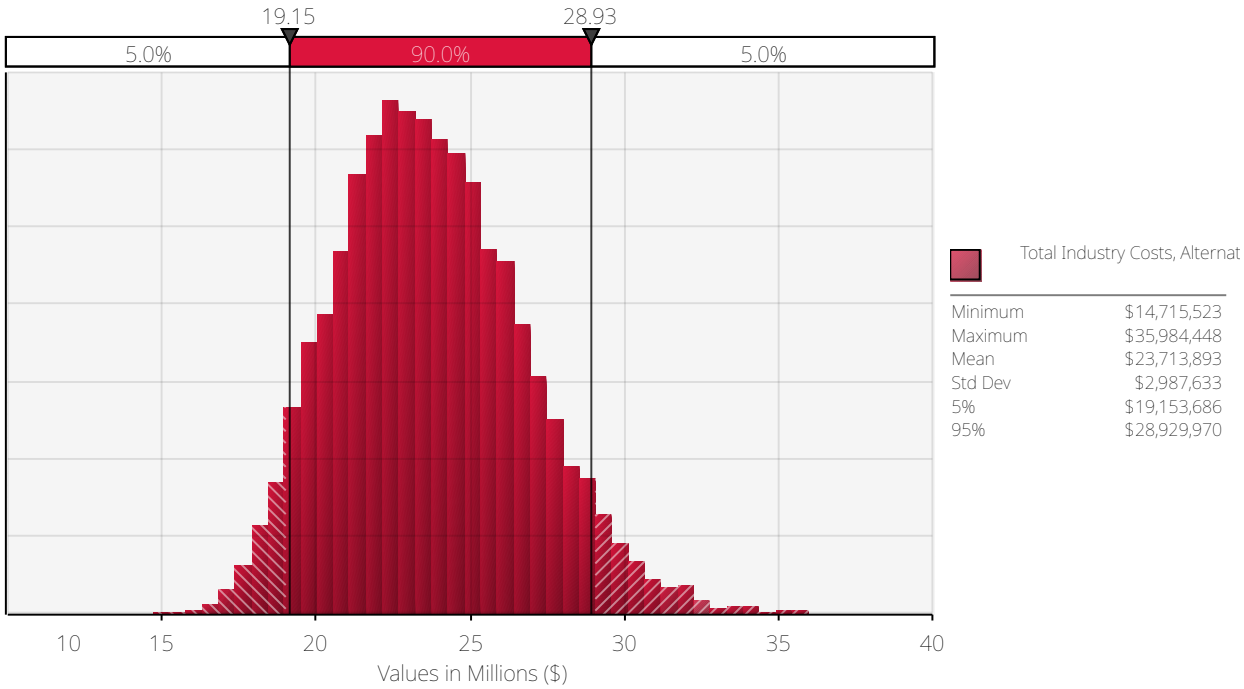

Figure 1 Total Industry Costs, Alternative 2, 7% NPV

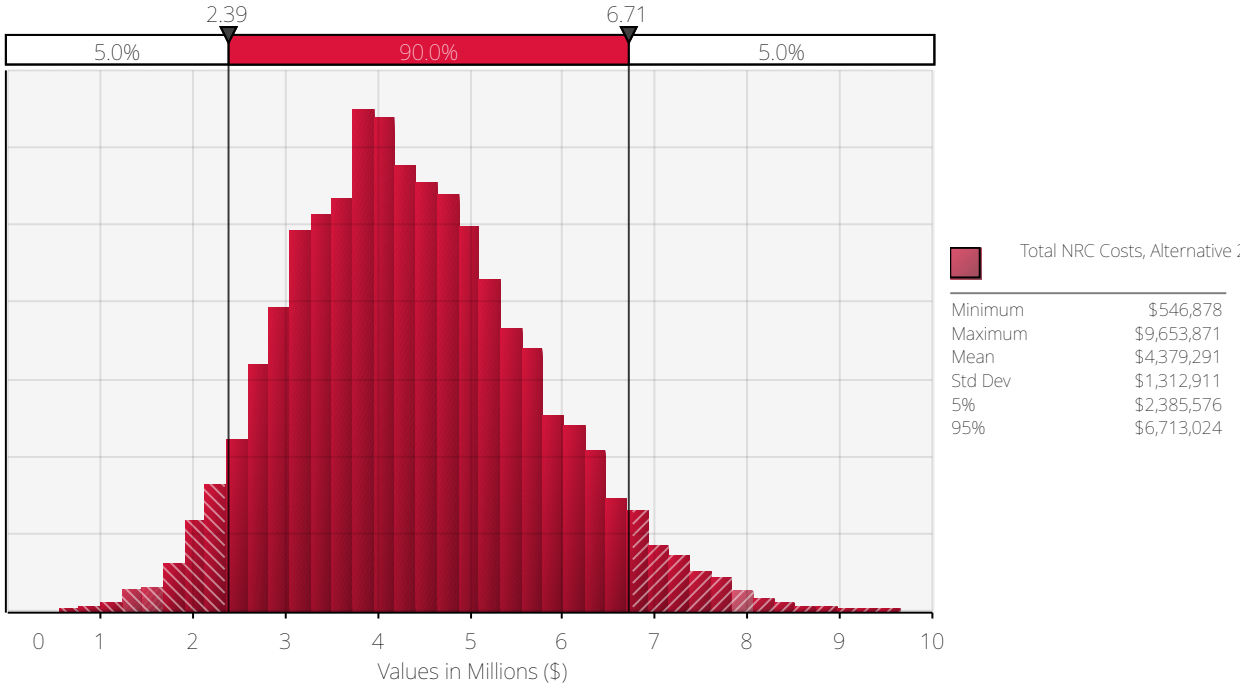

Figure 2 Total NRC Costs, Alternative 2, 7% NPV

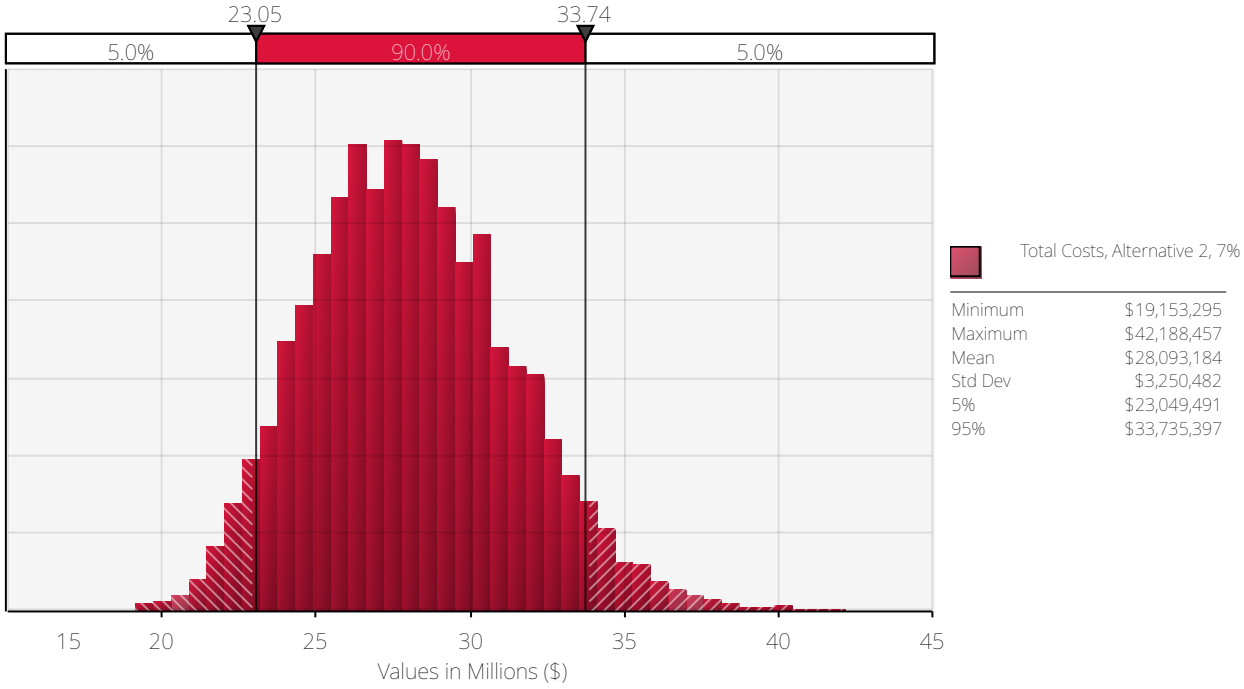

Figure 3 Total Costs, Alternative 2, 7% NPV

Table 6 presents descriptive statistics for the uncertainty analysis. In particular, the table shows the ranges of the output distributions, which give a clearer picture of the potential incremental costs and benefits of the proposed rule. The 5 percent and 95 percent values shown (rounded) in Table 6 also appear as numerical values in Figures 1, 2, and 3, above the vertical lines marking the endpoints of the 90 percent confidence intervals.

Table 6 Descriptive Statistics for Uncertainty Results (7 Percent NPV)

Uncertainty results	Incremental cost-benefit (2023 dollars, millions)					
	Min	Mean	Std dev	Max	5%	95%
Total industry cost	$14.7	$23.7.0	$2.99	$36.0	$19.2	$28.9
Total NRC cost	$0.55	$4.38	$1.31	$9.65	$2.39	$6.71
Total cost	$19.2	$28.1	$3.25	$42.2	$23.0	$33.7

Figure 4 shows a tornado diagram that identifies the cost drivers with the greatest impact for the proposed rulemaking. The figure ranks the top six cost drivers based on their contribution to the uncertainty in cost. The largest cost drivers are the reduction in digital assets needing protection, the industry labor rate, and the reduction in NRC labor hours to review the technical information for DCs, meaning that the uncertainty in these quantities generates the largest variation in the total costs.

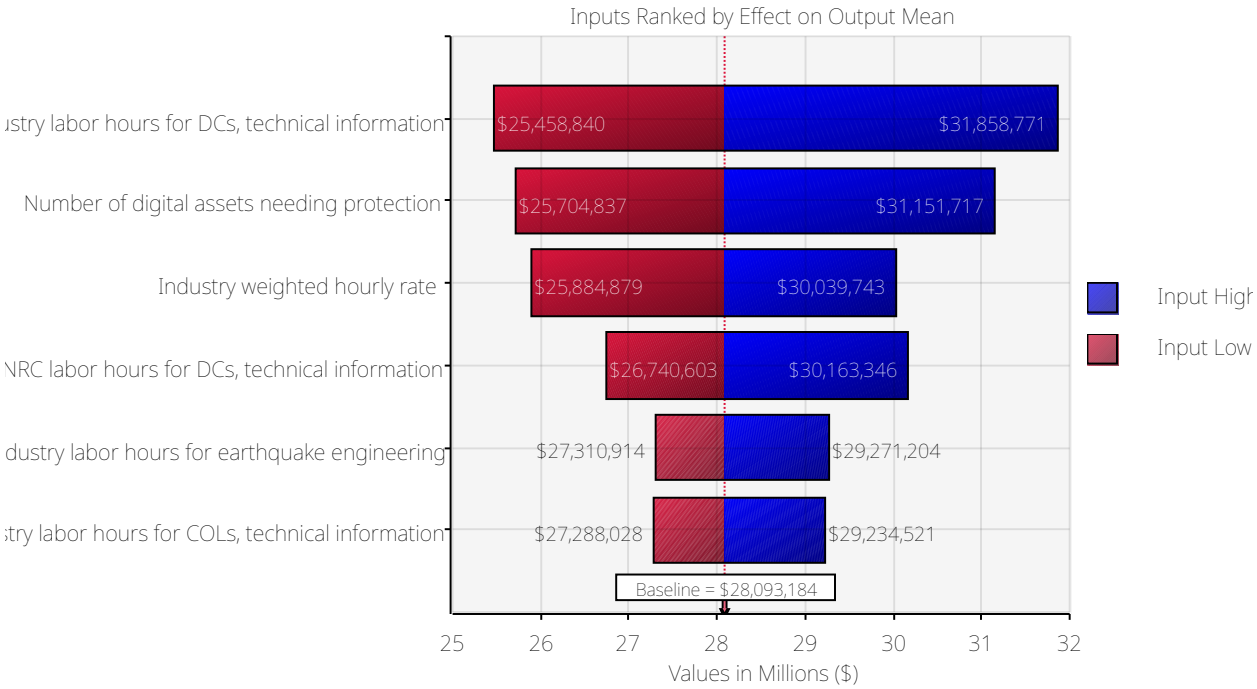

Figure 4 Sensitivity Analysis, Total Costs, Alternative 2, 7% NPV

Summary of Uncertainty Analysis Results

The uncertainty analysis shows that the estimated mean averted costs for Alternative 2 are $28.1 million (7 percent NPV), and that there is a greater than 99 percent confidence that the proposed rule is cost beneficial. It is reasonable to infer that proceeding with the proposed rule

represents an efficient use of resources and averted costs for the NRC and the industry. The rule would also be cost beneficial to the industry and to the NRC when considered separately.

5.9 Disaggregation

The purpose of the 10 CFR Part 53 rulemaking is to respond to NEIMA and create a new performance-based, technology-inclusive framework for future reactor applicants. Given that the goal of all the new requirements matches the goal of the rulemaking and are separately needed to enable the benefits of the new requirements in general, the staff chose not to disaggregate and analyze the requirements further than they are disaggregated in Appendix B.

5.10 Summary

This regulatory analysis identified both quantifiable and nonquantifiable costs and benefits that will result from conducting the rulemaking to address risk-informed, technology-inclusive requirements for commercial nuclear plants. Although quantifiable costs and benefits appear more tangible, the staff urges decision-makers not to discount costs and benefits that cannot be quantified or monetized, as the latter may be of equal or greater importance. Based on this regulatory analysis, Alternative 2 is cost beneficial to industry and the NRC.

5.10.1 Quantified Net Benefit

As shown in Table 5, the estimated incremental averted costs for Alternative 2 (one licensee) over the 60-year analysis horizon, relative to the regulatory baseline (Alternative 1), range from approximately $28.1 million (7 percent NPV) to $34.5 million (3 percent NPV).

5.10.2 Nonquantified Benefits

In addition to the quantified costs discussed in this regulatory analysis, the proposed rule would lead to several nonquantified benefits for the general public, industry, and the NRC, in relation to the regulatory efficiency, improvements in knowledge, and increased public confidence. These costs and benefits are summarized below. Additionally, this regulatory analysis does not estimate the number of exemptions requests a future applicant might submit for many provisions in 10 CFR Part 50, 10 CFR Part 52, and 10 CFR Part 55, “Operators’ Licenses,” that would not be necessary for a future reactor design and would result in excessive costs to the applicant. This was not quantified because of the significant uncertainty in the extent of potential exemption requests, and because Alternative 2 has significant net averted costs without these requests being quantified. While it is important to acknowledge these averted costs, it is not necessary to quantify them, especially in view of the high levels of uncertainty in the data.

5.10.2.1 Improvements in Knowledge

Compared to the regulatory baseline (Alternative 1), Alternative 2 would increase the knowledge of the industry and the NRC staff by enabling licensees to justify operational flexibilities using advances in PRA and other risk-informed analyses in technology-inclusive frameworks with performance-based requirements. The industry and the NRC would thereby develop greater knowledge and common understanding of these advanced techniques through application and experience.

5.10.2.2 Regulatory Efficiency

Compared to the regulatory baseline, Alternative 2 would increase regulatory efficiency because the proposed rule codifies regulatory enhancements that exist currently in regulatory guides, such as the LMP methodology, and because of the other risk-informed alternatives for licensees to use without the need for exemption requests, such as the revised 10 CFR Part 26 requirements and the seismic analyses alternatives. This would give licensees flexibility and decrease their uncertainty when applying to the NRC and during operations. As noted above, Alternative 2 would also provide provisions allowing for factory fuel loading for manufacturing licensees. While the NRC has not attempted to quantify the benefits from these provisions, the NRC expects that the additional flexibility from these provisions could yield significant efficiencies for future applications.

5.10.2.3 Increased Public Confidence

Under Alternative 2, the NRC is meeting its statutory requirements by responding to NEIMA, demonstrating its role as an effective regulator. This alternative would allow licensees to use risk-informed, performance-based approaches and the latest methods and technology to design, construct, operate, examine, and test nuclear power plant components while maintaining NRC oversight of these activities, which would increase public confidence.

5.11 Safety Goal Evaluation

Safety goal evaluations are applicable only to regulatory initiatives considered to be generic safety enhancement backfits subject to the substantial additional protection standard at 10 CFR 50.109(a)(3) or the issue finality provisions in 10 CFR Part 52. The staff expects that a plant licensed under 10 CFR Part 53 will have the same or greater level of safety as a plant licensed under 10 CFR Part 50 or 10 CFR Part 52, and that the Commission's safety goals will be met. A more dominant effect of this rule is to reduce costs for the regulated entities and the NRC, resulting in cost savings for both.

5.12 Results for the Committee to Review Generic Requirements

This section addresses regulatory analysis information requirements for rulemaking actions or staff positions subject to review by the Committee to Review Generic Requirements (CRGR). All information called for by the CRGR procedures (NRC, 2018a) is presented in this regulatory analysis or in the *Federal Register* notice for the proposed rule. Table 7 cross-references the relevant information to its location in this document or the *Federal Register* notice. However, this proposed rule package was not reviewed by the CRGR. In SRM-SECY-20-0032 (NRC, 2020f), the Commission approved the staff's recommendation that the CRGR does not need to review this rule. In addition, the Committee declined to review the backfitting and issue finality assessment for this proposed rule.

Table 7 Specific CRGR Regulatory Analysis Information Requirements

CRGR Procedures Citation (NRC, 2018)	Information Item to Be Included in a Regulatory Analysis Prepared for CRGR Review	Where Item Is Discussed
Appendix B, (i)	The new or revised generic requirement or staff position in the proposed rule	Proposed rule text in *Federal Register* notice
Appendix B, (ii)	Draft papers or other documents supporting the requirements or staff positions	*Federal Register* notice for the proposed rule
Appendix B, (iii)	The sponsoring office's position on whether each requirement or staff position would modify, implement, relax, or reduce existing requirements or staff positions	Regulatory analysis, section 5, and section XI, "Backfitting and Issue Finality," of *Federal Register* notice for the proposed rule
Appendix B, (iv)	The method of implementation	Regulatory analysis, section 8
Appendix B, (vi)	The category of power reactors, new reactors, or nuclear materials facilities or activities to which the generic requirement or staff position applies	Regulatory analysis, section 4.2.2
Appendix B, (vii)–(viii)	The items required at 10 CFR 50.109(c) and the required rationale at 10 CFR 50.109(a)(3) if the action involves a power reactor backfit and the exceptions at 10 CFR 50.109(a)(4) are not applicable	Section XI of *Federal Register* notice for the proposed rule
Appendix B, (xvi)	An assessment of how the action relates to the Commission's Safety Goal Policy Statement	Regulatory analysis, section 5.11

6. Decision Rationale

Table 8 provides the quantified and qualified costs and benefits for Alternatives 1 and 2. The quantitative analysis used mean values.

Table 8 Summary of Totals

Net Monetary Savings or (Costs)—Total Present Value	Nonquantified Benefits or (Costs)
Alternative 1: No action $0	None
Alternative 2: Issuing the 10 CFR Part 53 proposed rule. Industry: $23.7 million using 7% NPV $29.5 million using 3% NPV NRC:	Benefits: • Fulfills the statutory requirements of NEIMA to establish a technology-inclusive regulatory framework for optional use by commercial nuclear plant applicants by December 31, 2027 • **Regulatory Efficiency:** Increases regulatory efficiency through codifying

Net Monetary Savings or (Costs)—Total Present Value	Nonquantified Benefits or (Costs)
$4.38 million using 7% NPV $4.94 million using 3% NPV Net benefit (cost): $28.1 million using 7% NPV $34.5 million using 3% NPV	regulatory enhancements that exist currently in RGs, such as the LMP program, and risk-informed and other alternatives for licensees to use without the need for exemption requests, such as the revised 10 CFR Part 26 requirements, the seismic analyses alternatives, and provisions for factory fuel loading for manufacturing licensees. Gives licensees flexibility and decreases their uncertainty when applying to the NRC and during operations. • **Improvements in Knowledge:** Increases the knowledge of the industry and the NRC staff by enabling licensees to use advances in PRA and other risk-informed analyses in a technology-inclusive framework with performance-based requirements. • **Public Confidence:** The NRC is meeting its statutory requirements by responding to NEIMA ahead of schedule, demonstrating its role as an effective regulator. Enabling the latest methods and technology to design, construct, operate, examine, and test nuclear power plant components while maintaining NRC oversight of these activities increases public confidence.

Note: The regulatory analysis considers the costs and benefits of one applicant.

The industry and the NRC would benefit from Alternative 2, because of several major averted cost drivers discussed above. As previously stated, this regulatory analysis estimated costs and benefits for one applicant to each framework; each additional applicant would result in further averted costs.

Based solely on quantified costs and benefits, the regulatory analysis shows that the rulemaking is justified because the total quantified benefits of the proposed regulatory action would exceed the costs, for all discount rates up to 7 percent. The identified qualitative benefits further justify proceeding with the proposed rule. The uncertainty analysis shows a net benefit (averted cost) for all simulations with a range of averted costs from $19.1 million to $42.2 million (at a 7 percent NPV).

Therefore, after integrating both quantified and qualitative costs and benefits, the benefits of the proposed rule outweigh the costs to implement the rule.

7. Regulatory Flexibility Analysis

The Regulatory Flexibility Act, as amended at 5 U.S.C. 601 et seq., requires that agencies consider the impact of their rulemakings on small entities and, consistent with applicable statutes, consider alternatives to minimize these impacts on the businesses, organizations, and government jurisdictions to which they apply.

The NRC has established standards for determining which of its licensees qualify as small entities pursuant to 10 CFR 2.810, “NRC size standards.” These standards are based on the Small Business Administration’s most common receipts-based size standards and provides for business concerns that are manufacturing entities, with the use of a criteria of less than 500 employees. As required by NEIMA, the NRC is drafting proposed regulations for commercial nuclear plants, both in existing parts and in a new 10 CFR Part 53. Some of these advanced reactors could conceivably demonstrate compliance with the definition of small entities, but the NRC is currently not aware of any known small entities that are planning to apply for a commercial nuclear plant ESP, CP, OL, ML, or COL under 10 CFR Part 53 that would be impacted by this proposed rule.

The Small Business Regulatory Enforcement Fairness Act requires that the NRC prepare a written compliance guide to assist small entities in complying with each rule for which a regulatory flexibility analysis is prepared. Since the NRC is not aware of any small entities that would be affected by this proposed rule, this guide was not prepared for the 10 CFR Part 53 proposed rule.

7.1 Impact on Small Entities

The NRC’s 10 CFR Part 53 rule will result in reduced costs to those individuals, organizations, and companies licensed by the agency that choose to apply under the new regulatory frameworks for commercial nuclear plants. The staff anticipates that a licensees could possibly qualify as a small entity if such an enterprise were for a commercial nuclear plant rated 8 MWe or less. This qualification is dependent on how the ownership and/or operating responsibilities for such an enterprise are structured.

On January 14, 2019, the President signed NEIMA into law (Public Law 115-439). NEIMA directs the NRC to develop the regulatory infrastructure to support the development and commercialization of advanced nuclear reactors. This rulemaking would establish two technology-inclusive regulatory frameworks for optional use by applicants for new commercial advanced nuclear reactors. The regulatory requirements developed in this rulemaking would use methods of evaluation, including risk-informed and performance-based methods, that are flexible and practicable for application to a variety of advanced reactor technologies.

Before NEIMA, the staff described its efforts to prepare for the licensing of advanced reactors in documents such as the Vision and Strategy report (NRC, 2016) and SECY-14-0095 (NRC, 2014).

Through this rulemaking, the staff is proposing to amend the regulations by creating alternative regulatory frameworks for licensing advanced nuclear reactors. The new alternative requirements and implementing guidance would adopt technology-inclusive approaches, and include the appropriate use of risk-informed and performance-based techniques, to provide the

necessary flexibility for licensing and regulating a variety of advanced nuclear reactor technologies and designs.

The proposed rule's objectives are to (1) continue to provide reasonable assurance of adequate protection of public health and safety and the common defense and security at reactor sites at which advanced nuclear reactor designs are deployed to at least the same degree of protection as required for current-generation LWRs, (2) protect health and minimize danger to life or property to at least the same degree of protection as required for current-generation LWRs, (3) provide greater operational flexibilities where supported by enhanced margins of safety that may be provided in advanced nuclear designs, (4) promote regulatory stability, predictability, and clarity, and (5) reduce requests for exemptions from the current requirements in 10 CFR Part 50 and 10 CFR Part 52.

7.2 Summary

The NRC has determined that the 10 CFR Part 53 proposed rule would not have a significant impact on a substantial number of small entities. Some advanced reactor licensees may qualify as small entities, but not most, and for those small entities the averted costs of the 10 CFR Part 53 proposed rule would constitute a significant positive impact. The 10 CFR Part 53 proposed rule saves significant costs in the areas of applications (technical details), operator licensing, and PRA, compared to 10 CFR Parts 50, 52, and 55, which would otherwise apply to these advanced reactors. This regulatory analysis demonstrates that each applicant would experience estimated averted costs of approximately $28.1 million, which would be considerable for the types of entities anticipated to be future reactor applicants to the NRC. Based on its regulatory flexibility analysis, the NRC concludes that the 10 CFR Part 53 proposed rule maintains a balance between the objectives of NEIMA and the Regulatory Flexibility Act.

8. Implementation Schedule

The NRC assumes that the final rule will become effective 30 days after its publication in the *Federal Register* in 2027.

9. References

10 CFR Part 2. *U.S. Code of Federal Regulations*, “Agency Rules of Practice and Procedure,” Part 2, Chapter I, Title 10, “Energy.”

10 CFR Part 26. *U.S. Code of Federal Regulations*, “Fitness for Duty Programs,” Part 26, Chapter I, Title 10, “Energy.”

10 CFR Part 50. *U.S. Code of Federal Regulations*, “Domestic Licensing of Production and Utilization Facilities,” Part 50, Chapter I, Title 10, “Energy.”

10 CFR Part 52. *U.S. Code of Federal Regulations*, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” Part 52, Chapter I, Title 10, “Energy.”

10 CFR Part 55. *U.S. Code of Federal Regulations*, “Operator’s Licenses,” Part 55, Chapter I, Title 10, “Energy.”

10 CFR Part 73. *U.S. Code of Federal Regulations*, “Physical Protection of Plants and Materials,” Part 73, Chapter I, Title 10, “Energy.”

10 CFR Part 100. *U.S. Code of Federal Regulations*, “Reactor Site Criteria,” Part 100, Chapter I, Title 10, “Energy.”

10 CFR Part 170. *U.S. Code of Federal Regulations*, “Fees for Facilities, Materials, Import and Export Licenses, and Other Regulatory Services under the Atomic Energy Act of 1954, as Amended,” Part 170, Chapter I, Title 10, “Energy.”

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APPENDIX A
MAJOR ASSUMPTIONS AND INPUT DATA

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
General						
Base Year	2023					
Application Year 1	2027					After final rule issued
Application Year 2	2028					
Construction Year 1	2029					1 year after application
Construction Year 2	2030					
Construction Year 3	2031					
Operation Year	2032					One year of construction
Reactor Life	60 years					NRC expectation based on current trends and existing fleet operating experience
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Industry Weighted Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Managers	$203					The labor rates used are from the dataset “SOC Code: Standard Occupational Classification Code” (2023 values). The NRC then applied a

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						multiplier of 2.4, which includes fringe and indirect management costs, resulting in the displayed labor rates.
Technical Staff	$136					
Administrative Staff	$101					
Licensing Staff	$176					
Nuclear Engineer	$144					
Nuclear Technicians	$122					
Primary Discount Rate	7%					OMB
Alternative Discount Rate	3%					OMB
NRC Rulemaking						
Final Rule Preparation Begins	2025					
Final Rule Completed	2026					
Respond to Public Comments and Draft Final Rule						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	15,300	PERT	10,800	13,500	27,000	NRC estimate based on proposed rule actuals
Finalize and Issue Final Rule						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	15,300	PERT	10,800	13,500	27,000	NRC estimate based on

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						proposed rule actuals
Finalize and Issue Regulatory Guides						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	5,100	PERT	3,600	4,500	9,000	NRC estimate based on proposed rule actuals
10 CFR Part 26 Changes						
Exemption requests for 10 CFR Part 26 sections						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Number of Exemption Requests Submitted	35	PERT	20	35	50	NRC estimate based on number of regulatory requirements
Labor Hours	230	PERT	120	230	340	NRC estimate
Review exemption requests for approval						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Number of Exemption Requests Reviewed	35	PERT	20	35	50	NRC estimate based on number of regulatory requirements
Labor Hours	115	PERT	60	115	170	Half of the time to prepare and submit
NRC staff develops license conditions and inspects after implementation						
NRC Labor Rate	$152					Calculated value based on FY2021 actuals

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
Number of License Conditions	6					
Labor Hours per Condition	13.6	PERT	9.6	12	24	NRC estimate
Inspection Hours	7.6	PERT	5.3	6.7	13.3	
26.608 Licensees implement initial FFD training in construction year instead of operating year, which results in costs being incurred 1 year earlier and more personnel trained						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	680	PERT	480	600	1,200	NRC estimate, 2 hours of training, 300 personnel
Cost	($93,388)					
1 Year 7% NPV Factor	0.93					
Cost to Conduct a Year Earlier	($7,029)					
Number of Trainees	340	PERT	240	300	600	NRC estimate, 2 hours of training, 150 personnel
Cost to Train Additional Personnel	($46,694)					
Licensee implements performance monitoring and review program						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	362.7	PERT	256	320	640	NRC estimate
Licensee conducts performance monitoring						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	61	PERT	43	54	108	NRC estimate
Licensee evaluates lab and MRO performance						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	22.7	PERT	16	20	40	NRC estimate

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
Licensee writes change control procedure						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	136.0	PERT	96	120	240	NRC estimate
Licensee evaluates and justifies FFD changes						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	2.3	PERT	1.6	2	4	NRC estimate
Licensee ensures randomization in testing						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	4.5	PERT	3.2	4	8	NRC estimate
Licensee establishes dilute testing and conducts testing						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	5.1	PERT	3.6	4.5	9	NRC estimate
Licensee conducts dilute testing						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	1.1	PERT	0.8	1	2	NRC estimate
Licensee contracts with backup lab						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	109	PERT	77	96	192	NRC estimate
10 CFR Part 73 Changes						
Licensee performs analyses in support of cybersecurity plan (73.110)—occurs with licensing						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	211.3	PERT	150	212	270	NRC estimate of differences based on data for comparable regulations
Licensee reports annually to the NRC (73.110)—annual once operating						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	0.3	PERT	0.2	0.3	0.4	NRC estimate of differences based on data for

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						comparable regulations
Licensee implements cybersecurity controls and procedures to protect digital assets in support of cybersecurity plan (73.110)—occurs during construction						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Digital Assets Needing Protection	388.7	PERT	0	333	1,000	NRC estimate of differences based on data for comparable regulations
Labor Hours per Digital Asset	96.3	PERT	72	97	118	NRC estimate of differences based on data for comparable regulations
10 CFR Part 53 Changes						
53.440(f) Design requirements—safety and security interface—incremental costs in application year, requires considering safety and security together, NRC policy but not a current requirement						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	113.3	PERT	80	100	200	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	113.3	PERT	80	100	200	NRC estimate of differences based on data for comparable

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						regulations
53.480 Earthquake engineering—incremental savings in application year, greater flexibility with RG and risk-informed seismic approach						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	35,133	PERT	24,800	31,000	62,000	NRC estimate of differences based on data for comparable regulations
53.1146 Contents of applications for ESPs; technical information—incremental savings in application year due to simplified application requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	12,750	PERT	9,000	11,250	22,500	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	8,246	PERT	5,821	7,276	14,552	NRC estimate of differences based on data for comparable regulations
53.1209 Contents of applications for SDAs; technical information—incremental savings in application year due to simplified application requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	8,976	PERT	6,336	7,920	15,840	NRC estimate of

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	6,283	PERT	4,435	5,544	11,088	NRC estimate of differences based on data for comparable regulations
53.1239 Contents of applications for DCs; technical information—incremental savings in application year due to simplified application requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	101,658	PERT	71,758	89,698	179,396	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	50,829	PERT	35,879	44,849	89,698	NRC estimate of differences based on data for comparable regulations
53.1279 Contents of applications for manufacturing licenses; technical information—incremental savings in application year due to simplified application requirements						

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	23,800	PERT	16,800	21,000	42,000	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	25,290	PERT	17,852	22,315	44,630	NRC estimate of differences based on data for comparable regulations
53.1309 Contents of applications for construction permits; technical information—incremental savings in application year due to simplified application requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	25,500	PERT	18,000	22,500	45,000	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	12,646	PERT	8,926	11,158	22,316	NRC estimate of differences based on data for comparable

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						regulations
53.1369 Contents of applications for operating licenses; technical information—incremental savings in application year due to simplified application requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	11,333	PERT	8,000	10,000	20,000	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	12,569	PERT	8,872	11,090	22,180	NRC estimate of differences based on data for comparable regulations
53.1416 Contents of applications for combined licenses; technical information—incremental savings in application year due to simplified application requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	35,709	PERT	25,206	31,508	63,016	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	25,290	PERT	17,852	22,315	44,630	NRC estimate of

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						differences based on data for comparable regulations
53.1540 Updating licensing-basis information and determining the need for NRC approval—annual savings due to enhanced use of PRA to assess changes						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	479	PERT	338	423	846	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	18	PERT	13	16	32	NRC estimate of differences based on data for comparable regulations
53.1550(a) Evaluating changes to facility as described in final safety analysis reports. Savings treated annually due to PRA providing specific metrics for NRC approval instead of the need to make a determination						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	66	PERT	46	58	116	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						based on FY 2023 actuals
Labor Hours	44	PERT	31	39	78	NRC estimate of differences based on data for comparable regulations
53.780 Training, examination, and proficiency program—periodic training treated annually, incremental savings due to simplified and streamlined requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	805.8	PERT	569	711	1,422	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	124.7	PERT	88	110	220	NRC estimate of differences based on data for comparable regulations
53.805 Facility licensee requirements related to generally licensed reactor operators—annual costs due to new requirement to report information on all GLROs						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	7	PERT	5	6	12	NRC estimate of differences based on data for comparable

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	1.1	PERT	0.8	1	2	NRC estimate of differences based on data for comparable regulations
53.810 Generally licensed reactor operators—periodic training treated annually, incremental savings due to simplified and streamlined requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	28.3	PERT	20	25	50	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	5.7	PERT	4	5	10	NRC estimate of differences based on data for comparable regulations
53.815 Generally licensed reactor operator training, examination, and proficiency programs—periodic training treated annually, incremental savings due to simplified and streamlined requirements						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	2,578	PERT	1,820	2,275	4,550	NRC estimate of

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	284	PERT	201	251	502	NRC estimate of differences based on data for comparable regulations
53.850(b) Radiation protection—monthly savings treated annually, no requirement for effluent-related technical specification						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	231	PERT	163	204	408	NRC estimate of differences based on data for comparable regulations
53.850(c) Radiation protection—monthly costs treated annually, requirement for process control program						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	816	PERT	576	720	1,440	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						actuals
Labor Hours	435	PERT	307	384	768	NRC estimate of differences based on data for comparable regulations
53.860 Security programs—incremental savings in application year, no longer need exemption request from design-basis threat						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	385	PERT	272	340	680	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	193	PERT	136	170	340	NRC estimate of differences based on data for comparable regulations
53.870 Integrity assessment programs—incremental costs in construction year due to new program						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	764	PERT	539	674	1,348	NRC estimate of differences based on data for comparable regulations

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	340	PERT	240	300	600	NRC estimate of differences based on data for comparable regulations
53.870 Integrity assessment programs—annual costs starting in operation year due to new program						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	113	PERT	80	100	200	NRC estimate
NRC Activity						
NRC Labor Rate	$152					Calculated value based on FY 2023 actuals
Labor Hours	91	PERT	64	80	160	NRC estimate (Office of Nuclear Reactor Regulation)
53.440(k) Initiating events and accident analysis—chemical hazards—incremental costs in construction year, licensees would potentially need to research and test materials and coolants that have limited operating experience						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	1,360	PERT	960	1,200	2,400	NRC estimate of differences based on data for comparable regulations
NRC Activity						
NRC Labor Rate	$152					Calculated value

Activity	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
						based on FY 2023 actuals
Labor Hours	453	PERT	320	400	800	NRC estimate of differences based on data for comparable regulations
53.1545(a) Updating final safety analysis reports—incremental savings every 2 years, simplified FSAR means less information to be updated. Change is estimated to reduce recurring annual costs by half.						
Industry Activity						
Industry Labor Rate	$137	PERT	$116	$138	$156	BLS.gov tables
Labor Hours	113.3	PERT	80	100	200	NRC estimate of differences based on data for comparable regulations

APPENDIX B
DETAILED COST TABLES

Industry Operation

Year	Activity	No. of Applicants/ Licensees	Labor Hours	Rate	Net Benefit (Cost) (2023$)		
					Undiscounted	7% NPV	3% NPV
53.440(f) Design requirements—safety and security interface							
2028	Provide Safety and Security Design Information	1	113	$137	($16,000)	($11,000)	($13,000)
				Net Benefit (Cost) Total	**($16,000)**	**($11,000)**	**($13,000)**
53.480 Earthquake engineering							
2028	Flexibilities in Earthquake Engineering Specifications	1	35,133	$137	$4,825,000	$3,440,000	$4,162,000
				Net Benefit (Cost) Total	**$4,825,000**	**$3,440,000**	**$4,162,000**
53.1146 Contents of applications for ESPs; technical information							
2027	Simplified ESP Application Technical Information	1	12,750	$137	$1,751,000	$1,336,000	$1,556,000
				Net Benefit (Cost) Total	**$1,751,000**	**$1,336,000**	**$1,556,000**
53.1209 Contents of applications for SDAs; technical information							
2027	Simplified SDA Technical Information	1	8,976	$137	$1,233,000	$940,000	$1,095,000
				Net Benefit (Cost) Total	**$1,233,000**	**$940,000**	**$1,095,000**
53.1239 Contents of applications for DCs; technical information							
2027	Simplified DC Application Technical Information	1	101,658	$137	$13,961,000	$10,651,000	$12,404,000
				Net Benefit (Cost) Total	**$13,961,000**	**$10,651,000**	**$12,404,000**
53.1279 Contents of applications for manufacturing licenses; technical information							
2028	Simplified ML Application Technical Information	1	23,800	$137	$3,269,000	$2,330,000	$2,820,000
				Net Benefit (Cost) Total	**$3,269,000**	**$2,330,000**	**$2,820,000**
53.1309 Contents of applications for construction permits; technical information							
2028	Simplified CP Application Technical Information	1	25,500	$137	$3,502,000	$2,497,000	$3,021,000
				Net Benefit (Cost) Total	**$3,502,000**	**$2,497,000**	**$3,021,000**

Year	Activity	No. of Applicants/ Licensees	Labor Hours	Rate	Net Benefit (Cost) (2023$)		
					Undiscounted	7% NPV	3% NPV
53.1369 Contents of applications for operating licenses; technical information							
2031	Simplified OL Application Technical Information	1	11,333	$137	$1,556,000	$906,000	$1,229,000
				Net Benefit (Cost) Total	**$1,556,000**	**$906,000**	**$1,229,000**
53.1416 Contents of applications for combined licenses; technical information							
2028	Simplified COL Application Technical Information	1	35,709	$137	$4,904,000	$3,497,000	$4,230,000
				Net Benefit (Cost) Total	**$4,904,000**	**$3,497,000**	**$4,230,000**
53.1540 Updating licensing-basis information and determining the need for NRC approval							
2032-2091	Streamlined Updating of Licensing Basis	1	479	$137	$3,950,000	$503,000	$1,397,000
				Net Benefit (Cost) Total	**$3,950,000**	**$503,000**	**$1,397,000**
53.1550(a) Evaluating changes to facility as described in final safety analysis reports							
2032-2091	Streamlined Change Evaluation Process	1	145	$137	$1,132,000	$144,000	$400,000
				Net Benefit (Cost) Total	**$1,132,000**	**$144,000**	**$400,000**
73.110(a) through (e) Additional cybersecurity plan analysis							
2028	Additional analyses in development of cyber plan	1	211	$137	($29,000)	($21,000)	($25,000)
				Net Benefit (Cost) Total	**($29,000)**	**($21,000)**	**($25,000)**
73.110(d)(1) and (e)(3) Protection of Digital Assets							
2029	Assets not required to be protected	389	96	$137	$5,142,000	$3,426,000	$4,306,000
				Net Benefit (Cost) Total	**$5,142,000**	**$3,426,000**	**$4,306,000**

Exemption requests for 10 CFR Part 26 sections

Year	Activity	No. of Applicants / Licensees	Labor Hours	Rate	Net Benefit (Cost) (2023$)		
					Undiscounted	7% NPV	3% NPV
2028	Averted Exemption Requests	35	230	$137	$1,106,000	$788,000	$954,000

				Net Benefit (Cost) Total	**$1,106,000**	**$788,000**	**$954,000**
26.608 Licensees implement initial FFD training							
2029	Implement Training During Construction vs. Operation	1	($53,723)		($54,000)	($36,000)	($45,000)
				Net Benefit (Cost) Total	**($54,000)**	**($36,000)**	**($45,000)**
26.603(d) Licensees implement performance monitoring and review program (PMRP)							
2029	Licensee Implement PMRP	1	363	$137	($50,000)	($33,000)	($42,000)
				Net Benefit (Cost) Total	**($50,000)**	**($33,000)**	**($42,000)**
26.603(d) Licensees conduct performance monitoring							
2030-2091	Licensee Audit PRMP and Benchmark	1	61	$137	($521,000)	($74,000)	($191,000)
				Net Benefit (Cost) Total	**($521,000)**	**($74,000)**	**($191,000)**
26.603(d) Licensees evaluate lab and MRO performance							
2030-2091	Licensee Evaluate Performance	1	23	$137	($193,000)	($27,000)	($71,000)
				Net Benefit (Cost) Total	**($193,000)**	**($27,000)**	**($71,000)**
26.603(e) Licensees write change control procedure							
2030	Licensee Write Procedure	1	136	$137	($19,000)	($12,000)	($15,000)
				Net Benefit (Cost) Total	**($19,000)**	**($12,000)**	**($15,000)**
26.603(e) Licensees evaluate and justify FFD changes							
2031-2091	Licensee Evaluate And Justify Changes	1	2	$137	($19,000)	($3,000)	($7,000)
				Net Benefit (Cost) Total	**($19,000)**	**($3,000)**	**($7,000)**
26.607(b)(2)(v) Licensees ensure randomization in testing							
2029	Licensees Randomize Selection Process	1	5	$137	($1,000)	$0	($1,000)
				Net Benefit (Cost) Total	**($1,000)**	**$0**	**($1,000)**
26.163 Licensees establish dilute testing and conduct testing (referenced in 26.607(c)(2)(iii))							
2027	Licensees Establish Testing	1	5	$137	($1,000)	$0	($1,000)
2029-2091	Licensee Annually Test Dilutes	1	1	$137	($10,000)	($1,000)	($4,000)
				Net Benefit (Cost) Total	**($11,000)**	**($1,000)**	**($5,000)**
26.607(c)(4) Licensees contract with backup lab							
2029	Licensee Establish Contract	1	109	$137	($15,000)	($10,000)	($13,000)

				Net Benefit (Cost) Total	**($15,000)**	**($10,000)**	**($13,000)**
53.780 Training, examination, and proficiency program							
2031-2091	Scalable Training Program Requirements	1	806	$137	$6,751,000	$905,000	$2,432,000
				Net Benefit (Cost) Total	**$6,751,000**	**$905,000**	**$2,432,000**
53.805 Facility licensee requirements related to generally licensed reactor operators							
2031-2091	Reporting Names of GLROs	1	7	$137	($57,000)	($8,000)	($21,000)
				Net Benefit (Cost) Total	**($57,000)**	**($8,000)**	**($21,000)**
53.810 Generally licensed reactor operators							
2031-2091	Simplified Requirements for GLROs	1	28	$137	$237,000	$32,000	$86,000
				Net Benefit (Cost) Total	**$237,000**	**$32,000**	**$86,000**
53.815 Generally licensed reactor operator training, examination, and proficiency programs							
2031-2091	Simplified Requirements for GLROs	1	2,578	$137	$21,600,000	$2,897,000	$7,782,000
				Net Benefit (Cost) Total	**$21,600,000**	**$2,897,000**	**$7,782,000**
53.850(b) Radiation protection							
2032-2091	Removed Effluent-Related Tech Specs	1	231	$137	$1,905,000	$242,000	$673,000
				Net Benefit (Cost) Total	**$1,905,000**	**$242,000**	**$673,000**
53.850(c) Radiation protection							
2032-2091	Maintain Process Control Program	1	816	$137	($6,724,000)	($856,000)	($2,377,000)
				Net Benefit (Cost) Total	**($6,724,000)**	**($856,000)**	**($2,377,000)**
53.860 Security programs							
2028	Averted Exemption Request	1	385	$137	$53,000	$38,000	$46,000
				Net Benefit (Cost) Total	**$53,000**	**$38,000**	**$46,000**
53.870 Integrity assessment programs							
2031	Establish Integrity Assessment Program	1	764	$137	($105,000)	($61,000)	($83,000)
				Net Benefit (Cost) Total	**($105,000)**	**($61,000)**	**($83,000)**
2032-2091	Maintain Integrity Assessment Program	1	113	$137	($934,000)	($119,000)	($330,000)

				Net Benefit (Cost) Total	**($934,000)**	**($119,000)**	**($330,000)**
53.440(k) Initiating events and accident analysis—chemical hazards							
2031	Chemical Hazard Analysis	1	1,360	$137	($187,000)	($109,000)	($147,000)
				Net Benefit (Cost) Total	**($187,000)**	**($109,000)**	**($147,000)**
53.1545(a) Updating final safety analysis reports							
2032-2091	Simplified FSAR Update	1	113	$137	$934,000	$119,000	$330,000
				Net Benefit (Cost) Total	**$934,000**	**$119,000**	**$330,000**

NRC Operation

Year	Activity	No. of Applicants / Licensees	Labor Hours	Rate	Net Benefit (Cost) (2023$)		
					Undiscounted	**7% NPV**	**3% NPV**
53.440(f) Design requirements—safety and security interface							
2028	Review Safety and Security Design Information	1	113	$152	($17,000)	($12,000)	($15,000)
				Net Benefit (Cost) Total	**($17,000)**	**($12,000)**	**($15,000)**
53.1146 Contents of applications for ESPs; technical information							
2027	Review Simplified ESP Application Technical Information	1	8,246	$152	$1,253,000	$956,000	$1,114,000
				Net Benefit (Cost) Total	**$1,253,000**	**$956,000**	**$1,114,000**
53.1209 Contents of applications for SDAs; technical information							
2027	Review Simplified SDA Technical Information	1	6,283	$152	$955,000	$729,000	$849,000
				Net Benefit (Cost) Total	**$955,000**	**$729,000**	**$849,000**
53.1239 Contents of applications for DCs; technical information							
2027	Review Simplified DC Application Technical Information	1	50,829	$152	$7,726,000	$5,894,000	$6,864,000
				Net Benefit (Cost) Total	**$7,726,000**	**$5,894,000**	**$6,864,000**
53.1279 Contents of applications for manufacturing licenses; technical information							
2028	Review Simplified ML Application Technical	1	25,290	$152	$3,844,000	$2,741,000	$3,316,000

	Information						
				Net Benefit (Cost) Total	**$3,844,000**	**$2,741,000**	**$3,316,000**
53.1309 Contents of applications for construction permits; technical information							
2028	Review Simplified CP Application Technical Information	1	12,646	$152	$1,922,000	$1,370,000	$1,658,000
				Net Benefit (Cost) Total	**$1,922,000**	**$1,370,000**	**$1,658,000**
53.1369 Contents of applications for operating licenses; technical information							
2029	Review Simplified OL Application Technical Information	1	12,569	$143	$1,797,000	$1,046,000	$1,419,000
				Net Benefit (Cost) Total	**$1,797,000**	**$1,046,000**	**$1,419,000**
53.1416 Contents of applications for combined licenses; technical information							
2031	Review Simplified OL Application Technical Information	1	12,569	$152	$1,910,000	$1,112,000	$1,508,000
				Net Benefit (Cost) Total	**$1,910,000**	**$1,112,000**	**$1,508,000**
53.1540 Updating licensing-basis information and determining the need for NRC approval							
2032-2091	Review Streamlined Licensing Basis Information	1	18	$152	$165,000	$21,000	$58,000
				Net Benefit (Cost) Total	**$165,000**	**$21,000**	**$58,000**
53.1550(a) Evaluating changes to facility as described in final safety analysis reports							
2032-2091	Review Streamlined FSAR Changes	1	44	$152	$403,000	$51,000	$143,000
				Net Benefit (Cost) Total	**$403,000**	**$51,000**	**$143,000**
Review exemption requests for approval							
2028	Averted Exemption Request Review	35	115	$152	$612,000	$436,000	$528,000
				Net Benefit (Cost) Total	**$612,000**	**$436,000**	**$528,000**
NRC staff develops license conditions and inspects after implementation							
2028	Averted License Conditions and Inspection	6	21	$152	$19,000	$14,000	$17,000
				Net Benefit (Cost) Total	**$19,000**	**$14,000**	**$17,000**
53.780 Training, examination, and proficiency program							

2031-2091	Added Flexibilities in Operator Licensing Requirements	1	125	$152	$1,156,000	$177,000	$442,000
				Net Benefit (Cost) Total	**$1,156,000**	**$177,000**	**$442,000**
53.805 Facility licensee requirements related to generally licensed reactor operators							
2031-2091	Processing Report of GLRO Names	1	1	$152	($11,000)	($2,000)	($4,000)
				Net Benefit (Cost) Total	**($11,000)**	**($2,000)**	**($4,000)**
53.810 Generally licensed reactor operators							
2031-2091	Elimination of Specific Operator Licensing	1	6	$152	$53,000	$8,000	$20,000
				Net Benefit (Cost) Total	**$53,000**	**$8,000**	**$20,000**
53.815 Generally licensed reactor operator training, examination, and proficiency programs							
2031-2091	Review Simplified Programs for GLROs	1	284	$152	$2,638,000	$405,000	$1,008,000
				Net Benefit (Cost) Total	**$2,638,000**	**$405,000**	**$1,008,000**
53.850(c) Radiation protection							
2032-2091	Review Process Control Program	1	435	$152	($3,969,000)	($505,000)	($1,403,000)
				Net Benefit (Cost) Total	**($3,969,000)**	**($505,000)**	**($1,403,000)**
53.860 Security programs							
2028	Averted Exemption Request Review	1	193	$152	$29,000	$21,000	$25,000
				Net Benefit (Cost) Total	**$29,000**	**$21,000**	**$25,000**
53.870 Integrity assessment programs							
2031	Initial Review of Integrity Assessment Program	1	340	$152	($52,000)	($30,000)	($41,000)
				Net Benefit (Cost) Total	**($52,000)**	**($30,000)**	**($41,000)**
2032-2091	Review Integrity Assessment Program Annually	1	91	$152	($827,000)	($105,000)	($292,000)
				Net Benefit (Cost) Total	**($827,000)**	**($105,000)**	**($292,000)**
53.440(k) Initiating events and accident analysis—chemical hazards							
2031	Review Chemical Hazard Analysis	1	453	$152	($69,000)	($40,000)	($54,000)

Net Benefit (Cost) Total	**($69,000)**	**($40,000)**	**($54,000)**

APPENDIX C
NEW AND MODIFIED REQUIREMENTS IN PROPOSED RULE LANGUAGE

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.3 Scope	Describes the NRC licensees subject to Part 26	None	Applicability, not requirements
26.4 FFD program applicability to categories of individuals	Requires that individuals with certain duties, responsibilities, and access be subject to Part 26	None	Applicability, matches existing requirements with editorial changes
26.5 Definitions	Adds new and revises definitions of oral fluid testing	None	Costs captured in procedure and training requirements
26.21 FFD program	Describes the NRC licensees and individuals subject to Subpart B of Part 26	None	Applicability, matches existing requirements
26.51 Applicability	Describes the NRC licensees and individuals subject to Subpart C, “Granting and Maintaining Authorization, ” of Part 26	None	Equivalent to current requirements
26.53 General provisions	Makes provisions of Subpart C of Part 26 applicable to Part 53 licensees	None	Equivalent to current requirements
26.63 Suitable inquiry	Details requirements for a	None	Equivalent to current requirements

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
	licensee's review of an individual's background		
26.73 Applicability	Describes the NRC licensees and individuals subject to Subpart D, "Management Actions and Sanctions to Be Imposed," of Part 26	None	Applicability, matches existing requirements
26.81 Purpose and applicability	Describes the NRC licensees and individuals subject to Subpart E, "Collecting Specimens for Testing," of Part 26	None	Applicability, matches existing requirements
26.201 Applicability	Describes the NRC licensees and individuals subject to Subpart I, "Managing Fatigue," of Part 26	Reduced costs	Averted exemption request due to codifying revised requirement

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.202 General provisions for facilities licensed under Part 53	Delineates several general requirements for Part 53 licensees	Reduced costs	Averted exemption request due to codifying revised requirement
26.205 Work hours	Establishes limits for working hours for employees	Reduced costs	Averted exemption request due to codifying revised requirement
26.207 Waivers and exemptions	Establishes the process for requesting waivers and exemptions	Reduced costs	Averted exemption request due to codifying revised requirement
26.211 Fatigue assessments	Describes how to assess worker fatigue	Reduced costs	Averted exemption request due to codifying revised requirement
26.601 Applicability	Describes the applicability of Part 26, Subpart M	None	Applicability, equivalent requirements to those in Part 26, Subpart K
26.603 General provisions	States that licensees and other entities under Part 53 may implement the requirements in Subpart M	None	Applicability, equivalent to 26.401
26.603(a) FFD program description	Describes the FFD program	None	Equivalent to 26.401(b)

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.603(b) FFD program implementation and availability	Describes how to implement the FFD program	None	Equivalent to 26.3 and 26.401(a) and (b)
26.603(c) Criterion and analysis for an FFD program	Provides analysis requirements and criterion for FFD programs	Increased costs	Codifies requirement to contract with backup lab leading to additional costs
26.603(d) FFD performance monitoring and review	Contains requirements to review and monitor performance of FFD program	Increased costs	New program leads to additional costs
26.603(e) FFD program change control	Provides requirements for changing aspects of an FFD program	None	Equivalent requirements to 50.54(p), 50.54(q), 26.137(f), 26.713(d), 26.713(g)
26.604 FFD program requirements for facilities that satisfy the § 26.603(c) criterion	Allows licensees that meet the new FFD criterion to avoid certain program requirements	Decreased costs	Equivalent to Part 26, Subpart K, without Drug & Alcohol testing
26.605 FFD program requirements for facilities that do not implement § 26.604	Requires licensees that do not meet the new FFD criterion to use the full program requirements	None	Applicability, not requirements

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.605(a)	FFD program requirements for an ML or a licensee of a commercial reactor constructing its facility or electing not to implement 26.604	Decreased costs	Averted exemption request due to codifying revised requirement
26.605(b)	FFD program requirements for a licensee operating a commercial reactor	Decreased costs	Averted exemption request due to codifying revised requirement
26.606 Written policy and procedures	Requires written FFD policy and procedures for licensees using Part 53	Decreased costs	Averted exemption request due to codifying revised requirement
26.607 Drug and alcohol testing	Introductory paragraph to requirements	None	Equivalent to 26.405
26.607(b)(1) Pre access testing	Requires signed consent and pre-access drug and alcohol test within 14 days of authorization	None	Equivalent to 26.405(c)(1)
26.607(b)(2)(v) Random testing	Requires random sampling equal to at least 50% of employees annually	Small increase in costs	Additional costs from randomization of selection process

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.607(c)(2)	Requires elements of urine testing	None	Refers to multiple existing requirements elsewhere in Part 26
26.607(c)(3)	Requires alcohol testing	None	Refers to multiple existing requirements elsewhere in Part 26
26.607(c)(4) Minimum requirements	Requires a primary and a backup laboratory certified by the U.S. Department of Health and Human Services	None	Clarification of existing regulatory requirements
26.607(g) Oral fluid testing	Establishes requirements for oral fluid testing, Food and Drug Administration premarket approval, and forensic toxicologist review	Decreased costs	Averted exemption request due to codifying revised requirement
26.607(h) Point of collection testing and assessment	Details requirements for forensic toxicologist review	Decreased costs	Averted exemption request due to codifying revised requirement
26.607(i) Hair testing	Describes how to conduct drug screening with hair specimens	None	Added regulatory flexibility

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.607(j) Portal area screening	Describes how to conduct portal area drug and alcohol screening	None	Added regulatory flexibility
26.607(k) Blood testing	Describes how to test for drugs and alcohol with a blood sample	None	Added regulatory flexibility
26.607(l) Custody-and control form	Requires a custody and control form when using a point of collection testing and assessment devices for drug and alcohol testing	Small increase in costs	Requirement for additional form increases costs
26.607(m)(1) Medical Review Officer	Requires MRO to review positive, adulterated, substituted, and diluted samples	None	Matches existing requirements

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.607(m)(2) Medical Review Officer	Requirement for MRO initial training	Slightly increased costs	Training requirement moved to construction instead of operation; very small impact, treated qualitatively
26.607(m)(3) Medical Review Officer	Requires triennial MRO training	None	Matches existing requirements
26.607(m)(4) Medical Review Officer	Clarifies that the MRO does not need to review an electronic breathalyzer test to confirm positive result and describes how to determine whether a specimen is positive	Decreased costs	Averted exemption request due to codifying revised requirement
26.608 FFD program training	Establishes FFD training requirements for Part 53 licensees	Increased costs	New requirement for FFD training programs during construction instead of only at operation
26.609 Behavioral observation	Delineates behavioral observation program requirements	None	Equivalent to 26.407 and 26.33

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.609(c) BOP [behavioral observation program] requirement	Requires that behavioral observation be performed and allows audio/video technologies	None	Equivalent to 73.55(e)(7)(i)(C)
26.609(d) Video and audio capture	Requirements for live video and audio streaming and capture	Increased costs	New requirement
26.610 Sanctions	Requires sanctions for FFD policy violations	None	Equivalent to 26.409 and 26.75
26.611 Protection of information	Requires system to protect personal information and signed consent to FFD program	None	Equivalent to 26.411 and 26.37
26.613 Appeals process	Requires procedure for appeals process for FFD determinations	None	Equivalent to 26.39
26.615 Audits	Requires audits of FFD program and frequency	None	Equivalent to 26.415 and 26.41

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.617 Recordkeeping and reporting	Requires recordkeeping and reporting to the NRC of program performance and individual violations	None	Equivalent to 26.417 and Subpart N
26.617(h)(4)(ii)	Requires a determination of fitness for impairment	None	References 26.189
26.619 Suitability and fitness determinations	Requires licensees to evaluate personnel for suitability to perform duties requiring them to be subject to FFD programs	None	Equivalent to 26.419 and Subpart H
26.709 Applicability	Requires Subpart N for licensees that do not implement Subpart M	None	Equivalent to 26.3

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
26.711 General provisions	Requires general provisions of Subpart N	None	Equivalent to 26.3
26.713 Recordkeeping requirements for licensees and other entities	Establishes recordkeeping requirements for licensees and other entities	None	Equivalent to existing requirements
26.825 Criminal penalties	States that the NRC may issue criminal penalties	None	Equivalent to Subpart O
53.220 Safety criteria for licensing-basis events other than design-basis accidents	Provides safety criteria for licensing-basis events other than design-basis accidents to address cumulative risk to individuals	None	These requirements were made available through LMP, RG 1.233
53.230 Safety functions	Defines primary and additional safety functions needed to ensure safety criteria are met	None	These requirements were made available through LMP, RG 1.233

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.240 Licensing-basis events	Provides requirements for identifying and addressing licensing-basis events	None	These requirements were made available through LMP, RG 1.233
53.250 Defense in depth	Provides requirements for protection via defense in depth to address uncertainties	None	These requirements were made available through LMP, RG 1.233
53.400 Design features for licensing-basis events	Introductory paragraph explaining the goal of design features to address licensing-basis events	None	These requirements were made available through LMP, RG 1.233
53.410 Functional design criteria for design-basis accidents	Provides requirements for design features specifically regarding design-basis accidents	None	These requirements were made available through LMP, RG 1.233
53.420 Functional design criteria for licensing-basis events other than design-basis accidents	Provides requirements for design features specifically regarding other licensing-basis events	None	These requirements were made available through LMP, RG 1.233

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.425 Design features and functional design criteria for normal operations	Provides requirements to keep public doses in accordance with Part 20 during normal operations	None	Equivalent requirements to Part 20
53.430 Design features and functional design criteria for protection of plant workers	Provides requirements to keep plant worker doses in accordance with Part 20	None	Equivalent requirements to Part 20
53.440(c) Design requirements —Materials qualification	Requires material qualification requirements for SSCs	None	Equivalent requirements to 50.49, 50.55a, and Appendix B to 10 CFR Part 50
53.440(d) Design requirements —Degradation mechanisms	Requires evaluation of possible degradation mechanisms of SSCs	None	Equivalent requirements to 50.34(a) and (b), 52.17, 52.47, 52.79, 52.137, 52.157, and 50.55a
53.440(e) Design requirements —Fire protection	Requires that SSCs be designed and located to minimize the probability of fires and explosions	None	Costs captured in content of application requirements

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.440(f) Design requirements —Safety and security interface	Requires that safety and security be considered together in the design process	Increased costs	Not a current requirement, though it is NRC policy
53.440(i) Design requirements —Radioactive material sources	Requires the consideration of all radioactive material sources in design	None	These requirements made available through LMP, RG 1.233
53.440(m) Design requirements —Criticality monitoring	Establishes requirements for providing means to detect criticality accidents	None	Equivalent to 50.68
53.440(n) Design requirements —Human factors	Requires state-of-the-art human factors principles in design	None	Equivalent to 50.34(f)(2)(iii)

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.450 Analysis requirements	Requires a PRA in combination with other generally accepted approaches for the analysis of the plant	None	These requirements made available through LMP, RG 1.233
53.460 Safety categorization and special treatments	Requires that SSCs be categorized according to safety significance and defines categories	None	These requirements made available through LMP, RG 1.233
53.470 Maintaining analytical safety margins used to justify operational flexibilities	Provides ability for licensees to establish more restrictive criteria to achieve operational flexibility	None	These requirements made available through LMP, RG 1.233
53.480 Earthquake engineering	Requires that certain SSCs be able to withstand the effects of earthquakes without loss of safety function	Reduced costs	Greater flexibility with a risk-informed seismic approach along with guidance

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.510 External hazards	Provides requirements for withstanding natural phenomena and human-related hazards up to design-basis external hazard levels	None	Costs captured in content of application requirements
53.700 Operational objectives	Provides overview of operational objectives	None	Contains no requirements
53.710 Maintaining capabilities and availability of SSCs	Requirements for safety-related and non-safety-related SSCs	None	These requirements made available through LMP, RG 1.233
53.715 Maintenance, repair, and inspection programs	Requires development and implementation of program for maintenance, repair, and inspection	None	Equivalent to 50.65, with some conforming changes

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.1146 Contents of applications for ESPs; technical information	Provides technical requirements for applications for ESPs	Reduced costs	Use of PRA in leading role and reduction of FSAR information
53.1209 Contents of applications for SDAs; technical information	Provides technical requirements for applications for SDAs	Reduced costs	Use of PRA in leading role and reduction of FSAR information
53.1239 Contents of applications for DCs; technical information	Provides technical requirements for applications for DCs	Reduced costs	Use of PRA in leading role and reduction of FSAR information
53.1279 Contents of applications for manufacturing licenses; technical information	Provides technical requirements for applications for manufacturing licenses	Reduced costs	Use of PRA in leading role and reduction of FSAR information
53.1309 Contents of applications for construction permits; technical information	Provides technical requirements for applications for construction permits	Reduced costs	Use of PRA in leading role and reduction of FSAR information

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.1369 Contents of applications for operating licenses; technical information	Provides technical requirements for applications for operating licenses	Reduced costs	Use of PRA in leading role and reduction of FSAR information
53.1416 Contents of applications for combined licenses; technical information	Provides technical requirements for applications for combined licenses	Reduced costs	Use of PRA in leading role and reduction of FSAR information
53.1540 Updating licensing-basis information and determining the need for NRC approval	Establishes requirements for updating licensing-basis information and determining the need for NRC approval	Reduced costs	Enhanced use of PRA in assessing plant changes
53.1550(a) Evaluating changes to facility as described in FSARs	Provides requirements under which a licensee may make changes without obtaining a license amendment	Reduced costs	Use of PRA would provide specific metrics that lead to NRC approval as opposed to having to make a determination

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.1630 Immediate notification requirements for operating commercial nuclear plants	Provides requirements for notification of the NRC Operating Center via the Emergency Notification System	None	Equivalent to 50.72
53.1640 Licensee event report system	Defines reportable events and requires licensee event report submittal	None	Equivalent to 50.73
53.600 Construction and manufacturing—scope and purpose	Establishes the overall construction and manufacturing requirements	None	Does not contain requirements
53.620(a) Manufacturing—management and control	Requires specific activities to manage and control manufacturing activities	None	Equivalent to 52.157(a)(26) and (a)(29)
53.620(b) Manufacturing—manufacturing activities	Details requirements for executing manufacturing processes following receipt of ML	None	Equivalent to 52.157(a)(17) and 52.158

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.620(c) Control of radioactive materials	Establishes requirements for the control of radioactive materials for ML holders planning to possess and use such materials as part of the manufacturing process.	None	Equivalent to requirements in Parts 30, 40, and 70 for control of radioactive materials.
53.620(d) Fuel loading	Establishes requirements for fuel loading for manufactured reactors	None	The benefits of these provisions are equal to or exceed the costs of a case-by-case approval process that would be necessary under current regulations and historical position
and 53.620(e)(3) Manufacturing — transportation	Establishes procedure requirements for transportation of a manufactured reactor or major portions thereof	None	This analysis assumes that a procedure would have been developed and this paragraph simply codifies that requirement
53.620(f) Manufacturing —acceptance and installation at the site	Requires a verification process for a reactor to be installed at a site	None	This requirement reflects how the NRC staff expects the process would work under the current regulations

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.730 Defining, fulfilling, and maintaining the role of personnel in ensuring safe operations	Details requirements for personnel measures to enable safe operation of the plant	Small increase in costs	Cost increase from proposing examination program and staffing plan; captured in content of applications costs
53.740 Facility licensee requirements —general	Contains licensee requirements for plant operators and controls	None	Equivalent to 50.54(i), 50.54(l), 50.54(j), 50.54(m)(2)(iv), 50.54(x), and 50.54(y)
53.780 Training, examination, and proficiency program	Details requirements for the program	Reduced costs	Simplified and streamlined program requirements
53.800 Facility licensees for self-reliant-mitigation facilities	Provides alternative requirements for and defines a self-reliant mitigation class	Increased costs	Additional requirements to be able to have generally licensed reactor operators (GLROs); costs captured in contents of applications costs
53.805 Facility licensee requirements related to GLROs	Provides requirements to facility licensees that have GLROs	Small increase in costs	New annual reporting requirement of the names of all GLROs

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.810 GLROs	Details requirements for a general license and GLROs	Reduced costs	Simplified and eliminated requirements when creating GLRO
53.815 GLRO training, examination, and proficiency programs	Describes the applicability and requirements of the GLRO program	Reduced costs	Simplified and eliminated requirements when creating GLRO
53.820 Cessation of individual applicability	Delineates when a general license expires	None	No change in requirements
53.845 Programs	General requirement for licensees to have various types of programs	None	Specific requirements are elsewhere in 10 CFR Part 53
53.850(a) Radiation protection	Requires OL and COL holders to establish a radiation protection program	None	Equivalent to 20.1101
53.850(b) Radiation protection	Requires OL and COL holders to establish a program to control effluents and minimize public dose	Reduced costs	Similar to 50.36a without requirement for effluent-related technical specifications

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.850(c) Radiation protection	Requires OL and COL holders to establish a process control program	Increased costs	Similar to 50.36a except adds requirements from standard technical specifications
53.855 Emergency preparedness	Requires OL and COL holders to have an emergency response plan	None	Equivalent to 50.47 and Appendix E to Part 50 or 50.160
53.860(a)(2)(i) and (ii) Security programs	Details requirements for physical protection, fitness for duty, access authorization, cybersecurity, and information security programs	Reduced costs	Removes need for exemption from requirement to protect against the design-basis threat
53.860(b), (c), (d), and (e) Security programs	Contains requirements for physical protection, fitness for duty, access authorization, cybersecurity, and information security programs	None	This language points to 10 CFR Part 26 and 73.55, 73.54, 73.56

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.865 Quality assurance	Requires a quality assurance program in accordance with appendix B of Part 50	None	Refers to Appendix B to Part 50
53.910 Procedures and guidelines	Details requirements for developing, implementing, and maintaining procedures and guidelines	None	Equivalent to administrative controls section of Part 50 and Part 52 technical specifications
53.870 Integrity assessment programs	Contains requirements for actively assessing possible degradation of SSCs from the effects of aging, fatigue, and environmental conditions	Increased costs	New program requires assessing aging management of SSCs and corrective actions

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.1020 Cost estimates for decommissioning	Requires site-specific decommissioning fund cost estimates	None	Equivalent to 50.75(c)
53.440(k) Initiating events and accident analysis—chemical hazards	Requires design to achieve a low risk of permanent injury to the public from chemical hazards	Increased costs	Licensees would potentially need to research and test materials and coolants that have limited operating experience
53.1282 Contents of applications for manufacturing licenses; other application content	Contains additional requirements for ML applications	None	Equivalent to 52.158
53.1348 Termination of construction permits	Requires notification within 30 days upon deciding to permanently cease construction	None	Equivalent to 52.3(b)(8) and 52.110(a)(1)

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
53.1535(b) Amendments during construction	Directs COL holders to regulations for requesting amendments within 45 days of beginning construction	None	Equivalent to 50.35(b)
53.1545(a) Updating FSARs	Provides requirements for updating FSARs, frequency, and inclusions	None	Equivalent to 50.71(e)
53.1595 Renewal	Allows for renewal of licenses	None	Equivalent to Part 54
53.1720 Insurance required to stabilize and decontaminate plant following an accident	Delineates requirements for decontaminati on insurance	None	Equivalent to 50.54(w)
73.100 Technology-inclusive requirements for physical protection of licensed activities at commercial nuclear plants against radiological sabotage	Requires security plans for licensees and details their elements	None	Equivalent to 73.55

Regulatory Paragraph[(a)]	Description[(a)]	Incremental Effect	Explanation[(a)]
73.110 Technology-inclusive requirements for protection of digital computer and communication systems and networks	Requirements for a cybersecurity program to protect assets similar to 73.54	Decreased costs	Additional analyses during development of cybersecurity plan resulting in a significant reduction in number of assets to protect
73.120 Access authorization program for commercial nuclear plants	Requires applicant to establish an access authorization program	None	Equivalent to requirements for research and test reactors and Part 37

[(a)]Paragraph references are all to Title 10 of the *Code of Federal Regulations* (10 CFR) (e.g., 73.120 means 10 CFR 73.120).