
Financial Qualifications Requirements for Reactor Licensing Proposed Rule— Draft Regulatory Analysis

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Division of Rulemaking



EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) proposes to amend the current financial qualification (FQ) requirements of “reasonable assurance” under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities.” The amended requirements will conform with the review standard of “appears to be financially qualified” found in 10 CFR Part 70, “Domestic Licensing of Special Nuclear Material.” Specifically, the proposed rule would amend 10 CFR 50.33(f) to remove the requirement for a production or utilization facility applicant to demonstrate that it possesses or can provide reasonable assurance of obtaining the funds necessary for construction and operation and replace that requirement with an “appears to be financially qualified” standard. Additionally, the proposed rule would remove Appendix C, “A Guide for the Financial Data and Related Information Required To Establish Financial Qualifications for Construction Permits and Combined Licenses,” to 10 CFR Part 50. The proposed rule would require an applicant to submit a plan describing how it will finance the construction and operation of the facility. The plan would ensure that the applicant has both a well-articulated understanding of the size of the project it is undertaking and the financial capacity to obtain the necessary financing before beginning reactor construction.

The NRC FQ rules for reactors appear in 10 CFR Part 50. In the staff requirements memorandum to SECY-13-0124, “Staff Requirements—SECY-13-0124—Policy Options for Merchant (Non-Electric Utility) Plant Financial Qualifications,” dated April 24, 2014, the Commission directed the staff to engage in rulemaking to develop a standard of review for FQ during initial licensing of power reactors. For applicants to have and maintain special nuclear material, the Commission further directed that this standard of review must not be below the FQ standard in 10 CFR 70.23, “Requirements for the approval of applications.”

This draft regulatory analysis evaluates the costs and benefits associated with the proposed FQ requirements for production and utilization facility licensing and associated guidance documents. It contains a simulation analysis showing that the estimated mean benefit of this proposed rule is \$762,000, with 90-percent confidence that the total of estimated costs and benefits is between (\$0.69 million) and \$2.93 million using a 7-percent discount rate. The results show a 73-percent likelihood that the proposed rule is cost beneficial. A reasonable inference from the uncertainty analysis is that proceeding with the proposed rule represents an efficient use of resources and averted costs to the NRC and the industry. Considered separately, the rule is deemed cost beneficial to industry. Because of the immediate rulemaking costs and the lag in recognizing projected benefits within the next 10 years, the rule is cost neutral to the NRC with a net present value cost of (\$61,000) using a 7-percent discount rate and a 61-percent likelihood of experiencing a net cost.

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	ii
ABBREVIATIONS AND ACRONYMS	vi
1. INTRODUCTION	1
2. STATEMENT OF THE PROBLEM AND OBJECTIVE	1
2.1 Background	1
2.2 Problem Statement.....	2
2.3 Objective	3
3. IDENTIFICATION AND PRELIMINARY ANALYSIS OF ALTERNATIVE APPROACHES	3
3.1 Alternative 1—Status Quo: No Changes to 10 CFR Part 50 or Appendix C to 10 CFR Part 50 and Maintain the Current Initial Licensing Process	3
3.2 Alternative 2—Rulemaking	4
3.2.1 Option 1—Rulemaking To Rescind Financial Qualifications Requirements for Production and Utilization Facility Initial Licensing	4
3.2.2 Option 2—Rulemaking To Amend Financial Qualifications Requirements for Production and Utilization Facility Licensing To Apply an Ongoing Oversight Indicator	4
3.2.3 Option 3—Rulemaking To Conform Production and Utilization Facility Financial Qualifications Requirements to 10 CFR Part 70 Standards	5
3.2.4 Option 4—Rulemaking To Defer Financial Qualifications Demonstrations until after Issuance of Operating License or Combined License	6
3.2.5 Summary of Alternative 2 Rulemaking Options	6
3.3 Alternative 3—Issue Exemptions on a Case-by-Case Basis.....	6
3.4 Alternative 4—Use of License Conditions under Current Regulations	7
4 ESTIMATION AND EVALUATION OF COSTS AND BENEFITS	7
4.1 Identification of Affected Attributes	8
4.2 Analytical Methodology	9
4.2.1 Regulatory Baseline.....	10
4.2.2 Affected Entities.....	10
4.2.3 Base Year	17
4.2.4 Discount Rates	17
4.2.5 Benefit/Cost Inflaters	18
4.2.6 Labor Rates	18
4.2.7 Sign Conventions.....	19
4.2.8 Analysis Horizon	19
4.2.9 Cost Estimation.....	20
4.3 Data.....	20
5 PRESENTATION OF RESULTS	21
5.1 Industry Implementation	21
5.2 NRC Implementation	24
5.3 Total Implementation Costs.....	25
5.4 Other Governments	26
5.5 General Public.....	27
5.6 Regulatory Efficiency.....	28
5.7 Environmental Considerations.....	28
5.8 Other Considerations—Judgment-Proof Strategies	29
5.9 Attributes Not Affected	29
5.10 Uncertainty Analysis.....	29
5.10.1 Uncertainty Analysis Assumptions.....	29

	5.10.2 Uncertainty Analysis Results	30
	5.10.3 Summary of Uncertainty Analysis.....	33
5.11	Disaggregation	33
5.12	Summary	33
	5.12.1 Quantified Net Benefit.....	33
	5.12.2 Nonquantified Benefits.....	34
	5.12.3 Nonquantified Costs	35
6	DECISION RATIONALE FOR SELECTION OF PROPOSED ACTION.....	35
7	IMPLEMENTATION SCHEDULE	36
8	REFERENCES.....	36
	APPENDIX A—MAJOR ASSUMPTIONS AND INPUT DATA.....	39

List of Figures

Figure 1	Completion Status of Nuclear Power Plant Licenses	27
Figure 2	Total Industry Costs (7% NPV)—Alternative 2	30
Figure 3	Total NRC Costs (7% NPV)—Alternative 2	31
Figure 4	Total Costs (7% NPV)—Alternative 2	31
Figure 5	Top Eight Variables for Which Uncertainty Drives the Largest Impact on Total Costs (7-Percent NPV)—Alternative 2.....	32

List of Tables

Table 1	Comparison of FQ Requirements by Groupings and Alternatives	14
Table 2	Number of Affected Entities by Grouping.....	17
Table 3	CPI-U Inflator	18
Table 4	Labor Rate Estimates by Industry Sector and Labor Category	19
Table 5	Industry Implementation Costs	23
Table 6	Total Industry Costs	24
Table 7	NRC Rulemaking Development Costs.....	24
Table 8	NRC Implementation Costs	25
Table 9	Total NRC Costs	25
Table 10	Total Implementation Costs	26
Table 11	Descriptive Statistics on the Uncertainty Results (7-Percent NPV)	32
Table 12	Summary of Qualitative Costs and Benefits	34
Table 13	Summary of Totals.....	35

ABBREVIATIONS AND ACRONYMS

AFCP	applicant financial capacity plan
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
BLS	Bureau of Labor Statistics (U.S. Department of Labor)
CFR	<i>Code of Federal Regulations</i>
COL	combined license
CP	construction permit
CPI	Consumer Price Index
CPI-U	Consumer Price Index for All Urban Consumers
DG	draft guide
EIS	environmental impact statement
FQ	financial qualification(s)
FR	<i>Federal Register</i>
FPL	Florida Power and Light Company
LLC	limited liability corporation
LOE	level of effort
NEPA	National Environmental Policy Act
NEI	Nuclear Energy Institute
NINA	Nuclear Innovation North America, LLC
NPUF	nonpower production or utilization facilities
NPV	net present value
NRC	U.S. Nuclear Regulatory Commission
NWMI	Northwest Medical Isotopes, LLC
OL	operating license
OMB	U.S. Office of Management and Budget
PERT	program evaluation and review technique
RG	regulatory guide
SHINE	SHINE Medical Technologies, Inc.
SRM	staff requirements memorandum
STPNOC	STP Nuclear Operating Company

1 INTRODUCTION

This document presents the draft regulatory analysis of the U.S. Nuclear Regulatory Commission's (NRC's) proposed rule to amend the current financial qualification (FQ) requirements of "reasonable assurance" under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," the associated draft guide (DG)-9004, "Financial Qualifications for Power Reactors and Non-Power Production or Utilization Facilities," draft NUREG-1577, Rev. 2, "Standard Review Plan on Power Reactor and Non-Power Production or Utilization Facility Financial Qualifications and Decommissioning Funding Assurance," draft NUREG-1537, Part 1, Rev. 1, Chapter 15, "Format and Content," and draft NUREG-1537, Part 2, Rev. 1, Chapter 15, "Standard Review Plan and Acceptance Criteria." The amended requirements will conform to the review standard of "appears to be financially qualified" found in 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," and will remove Appendix C, "A Guide for the Financial Data and Related Information Required To Establish Financial Qualifications for Construction Permits and Combined Licenses," to 10 CFR Part 50.

2 STATEMENT OF THE PROBLEM AND OBJECTIVE

2.1 Background

The NRC's authority to review a license applicant's FQ comes from Section 182a of the Atomic Energy Act (AEA), which provides, in part, the following:

Each application for a license...shall be in writing and shall specifically state such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant, the character of the applicant, the citizenship of the applicant, or any other qualifications of the applicant as the Commission may deem appropriate for the license.

The AEA gives the Commission broad authority to determine what FQ information is necessary.

In current 10 CFR 50.33(f), the NRC requires applicants for a construction permit (CP), operating license (OL), or combined license (COL) to demonstrate reasonable assurance of financial qualification to engage in the proposed activities. Under the current requirements, no consideration of FQ is necessary for an electric utility¹ applicant for an OL because electric utilities generically have been presumed to be financially qualified for operations because of the regulatory processes for ratemaking.² Current Appendix C to 10 CFR Part 50 applies to all applicants for CPs and COLs and describes the general kinds of financial data and other related information that will demonstrate the FQ of the applicant.

¹ "Electric utility" is defined in 10 CFR 50.2, "Definitions," as "any entity that generates or distributes electricity and which recovers the cost of this electricity, either directly or indirectly, through rates established by the entity itself or by a separate regulatory authority."

² Utility rates are set through a process called a "rate case." Rate cases are concerned with two primary issues—the rate level, or amount of money the utility is allowed to collect, and rate design, or how rates are structured to match the utility's revenue requirements.

When the current NRC nuclear power reactor FQ requirements under 10 CFR Part 50 were developed, before the electricity markets in the United States were deregulated, nuclear power reactor applicants were considered to be financially qualified based on their status as regulated electric utilities. In the current power market, merchant plant and nonpower production or utilization facility (NPUF) applicants are not subject to ratemaking and thus may not have a predictable source of funds for construction or operation.³ The current regulations require applicants to either have financing for licensed activities or reasonable assurance to obtain financing at the time they submit their application for an initial license or license transfer. In a letter dated May 31, 2012, from Nuclear Innovation North America, LLC (NINA), and a letter dated November 13, 2012, from the Nuclear Energy Institute (NEI), NINA and NEI asserted that it is difficult for merchant plant applicants to secure project financing to meet FQ requirements before issuance of the initial license because of perceptions in the financial community that the licensing process is uncertain (NRC, 2016b). In this draft regulatory analysis, an initial license means a CP or an OL under 10 CFR Part 50 or a COL under 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants.”

2.2 Problem Statement

The NRC developed its current nuclear power reactor FQ requirements and review process before the electricity markets in the United States were deregulated. All current operating nuclear power reactor licensees were found to be financially qualified at initial licensing on the basis of their status as rate-regulated electric utilities. Unlike traditional electric utility licensees, merchant plants sell the power they generate on the open market. These merchant plant applicants have no defined ratepayer base and, unlike electric utility applicants, cannot rely on such a base to demonstrate FQ for operations. Thus, merchant plant applicants, unlike electric utility applicants that can recover costs through the ratemaking process, might not have a predictable source of funds for at the time of licensing. Without identified sources of funds, merchant plant applicants may not be able to meet the FQ requirements. Although the current rules contemplate applications from merchant plants, to date, no merchant plant applicant has met the requirements of the FQ regulations at initial licensing.

The NRC has issued a COL to a merchant plant applicant using principles similar to those proposed in this rule. On February 12, 2016, the Commission issued a COL for South Texas Project, Units 3 and 4.⁴ The South Texas Project application relied on an NRC-approved exemption from current FQ requirements. The exemption was based on Commission direction in Staff Requirements Memorandum (SRM)-SECY-13-0124, “Policy Options for Merchant (Non-Electric Utility) Plant Financial Qualifications,” dated April 24, 2014, which states, “the staff should consider utilizing an exemption process to address existing and emergent cases...during the pendency of the rulemaking process and that anticipates the outcome of the proposed changes to the current financial qualification regulations.” The exemption and associated license conditions were also consistent with the final regulatory basis for this rulemaking, which was being developed at the time.

³ Merchant plants are entities that engage in the business of production, manufacturing, generating, buying, aggregating, marketing, or brokering electricity for sale at wholesale or for retail sale to the public. A nonpower production or utilization facility is a nonpower reactor, testing facility, or other production or utilization facility licensed under the authority of Section 103, 104a, or 104c of the AEA that is not a nuclear power reactor or fuel reprocessing plant.

⁴ *Nuclear Innovation N. Am. LLC* (South Texas Project Units 3 & 4), CLI-16-02, 82 NRC 13, 47-48 (2016).

2.3 Objective

The objective of this regulatory action is to conform 10 CFR 50.33(f) to the FQ standards of 10 CFR Part 70. In SRM-SECY-13-0124, the Commission approved the staff recommendation to engage in rulemaking and directed the staff to develop a standard of review for FQ during initial licensing of nuclear power reactors and NPUFs that is not below the FQ standard in 10 CFR 70.23, “Requirements for the approval of applications,” for applicants to have and maintain special nuclear material.⁵ In SRM-SECY-13-0124, the Commission also directed that the rulemaking reflect both initial licensing and license transfers. The staff is considering alternative FQ approaches that protect public health and safety in which non-utility entity applicants would be able to comply with the NRC’s FQ requirements for the initial issuance or transfer of a CP, OL, or COL.

In SRM-SECY-13-0124, the Commission directed the staff to perform a careful examination of decommissioning funding regulations to ensure against unintended impacts on the agency’s decommissioning funding rules. Accordingly, this document discusses the potential effects on decommissioning funding regulations of the alternatives considered by the NRC staff.

3 IDENTIFICATION AND PRELIMINARY ANALYSIS OF ALTERNATIVE APPROACHES

This section analyzes the four alternatives, with subalternatives, considered by the staff. SECY-13-0124, “Policy Options for Merchant (Non-Electric Utility Plant) Financial Qualifications,” dated November 22, 2013, discussed in detail two of the alternatives, including the subalternatives. The NRC developed a third alternative during the regulatory basis process. Industry proposed a fourth alternative, which is also presented here.

3.1 Alternative 1—Status Quo: No Changes to 10 CFR Part 50 or Appendix C to 10 CFR Part 50 and Maintain the Current Initial Licensing Review

The status quo option would result in no changes to the FQ demonstration requirements in 10 CFR Part 50 and 10 CFR Part 52. As stated in current 10 CFR 50.33, “Contents of applications; general information,” applicants, including merchant plants with no identified funding sources, must submit information that demonstrates that they possess or have reasonable assurance of obtaining the funds necessary to cover estimated construction costs, operation costs for the period of the license, and related fuel cycle costs.

The primary advantage to this option is that it would allow the NRC to review FQ based on information submitted by the applicant with identified available funding sources, not speculative future financing. However, this option may result in the denial of licenses to applicants that do not have the funds necessary at the time of application to construct and operate a nuclear power plant.

⁵ “[T]hat the applicant appears to be financially qualified to engage in the proposed activities in accordance with the regulations in this part.”

3.2 Alternative 2—Rulemaking

The NRC considered rulemaking to amend or rescind the 10 CFR Part 50 FQ demonstration requirements. The following subsections discuss the different rulemaking approaches that the NRC staff considered. For the rulemaking alternative, with any of its four possible options, the staff would follow the rulemaking process. The staff would issue proposed rule language for a 75-day public comment period. The staff would evaluate and respond to comments received on the proposed rule and provide a final rule to the Commission for vote. The rulemaking process allows opportunity for public interaction, feedback, and comment as directed by the Commission in SRM-SECY-13-0124.

3.2.1 Option 1—Rulemaking to Rescind Financial Qualifications Requirements for Production and Utilization Facility Initial Licensing

The current regulatory framework distinguishes between electric utilities and merchant plants with respect to FQ for operations. Under the current regulations, it is more difficult for merchant plants to demonstrate FQ for facility operations. For example, unlike merchant plants, electric utilities recover their costs through rate setting and do not face the same type of financial pressures as merchant plants. Accordingly, under the current regulatory framework, electric utilities do not need a detailed FQ review with respect to facility operations.

This rulemaking approach would rescind the FQ requirements for the initial licensing (construction and operation) of electric utility, merchant plant, and NPUF applicants in light of (1) the lack of evidence to support their efficacy, (2) the robustness of other NRC methods for ensuring safety, (3) the potential for unwarranted barriers to licensing, and (4) the questionable usefulness of initial FQ information given that an applicant's financial arrangements may change after license issuance.

The NRC staff evaluated this approach during the regulatory basis phase and found it inferior to Option 3, "Rulemaking to Conform Production and Utilization Facility Financial Qualifications Requirements to 10 CFR Part 70 Standards," as discussed in the regulatory basis document "Financial Qualifications for Reactor Licensing Rulemaking," issued October 2016.

3.2.2 Option 2—Rulemaking to Amend Financial Qualifications Requirements for Production and Utilization Facility Licensing To Apply an Ongoing Oversight Indicator

Under Option 2, the NRC would no longer carry out FQ reviews as a component of an initial licensing decision. Instead, the NRC would monitor the overall financial health of the licensee over the construction and operating life of the plant, taking action as needed. Although the NRC does not systematically review licensees' FQ or financial conditions after license issuance, it does monitor licensees throughout the terms of their licenses for indications of financial distress that may affect operational safety. However, removing existing FQ requirements for license issuance and relying on one or more indicators of financial distress for post-licensing monitoring would be a new oversight process. Additionally, the application of this approach for the current operating fleet would have to be resolved.

The staff also considered creating new financial health performance indicators that would be used to monitor the financial viability of licensees over the construction and operating life of the

plant. The new financial health performance indicators would be based on open source financial information and would be incorporated into the construction reactor oversight process and the reactor oversight process, or some other method of oversight, perhaps similar to that of decommissioning trust funds oversight. The staff would develop guidance for monitoring and evaluating licensee financial performance using these indicators during construction and operation and create a structure for enforcement action. The staff would evaluate the new financial health performance indicators for their use in oversight.

The staff evaluated this option during the regulatory basis phase and found it inferior to Option 3 as discussed in the regulatory basis document (NRC, 2016b).

3.2.3 Option 3—Rulemaking to Conform Production and Utilization Facility Financial Qualifications Requirements to 10 CFR Part 70 Standards

Under Option 3, the staff would amend 10 CFR 50.33(f) to conform to the “appears to be financially qualified” review standard in 10 CFR 70.23. Additionally, Appendix C to 10 CFR Part 50 would be deleted. This option would result in a level of FQ review that is greater than rescinding the rule but less than the current level of review. This option would require applicants to provide an applicant financial capacity⁶ plan (AFCP) and a cost estimate to demonstrate that—1) the applicant understands the size of the project undertaking and 2) the applicant has the financial capacity to obtain the necessary financing before it begins licensed activities (i.e., construction and operations) or the transfer of the license. Under the proposed rule, FQ license conditions would not be used for license transfers; the NRC would expect most applicants for a license transfer to be able to demonstrate that they have sufficient funding in their application. The NRC is, however, requesting public comments on this approach.

The purpose of the staff’s FQ review is to ensure that an applicant has the financial capacity to obtain funding, not to ensure that the project is completed. The staff has determined that an applicant with commitments for greater than 50 percent of the funding for proposed licensed activities has made a reasonable and sufficient demonstration of financial capacity; such an applicant would not be subject to license conditions for future verification. Under the proposed rule, applicants with 50 percent or less of the necessary funding identified at the time of application would be subject to license conditions for future verification that sufficient funding is available before the start of licensed activities. The license conditions would be such that the staff’s confirmation of a licensee’s compliance with these license conditions would be ministerial.⁷

The staff evaluated this approach during the regulatory basis phase and found it to be the preferred rulemaking option as discussed in the regulatory basis document (NRC, 2016b).

In SRM-SECY-13-0124, the Commission directed the staff to perform a careful examination of decommissioning funding regulations to ensure against unintended impacts on the agency’s decommissioning funding rules. After reviewing the FQ regulations in conjunction with the

⁶ The term “financial capacity” means the capacity to obtain the necessary financing for construction and operating activities.

⁷ The Commission has defined “ministerial” through case law to mean that “verification efforts should be able to verify compliance without having to make overly complex judgments...” *Private Fuel Storage, LLC*, (Independent Spent Fuel Storage Installation) CLI-00-13, 52 NRC 23, 34 (2000).

NRC's decommissioning funding regulations in 10 CFR 50.75, 50.82, and 52.110, the staff determined that clarification was necessary in the proposed rule for license transfer applicants for facilities in decommissioning. The proposed changes would not affect the NRC's decommissioning funding requirements.

The regulations in current 10 CFR 50.33(k)(1) would still be in place (redesignated as 50.33(k)) for facilities that have not commenced decommissioning, requiring an applicant for an OL or COL to provide a report demonstrating reasonable assurance that funds will be available to decommission the facility. Also, under 10 CFR 50.75(b)(1), applicants that hold or are applying for an OL (for a facility that is not in decommissioning) must have certification of decommissioning financial assurance that meets the minimum decommissioning formula under 10 CFR 50.75(c). A COL holder must have certification of decommissioning financial assurance that meets the minimum decommissioning formula under 10 CFR 50.75(c) no later than 30 days after the Commission publishes the notice of intended operation in the *Federal Register* (FR) under 10 CFR 52.103(a).

Under proposed 10 CFR 50.33(f)(5), license transfer applicants for facilities in decommissioning would continue to provide reasonable assurance that funds will be available for the decommissioning process. The proposed rule would clarify the submissions required for license transfer applicants for facilities in decommissioning. These documents are consistent with the NRC's decommissioning funding regulations in 10 CFR Parts §§ 50.75, 50.82, and 52.110, as appropriate for the facility and the stage of decommissioning activities.

3.2.4 Option 4—Rulemaking to Defer Financial Qualifications Demonstrations until after Issuance of Operating License or Combined License

This approach would defer the FQ review until after OL or COL issuance but before the start of reactor construction. The license holder would need to obtain adequate financing of construction and operating costs in accordance with current regulations. Section 185 of the AEA requires all safety findings to be made before license issuance. Also, the Commission has stated that all issues material to licensing need to be resolved at the initial licensing stage. Therefore, this option is not legally justifiable, as discussed in the regulatory basis document (NRC, 2016b). As a result, the staff did not consider this option further.

3.2.5 Summary of Alternative 2 Rulemaking Options

Based on this analysis and the analysis in the regulatory basis document (NRC, 2016b), the staff found Option 3 to be the preferred rulemaking approach; hereafter, the option is referred to as Alternative 2.

3.3 Alternative 3—Issue Exemptions on a Case-by-Case Basis

In this alternative, the NRC would issue exemptions under 10 CFR 50.12, "Specific exemptions," for CP and OL applicants and under 10 CFR 52.7, "Specific exemptions," for COL applicants to entities that cannot satisfy the existing 10 CFR 50.33(f) FQ requirements. However, the inability of 10 CFR Part 50 or 10 CFR Part 52 applicants to meet FQ requirements could affect multiple entities that are similarly situated because none of them would be able to demonstrate, at the time of initial licensing or license transfer, that they possessed or had

reasonable assurance of obtaining the funds necessary to cover the estimated costs of constructing and operating a reactor. Because the FQ issue could affect a class of entities, it is a generic issue. Generic issues should not be resolved through exemptions but through rulemaking.⁸ As such, this process is not an efficient use of NRC staff or licensee resources and introduces unnecessary regulatory burden. Therefore, granting exemptions to the FQ requirements is not a viable alternative to rulemaking.

3.4 Alternative 4—Use of License Conditions under Current Regulations

In a letter dated November 13, 2012, NEI requested Commission guidance to clarify the application of FQ requirements for new nuclear power plant development by merchant plants. Because the NRC's current regulations require a finding of reasonable assurance of the availability of adequate funds before the agency issues a COL, NEI recommended that the Commission develop guidance that allows the use of license conditions to satisfy the NRC FQ requirements and allow issuance of the license.

In summary, the proposed license condition would state that, before beginning reactor construction, the licensee must make available for NRC inspection draft copies of documents demonstrating adequate and available funding to complete construction and begin operations based on an updated estimate of the total project costs. In addition, the financial closing documents would need to identify (1) the legal and financial relationships between the licensee and the entities providing funding, (2) a debt service reserve, and (3) a revolving credit facility.

Under the current regulations, it may be difficult for applicants that have no identified sources of funding at the time of application to prepare an acceptable license condition with the financial detail required by current Appendix C to 10 CFR Part 50. Therefore, the NRC does not believe the industry-proposed license condition is a feasible alternative to meeting the current regulations.

4 ESTIMATION AND EVALUATION OF COSTS AND BENEFITS

This section describes the NRC staff's approach to estimating the costs and benefits expected to result from Alternative 2 relative to the regulatory baseline (Alternative 1). Section 4.1 identifies the attributes expected to be affected by the action. Section 4.2 describes how the analysis evaluates the costs and benefits. Section 5 presents the details of the calculations used to generate the estimated costs and benefits. The total costs and benefits are then summed to determine whether the difference between the costs and benefits results in a positive benefit. In some cases, costs and benefits are not monetized because meaningful quantification is not possible.

⁸ See *Capitol Airways, Inc. v. Civil Aeronautics Bd.*, 292 F.2d 755, 758 (D.C. Cir., 1961), concluding that, where an agency issues numerous, permanent, or unusually broad exemptions, it crosses the line into rulemaking; *Metropolitan Edison Co. (Three Mile Island Nuclear Station Unit 1)*, CLI-80-16, 11 NRC 674 (1980), concluding that when a case presents no "special circumstances" peculiar to the case but rather generic questions common to all light-water power reactors, the questions are best resolved by rulemaking; and *Delta Airlines v. United States*, 490 F. Supp. 907, 912-13 (N.D. Ga., 1980), indicating that excessive use of exemptions amounts to rulemaking.

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 would apply to nuclear power plant licensees and applicants for CPs, OLs, and COLs, whether initial or transfers. The staff believes that merchant plant and NPUF applicants would be the primary beneficiaries. The staff developed an inventory of the affected attributes using the list in Chapter 5 of NUREG/BR-0184, “Regulatory Analysis Technical Evaluation Handbook,” issued January 1997.

The rule would affect the following attributes:

- Industry Implementation. This attribute accounts for the projected net economic effect on the affected entities to implement the regulatory changes. For Alternative 2, the affected industry entities would incur costs from developing the final rule. First, the affected entities’ personnel would provide comments on the proposed rule and draft guidance and participate in public meetings. The industry would also incur costs from reading and interpreting the final rule and final regulatory guide. As compared to the current FQ requirements of Alternative 1, new applicants would collect less financial information to be submitted for NRC review. Additionally, for those affected applicants who have 50 percent or less of the necessary funding identified at the time of the initial license application review, the NRC would issue initial licenses with specific FQ license conditions. These license conditions are assumed to be sufficient and specific enough to permit a simple, ministerial review by the NRC to confirm that an applicant’s financing plan is executed and that funding is available before the licensee begins reactor construction. For license transfers, the NRC would expect the applicant to be able to demonstrate that they have sufficient funding in their application.
- NRC Implementation. This attribute accounts for the projected net economic effect on the NRC to place the proposed rulemaking alternative into effect. It includes the NRC’s implementation costs and benefits incurred in addition to those expected under the regulatory baseline. The NRC would incur costs for final rule promulgation (e.g., resolving public comments and preparing the final rule package) and the development and revision of regulatory guidance, which includes issuing the final regulatory guidance with the final rule and revising NUREG-1537, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors,” issued February 1996; NUREG-1577, “Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance,” issued February 1999; Draft Regulatory Guide (DG)-9004, “Power Reactor and Non-power Production or Utilization Facility Financial Qualifications,” and NRC procedures for performing FQ reviews for license transfers.

As compared to the current FQ requirements of Alternative 1, because of the rescinding of Appendix C to 10 CFR Part 50, the volume and complexity of the financial information submitted for NRC review would likely be reduced. Additionally, for those affected applicants who have 50 percent or less of the necessary funding identified at the time of application, the NRC would perform ministerial reviews of licensees’ documentation to confirm that funding is available before the start of construction in accordance with their license conditions.

- Other Governments. This attribute measures the net economic effect of the proposed alternative on the Federal Government (other than the NRC) and State and local governments resulting from the implementation of Alternative 2.
- General Public. This attribute accounts for direct, out-of-pocket costs paid by members of the general public as a result of the implementation of Alternative 2.
- Regulatory Efficiency. This attribute accounts for regulatory and compliance improvements resulting from the implementation of Alternative 2 compared to the regulatory baseline.
- Environmental Considerations. Section 102(2) of the National Environmental Policy Act (NEPA) requires Federal agencies to take various steps to enhance environmental decision making. The NRC’s procedures for implementing NEPA are in 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.” The impact of the proposed alternative on the environment must be evaluated.
- Other Considerations. This attribute accounts for considerations that are not captured in the preceding attributes. Specifically, this attribute accounts for how Alternative 2 meets specific requirements of the Commission, helps achieve NRC policy, and provides other advantages or detriments.
- Attributes with No Effects. Attributes that are not expected to be affected under any of the alternatives include public health (accident), public health (routine), occupational health (accident), occupational health (routine), offsite property, onsite property, industry operation, NRC operation, improvements in knowledge, and safeguards and security considerations.

4.2 Analytical Methodology

This section describes the process used to evaluate costs and benefits associated with the proposed rulemaking alternative. The benefits include any desirable changes in affected attributes (e.g., averted costs, monetary savings, improved safety, improved security). The costs include any undesirable changes in affected attributes (e.g., monetary costs, increased exposures).

The NRC staff estimated the costs and benefits of the proposed rule as incremental costs and benefits as compared to a “no action” baseline. The no action baseline includes the historical costs incurred by applicants, licensees, and the NRC during the FQ process. The staff estimated all of the incremental costs and benefits resulting from the proposed rule requirements for three phases: final rule development, implementation, and operation. Implementation costs would be incurred beginning in 2019, when the rule is assumed to come into effect. All costs and benefits presented in this analysis are in 2017 dollars.

Of the seven affected attributes, the analysis evaluates two attributes—industry implementation and NRC implementation—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 licensees or applicants would implement, or would no longer implement,

because of the proposed alternative. Where possible, the staff calculated costs for these two attributes using three-point estimates to quantify the uncertainty in these estimates. Most of the tables used in this draft regulatory analysis are included in the individual sections for each of the provisions, but certain detailed cost tables are included in Appendix A. The staff evaluated the remaining five attributes qualitatively because the benefits of having ministerial confirmation that FQ license conditions have been met before licensed activities begin are not quantifiable, or because the data necessary to quantify and monetize the impacts on these attributes are not available.

For this draft regulatory analysis, the staff developed estimates to quantify the various factors considered. The staff then discounted the estimated cash flows and monetized benefits incurred in future years to the current year of the regulatory action. Finally, the staff summed the net present value (NPV) estimates of the costs and benefits for each alternative and compared them.

In addition, to the extent that some important qualitative factors cannot be quantified, these factors are discussed in qualitative terms. Based on the consideration of each attribute, combined with the quantified costs and benefits, the staff will typically make a recommendation for each alternative. The staff documents its assumptions throughout this draft regulatory analysis. For reader convenience, Appendix A summarizes the major assumptions and input data.

4.2.1 Regulatory Baseline

This draft regulatory analysis presents the incremental impacts of the proposed rule alternative compared to a baseline that reflects anticipated behavior in the event the NRC does not undertake regulatory or nonregulatory action. The regulatory baseline assumes full compliance with the NRC's existing requirements, including current regulations and relevant orders. Section 5.0 of this draft regulatory analysis presents the estimated incremental costs and benefits of the alternatives compared to this baseline.

4.2.2 Affected Entities

Alternative 2 will affect electric utilities, merchant plants, and NPUF applicants and licensees.

Electric utility applicants would benefit from the proposed rule change because their application would need to meet the new standards as opposed to the current standard of "reasonable assurance." The delay in establishing long-term financing of the project until after receipt of the construction permit or combined license, provides the applicant with increased flexibility in responding to changing market conditions and provides options for when and what financing strategies to execute.

The NRC understands that most merchant plant applicants will not have any committed sources of funding at the time of application and that they intend to establish financing for their projects after obtaining a license. In many cases, merchant applicants will likely pursue funding through the project finance model⁹ to establish all funding for the project at one time, using multiple

⁹ See the discussion of project finance in the transcript of "Public Meeting on Financial Qualifications for Merchant Plant Combined License Applicants," dated January 8, 2013, ADAMS Accession No. ML13022A446, beginning with Kenneth Hansen's discussion on page 17.

sources of capital. The project finance model is often used to underwrite long-term financing of infrastructure and industrial projects based on the projected cash flow of the project rather than on the balance sheets of its sponsors. This approach usually involves a number of equity investors, known as sponsors, as well as a syndicate of banks or other lending institutions that provide loans to the project. Loans made to fund the project are generally secured by the project assets, rather than from the general assets or creditworthiness of the project sponsors, and are paid entirely from the project's cash flow.

The staff recognizes the possibility that an applicant, particularly one with an aggressive construction schedule, may present an application that contains committed sources of funding. Accordingly, the staff has decided to distinguish between applicants that have more than 50 percent of their financing versus those with 50 percent or less of their financing identified at the time of application.

The NPUFs include all existing nonpower reactors licensed under 10 CFR 50.21(a) and (c) and proposed production or utilization facilities licensed under 10 CFR 50.22, "Class 103 licenses; for commercial and industrial facilities," for the production of medical radioisotopes, such as molybdenum-99. Based on comments received from the public on the draft regulatory basis and on further analysis by the staff, the NRC recognizes that applicants for this type of facility may have difficulties similar to merchant plant applicants in meeting current FQ requirements. Accordingly, the staff has decided to treat NPUF applicants similar to merchant plant applicants.

4.2.2.1 *Applicants with 50-Percent or Less Funding at Time of CP or COL Application*

For all CP and COL applicants with 50 percent or less committed funding sources at the time of application, the applicant would provide the following:

- a construction cost estimate
- an AFCP with proposed license conditions

The cost estimate and AFCP are intended to demonstrate that, at the time of application, an applicant has sufficient financial capacity before starting construction. For applicants with 50 percent or less committed funding sources at the time of application, the applicant would provide proposed license conditions to ensure that funding is available before beginning construction.

The licensee would need to meet the license conditions before beginning construction. The conditions are assumed to be similar in content to the following.

[THE APPLICANT] must notify the NRC at least 60 days before the anticipated date of construction that this license condition has been fulfilled and that the following information is available:

- An updated cost estimate;

- A description of any material variances from the original cost estimate provided in the application, along with an explanation for the changes; and
- Documentation confirming that the licensee has secured financing to fund the updated cost estimate. This document must include operative closing documents and may include documented proof of parent and affiliate assurances, or capital from other sources (as required to close the financing) that reflect financing for the project.

An updated cost estimate is the basis for confirming that the licensee has the funds necessary to begin construction. The documentation confirming that the licensee has secured financing verifies the availability of funds to begin reactor construction.

4.2.2.2 *Applicants with Financing of More Than 50 Percent at Time of CP or COL Application*

For all CP and COL applicants with more than 50-percent committed funding sources at the time of application, the applicant would provide both of the following:

- a construction cost estimate
- an AFCP with documentation demonstrating commitments of financing equal to more than 50 percent of the construction cost estimate

The cost estimate and AFCP are intended to demonstrate an applicant's financial capacity. The staff believes that an applicant with commitments for more than 50 percent of its construction funding that has submitted a sufficient construction cost estimate and AFCP has sufficiently demonstrated its financial capacity. Accordingly, where the applicant has identified such commitments, license conditions requiring documentation for the remaining portion of the construction funding is not necessary. This is because the purpose of the staff's FQ review is not to ensure that the project is completed; rather, it is to ensure that an applicant has the financial capacity to obtain financing when the project moves forward.

4.2.2.3 *OL and COL Applicants*

For all merchant plant and NPUF OL applicants and merchant plant COL applicants, the applicant would provide both of the following:

- an estimate of total annual operating costs for each of the first 5 years of operations; and
- an AFCP that includes a high-level summary discussion with enough detailed information to conclude that the applicant understands both the operational requirements of the facility and the financial capacity to obtain or provide financing for operations, when appropriate.

The staff's review of a 5-year projected cost of operations, along with projected sources of funding for those 5 years, is a well-established financial review approach. Therefore, for operations, the applicant would have available for NRC inspection (1) an updated estimate of total annual operating cost for each of the first 5 years of operations and (2) documentation of

sources of funds to cover each of the first 5 years of operation. In the case of a merchant plant applicant under 10 CFR Part 50 or a COL holder under 10 CFR Part 52, such sources could include, but are not limited to, power purchase agreements, parent assurances, and projected revenue from the anticipated sale of power. In the case of an NPUF entity, such sources could include, but are not limited to, the anticipated sale of products and services, if applicable; commitments from Federal and State or other government agencies and documentation of such commitments, if applicable; and other guarantees.

The documentation reflecting available funds to cover operating and maintenance expenses ensures that the licensee can operate and maintain the facility after completion of construction.

If the applicant does not have documented sources of funds for operations at the time of application, the applicant would provide proposed license conditions for operations in its initial application to ensure that funding is available prior to the start of licensed activities. The following is an example of such a license condition for a merchant plant or NPUF applicant:

[THE APPLICANT] must notify the NRC at least 60 days before the scheduled initial loading of fuel [or 60 days before the scheduled use of SNM beyond receipt, as applicable, for some NPUF applicants] that this license condition has been fulfilled and that the following information is available:

- An updated cost estimate for each of the first 5 years of operations;
- A description of any material variances from the original cost estimate provided in the application, along with an explanation for the changes; and
- Documentation confirming that the licensee has secured financing to fund the updated cost estimate.

If the applicant does not have finalized sources of funding for operations at the time of application, this license condition would ensure that adequate funds are available prior to the start of licensed activities.

The staff identified four groups for this analysis, which are presented in Table 1. Table 1 summarizes the comparison of FQ requirements by groupings and alternatives.

Table 1 Comparison of FQ Requirements by Groupings and Alternatives

Groupings	Power		Nonpower ^c
	<i>Electric Utilities</i>	<i>Merchant/Transfer</i>	
Alternative 1—Current FQ Requirements^a			
<i>Construction</i>	Reasonable assurance to cover estimated total construction costs and sources of funding	Reasonable assurance to cover estimated total construction costs and sources of funding	Reasonable assurance to cover estimated total construction costs and sources of funding
<i>Operating</i>	N/A	Reasonable assurance to cover estimated operating costs for the period of the license, total operating cost estimates for 5 years, and sources of funding	Reasonable assurance to cover estimated operating costs for the period of the license, total operating cost estimates for 5 years, and sources of funding
<i>COLs</i>	Reasonable assurance to cover estimated total construction costs and sources of funding	Reasonable assurance to cover estimated total construction costs and estimated operating costs for the period of the license, total operating cost estimates for 5 years, and sources of funding	N/A
<i>License Renewal</i>	None	None	Reasonable assurance to cover estimated operating costs for the period of the license, total operating cost estimates for 5 years, and sources of funding
Alternative 2—New FQ Requirements^b			
<i>Construction</i>	Total construction cost estimates and AFCP	Total construction cost estimates and AFCP	Total construction cost estimates and AFCP
<i>Operating</i>	N/A	Total operating cost estimates for 5 years and source of funds	Total operating cost estimates for 5 years and source of funds
<i>COLs</i>	Total construction cost estimates and AFCP	Total construction cost estimates, AFCP, total operating cost estimates for 5 years, and source of funds	N/A
<i>License Renewal</i>	None	None	Total operating cost estimates for 5 years and source of funds

^a A newly formed entity must provide additional information.

^b For applicants with funding of 50 percent or less at the time of application, a license condition would be included to confirm that funding is available before the start of construction or operation. License conditions would not be available for license transfers.

^c A separate rulemaking under consideration would remove this requirement upon Commission review and approval of the draft final rule.

The affected entities assigned to these groupings are discussed below.

- Construction—As of June 2017, there are no active 10 CFR Part 50 power or nonpower reactor CP applications or known plans for CP or COL license transfers during the

construction phase.¹⁰ The staff is aware of one merchant power applicant that has expressed interest in submitting a license application for a CP and one merchant power applicant that has expressed interest in requesting a CP transfer in the 2020 timeframe. Furthermore, the staff is aware of six merchant power applicants who have expressed interest in submitting CP license applications in the 2025 timeframe.

In addition, the NRC staff completed its review of the Northwest Medical Isotopes, LLC (NWMI) CP application in 2017 and anticipates that a decision on issuing the CP will be made later this year, following the January 23, 2018, mandatory hearing held by the Commission. The NRC staff concluded in its safety evaluation report that NWMI is financially qualified. The NRC issued a CP to SHINE Medical Technologies, Inc., in February 2016 (SHINE, 2016) and found the applicant to be financially qualified. Both SHINE and NWMI, assuming a CP is issued for the latter, are expected to submit OL applications in fiscal year 2018. As a result, the NRC does not expect that this proposed regulation will affect these entities.

- Operating—There are no CP holders that are nearing construction completion. As of June 2017, the NRC staff is unaware of any planned license transfers of power or nonpower reactor operating licenses.¹¹
- COL—As of June 2017, the NRC had issued four COLs to power reactors that are under construction and eight COLs to power reactors that have no published construction schedule.¹² Of these 12 COL holders, 10 are electric utilities and only the 2 South Texas Project reactors are merchant plants. On May 18, 2015, the STP Nuclear Operating Company (STPNOC) submitted an exemption request that addressed the standards in 10 CFR 52.7 and 10 CFR 50.12 and submitted an AFCP with proposed license conditions. STPNOC had previously provided construction and operating cost estimates as part of the COL application review. STPNOC has not announced a construction schedule for these reactors. The staff assumes that this proposed rule would not affect this FQ submittal and staff inspection before the start of construction and operation.

The staff is currently reviewing the Turkey Point, Units 6 and 7, COL applications. The Turkey Point FQ information was submitted with the application and the final safety evaluation report documents. The staff found the applicant, Florida Power and Light

¹⁰ The Bellefonte Nuclear Generating Station Units 1 and 2, whose construction permits were in a deferred status, were sold November 2016. The NRC staff expects that the license transfer FQ review would be completed before the final rule is issued.

¹¹ Although no planned license transfers are known, there is the possibility of future transfer of nuclear licenses that could impact this analysis. For example, electricity markets that are deregulated and that contain intermittent renewable generation and gas-fired generation are creating economic difficulties for nuclear power plants, which may result in the sale of operating assets or early shutdown of the facility.

¹² The four power reactors under construction are Virgil C. Summer Nuclear Station, Units 2 and 3, and Vogtle Electric Generating Plant, Units 3 and 4. The eight power reactor COL holders without a published construction schedule are Enrico Fermi Nuclear Plant, Unit 3; Levy Nuclear Plant, Units 1 and 2; North Anna Power Station, Unit 3; South Texas Project, Units 3 and 4; and William States Lee III Nuclear Station, Units 1 and 2.

Company (FPL), to be financially qualified. Further, because FPL is an electric utility, FPL is not subject to the FQ information requirements of 10 CFR 50.33(f)(2).

- License Renewal—There are no proposed changes to the FQ requirements for the license renewal of power reactor licensees; therefore, this analysis does not consider these reactor licensees.

The NRC regulates 36 nonpower reactors of which 31 are currently operating (NRC, 2016a). The other regulated nonpower reactors are in the process of decommissioning, have possession-only licenses, or are permanently shut down. The proposed rule under consideration would affect nonpower reactors and other NPUF applicants seeking a CP or an OL and all currently operating nonpower reactors and future NPUFs that apply for a license renewal after the effective date of the final rule, assuming that the Commission reviews and approves a final rule that is substantially similar to the proposed rule.

Section 103 (for commercial or industrial purposes) and Sections 104a and 104c (for medical therapy and research and development activities) of the AEA establish the NRC's authority to license NPUFs. The NRC's regulations provide for the licensing of facilities under Section 103 of the AEA per 10 CFR 50.22 and under Sections 104a and 104c per 10 CFR 50.21(a) and (c), respectively. For those facilities licensed under Sections 104a or 104c, the AEA requires that the Commission impose only the minimum amount of regulation needed to promote common defense and security, protect the health and safety of the public, and permit the widest amount of effective medical therapy possible and widespread and diverse research and development. Thus, under the staff's proposal to amend the NRC's regulations governing the license renewal process for NPUFs, the proposed rule would eliminate the license terms for noncommercial NPUFs, other than testing facilities, licensed under 10 CFR 50.21(a) or (c) (NRC, 2015).

The only licensed testing facility is the National Institute of Standards and Technology, which would continue to go through the license renewal process if the proposed rule were adopted as a final rule.

Table 2 summarizes the number of affected entities by category and shows the timing of their initial FQ submittals.

Table 2 Number of Affected Entities by Grouping

Groupings	Year of FQ Submittal				
	2020	2025	2020	2025	2025
	Power				Nonpower
	<i>Electric Utilities</i>		<i>Merchant/Transfer</i>		
Construction	--	--	3	6	--
Operating	--	--	--	--	--
COLs	--	--	2	--	--
License Renewal	--	--	--	--	1

Note: The data in the table are based on the staff's current knowledge of the affected entities and timing of their initial FQ submittals.

4.2.3 Base Year

The staff calculated the present value of the costs and benefits in 2017 dollars. The rule is assumed to be finalized and become effective in 2019. One-time rulemaking development costs are those costs incurred by the NRC and industry before the rulemaking is effective. These development costs will become sunk costs in later stages of the rulemaking and will be removed in the final regulatory analysis. One-time implementation costs for the NRC and licensees are assumed to be incurred in 2019. Ongoing costs related to the alternative are assumed to begin in 2020, unless otherwise stated.

One-time implementation costs are estimated. The staff assumes that these costs will be incurred in the first year of the analysis, unless otherwise noted.

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 staff performed a discounted cash flow calculation to discount these annual expenses to 2017 dollar values.

4.2.4 Discount Rates

In accordance with guidance from OMB Circular No. A-4, "Regulatory Analysis," dated September 17, 2003, and NUREG/BR-0058, present-worth calculations are used to determine how much society would need to invest today to ensure that the designated dollar amount is available in a given year in the future. By using present-worth values, costs and benefits, regardless of when they are incurred, are valued to a reference year for comparison. Based on OMB Circular No. A-4 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.¹³ A 7-percent discount rate approximates the marginal pretax real rate of return on an average investment in the private sector, and it is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in

¹³ 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.

the private sector. A 7-percent rate is consistent with an opportunity cost¹⁴ of capital concept to reflect the time value of resources directed to meet regulatory requirements.

4.2.5 Benefit/Cost Inflaters

The staff estimated the analysis inputs for some attributes based on the values published in NUREG/BR-0184 or other sources as referenced, which are provided in prior-year dollars. To evaluate the costs and benefits consistently, these inputs are put into base-year dollars. The most common inflator is the Consumer Price Index for All Urban Consumers (CPI-U), developed by the U.S. Department of Labor, Bureau of Labor Statistics (BLS). Using the CPI-U, the prior-year dollars are converted to 2017 dollars. The formula to determine the amount in 2017 dollars is as follows:

$$\frac{CPI - U_{2017}}{CPI - U_{Base Year}} \times Value_{Base Year} = Value_{2017}$$

Table 3 summarizes the values of CPI-U used in this regulatory analysis.

Table 3 CPI-U Inflator

Base Year	CPI-U Annual Average	Forecast/Actual Percent Change from Previous Year
2016	240.007	
2017	243.035	1.0126%

Source: BLS Statistics, "Databases, Tables & Calculators by Subject: CPI Inflation Calculator."

Note: 2017 CPI-U and forecast percent change are based on 2016 actual percent change from 2015 to 2016.

4.2.6 Labor Rates

The NRC labor rates are determined by the calculation methodology in NUREG/CR-4627, Revision 2, "Generic Cost Estimates: Abstracts from Generic Studies for Use in Preparing Regulatory Impact Analyses," issued February 1992. This methodology considers only variable costs that are directly related to the implementation, operation, and maintenance of the analyzed activity. Currently, the NRC hourly labor rate is \$129 based on actual fiscal year 2016 incomes, fringe benefits, and other indirect expenses.¹⁵

The staff used the 2016 Occupational Employment and Wages data, which provide labor categories and the mean hourly wage rate by job type, and the inflator discussed above to estimate licensee labor rates in 2017 dollars. The labor rates used in the analysis reflect total

¹⁴ "Opportunity cost" represents what is foregone by undertaking a given action. If the licensee personnel were not engaged in revising procedures, 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.

¹⁵ 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 appropriately designed for full-cost recovery of the services rendered and, as such, include no incremental costs (e.g., overhead, administrative, and logistical support costs).

hourly compensation, which includes wages and nonwage benefits (using a burden factor of 2.4, applicable for contract labor and conservative for regular utility employees). The staff used the BLS data tables to select appropriate hourly labor rates for performing the estimated procedural, licensing, and utility-related work necessary during and following implementation of the proposed alternative. In establishing this labor rate, the staff considered wages paid for the individuals performing the work plus the associated fringe benefit component of labor cost (i.e., the time for plant management over and above those directly expensed) as incremental expenses and included them in the rate. Table 4 summarizes the BLS labor categories used to estimate industry labor costs to implement this draft rule and lists the industry labor rates used in the uncertainty analysis discussed in Section 5.10.

Table 4 Labor Rate Estimates by Industry Sector and Labor Category

Labor Category	Mean Wage Rate (2016 dollars) (A)	Loaded Wage Factor (B)	CPI-U Inflation (C)	Burdened Hourly Mean Wage (2016 dollars) (D = A x B x C)	Reference
Industry					
Financial Analysts	\$46.94	2.4	1.013	\$114.08	https://www.bls.gov/oes/current/oes132051.htm
Lawyers	\$67.25			\$163.44	https://www.bls.gov/oes/current/oes231011.htm
Executives	\$93.44			\$227.09	https://www.bls.gov/oes/current/oes111011.htm#(5)
Licensing Engineers	\$69.17			\$168.10	https://www.bls.gov/oes/current/oes119041.htm
Licensing Managers	\$58.70			\$142.66	https://www.bls.gov/oes/current/oes111021.htm
State					
Office of the State Attorney General ^a	\$44.87	2.4	1.013	\$109.05	https://data.bls.gov/oes/#/indOcc/Multiple%20occupations%20for%20one%20industry
General Public					
General Public ^b	\$23.86	1.0	1.013	\$24.16	Downloadable file from https://www.bls.gov/oes/current/oes_nat.htm
NRC					
NRC				\$129.00	Calculated from 2016 NRC payroll and benefits information

^a BLS data for State Government, excluding schools and hospitals (OES designation) from May 2016 database.

^b BLS May 2016 data for all occupations available in the downloadable XLS file from https://www.bls.gov/oes/current/oes_nat.htm used as a proxy for the value of the opportunity cost for the review and comment of the proposed rule by the general public.

4.2.7 Sign Conventions

The sign conventions used in this analysis are that 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)).

4.2.8 Analysis Horizon

The staff will estimate costs and benefits following the publication of the proposed rule for public comment in 2018. The staff assumes that, pending Commission review and approval, the final rule and associated guidance will be issued in 2019. To define the analysis horizon covered by this draft regulatory analysis (i.e., the period over which costs and benefits would be incurred), the staff used a 10-year analysis period, beginning in 2018 with the development of the final rule

and continuing through 2028, which provides a reasonable period for assessing FQ impacts on new applicants, license renewals, and license transfers.

4.2.9 Cost Estimation

To estimate the costs associated with Alternative 2, the staff used a work breakdown approach to deconstruct each requirement down to its mandated activities. For each required activity, the staff further subdivided the work across labor occupations (i.e., financial analysts, lawyers, executives, licensing engineers, and licensing managers). The staff estimated the required level of effort (LOE) for each required activity and used a blended labor rate to develop bottom-up cost estimates.

The staff gathered data from several sources and consulted FQ working group members to develop levels of effort and unit cost estimates. The staff applied several cost estimation methods in this analysis and used its collective professional knowledge and judgment to estimate many of the costs and benefits. Additionally, the staff used a buildup method, solicitation of licensee input, and extrapolation techniques to estimate costs and benefits.

The staff consulted subject matter experts within and outside the agency to develop most of the LOE estimates used in the analysis. For example, to estimate license applicants' costs and averted costs (benefits) related to the FQ requirements in the proposed rule, the staff published the draft regulatory basis and draft regulatory analysis for public comment on the associated LOE. The staff contributed to the estimate of LOE for review-related activities.

The staff extrapolated to estimate some cost activities, relying on actual past or current costs to estimate the future cost of similar activities. For example, to calculate the estimated averted costs of alternative requests and the costs for preparation of the draft rule and accompanying regulatory guidance, the staff used data from past projects to determine the labor categories of the personnel who would perform the work and estimated the time required under each category to complete the work. If data were not available, the staff estimated the LOE based on similar steps in the process for which data were available.

To evaluate the effect of uncertainty in the model, the staff used Monte Carlo simulation, which is an approach to uncertainty analysis in which input variables are expressed as distributions. Thousands of simulations were run with values chosen at random from the distributions of the input variables provided in Appendix A. The result was a distribution of values for the output variable of interest. Monte Carlo simulation also enables users to determine the input variables that have the greatest effect on the value of the output variable. Section 5.10 describes the Monte Carlo simulation methods in detail and presents the results.

4.3 Data

This analysis discusses the data and assumptions used in analyzing the quantifiable impacts associated with Alternative 2. The staff used data from subject matter experts, knowledge gained from past rulemakings, information gained from public comments on the regulatory basis document, and supporting regulatory analysis. The staff considered the potential differences between the new requirements and the current requirements and incorporated the proposed incremental changes into this draft regulatory analysis.

5 PRESENTATION OF RESULTS

This section provides the totals both quantitatively and qualitatively for Alternative 2 compared 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 proposed alternative has a favorable or adverse effect relative to the regulatory baseline (Alternative 1). Those attributes that are not easily represented in monetary values are discussed in qualitative terms. This *ex ante* cost-benefit analysis¹⁶ provides information useful in deciding whether to select an alternative, even if the analysis is based on estimates of future costs and benefits.

5.1 Industry Implementation

This attribute accounts for the projected net economic effect on the affected license applicants as a result of implementation of the proposed regulatory changes. Additional costs above the regulatory baseline are negative, and cost savings and averted costs are positive.

The current FQ requirements, also referred to in this document as the regulatory baseline, impede initial licensing for merchant plant applicants. For the regulatory baseline, industry implementation costs consist of the submittal of FQ paperwork and the submittal of an exemption request.

The staff proposes to amend the current FQ requirements of “reasonable assurance” under 10 CFR Part 50 to conform to the 10 CFR Part 70 review standard of “appears to be financially qualified.” The rulemaking alternative would require the applicant to submit a plan describing how it will finance the construction and operation of the facility. The AFCP submittals describing how the applicant will finance construction and operation of the facility would reduce the incremental costs to industry when compared to the regulatory baseline.

The rulemaking would provide a process for the NRC to issue initial licenses with conditions to applicants that have 50 percent or less funding identified at the outset of the license application review. As a result, the additional requirements under the regulatory baseline become an averted cost because most merchant applicants will be able to meet the proposed requirements and will no longer need to file for an exemption.

Electric utility applicants would benefit from the rulemaking because their application would need only demonstrate financial capacity, providing the applicant with increased flexibility and options for when and what financing strategies to execute. The consideration of costs in this regulatory analysis does not consider the savings to electric utility applicants for a CP or COL because, as discussed in section 4.2, the NRC staff is not aware of any potential utility applicants for the timeframe considered in this analysis.

The rule would result in industry implementation costs associated with reviewing the proposed rule requirements and potentially providing comments, which will be resolved during the final rule phase. If the rule is promulgated, industry would review the rule requirements to confirm its understanding of the revised FQ requirements. The staff assumes that each entity identified in Section 4.2.2 would review the final rule and make limited updates to procedures, programs, or

¹⁶ An “*ex ante* cost-benefit analysis” is prepared before a policy, program, or alternative is in place and can assist in deciding whether resources should be allocated to that alternative.

plans to reflect the change in rule requirements. One-time industry implementation costs are assumed to begin in 2019, the year that the rule is expected to become effective.

Table 5 details the incremental industry implementation costs, which account for the change in the FQ submittal requirements and the elimination of the exemption request. The total incremental costs of implementation represent averted costs of \$899,905 using a 7-percent discount rate and \$1,128,001 using a 3-percent discount rate.

Table 5 Industry Implementation Costs

Industry Development Costs

Year	Activity	Weighted Hourly Rate	Hours	No. of Entities	Incremental Cost (2017 dollars)		
					Undiscounted	7% NPV	3% NPV
2017	Review proposed rule and guidance	\$135	18.5	19	(\$48,269)	(\$48,269)	(\$48,269)
2017	Submit comments on proposed rule and guidance	\$135	31.7	6	(\$25,030)	(\$25,030)	(\$25,030)
Total Incremental Cost of Development					(\$73,299)	(\$73,299)	(\$73,299)

Industry Implementation Costs

Year	Activity	Weighted Hourly Rate	Hours	Unit Rate	Incremental Cost (2017 dollars)		
					Undiscounted	7% NPV	3% NPV
Industry Implementation Costs—Review Final FQ Rule							
2019	Review FQ final rule and make limited updates to procedures, programs, or plans to reflect rule requirements	\$135	165	10	(\$225,303)	(\$196,789)	(\$212,370)
<i>Subtotal</i>					<i>(\$225,303)</i>	<i>(\$196,789)</i>	<i>(\$212,370)</i>
Industry Implementation Costs—FQ Submittals at License Application							
2020	FQ submittal to demonstrate “reasonable assurance” (averted)	\$135	3,582	2	\$1,044,773	\$852,846	\$956,115
2020	FQ submittal for “appears to be financially qualified”	\$135	1,495	2	(\$435,905)	(\$355,828)	(\$398,915)
2025	FQ submittal to demonstrate “reasonable assurance” (averted)	\$135	3,582	3	\$1,205,507	\$701,616	\$951,639
2025	FQ submittal for “appears to be financially qualified”	\$135	1,495	3	(\$502,967)	(\$292,732)	(\$397,047)
<i>Subtotal</i>					<i>\$1,311,408</i>	<i>\$905,902</i>	<i>\$1,111,792</i>
Industry Implementation Costs—Exemption Requests (averted)							
2020	Exemption request submittal (averted)	\$135	526	2	\$153,450	\$125,261	\$140,428
2025	Exemption request submittal (averted)	\$135	526	3	\$177,060	\$103,049	\$139,771
<i>Subtotal</i>					<i>\$330,508</i>	<i>\$228,310</i>	<i>\$280,199</i>
Industry Implementation Costs—Financial Plan Submittal at Beginning of Construction							
2023	AFCP submittal at time of application	\$135	106	2	(\$30,891)	(\$20,584)	(\$25,871)
2028	AFCP submittal at time of application	\$135	106	3	(\$35,643.80)	(\$16,934)	(\$25,750)
<i>Subtotal</i>					<i>(\$66,535)</i>	<i>(\$37,518)</i>	<i>(\$51,621)</i>
Total Incremental Cost of Implementation					\$1,350,077	\$899,905	\$1,128,001

Table 6 summarizes the total industry costs broken down between development, implementation, and operation costs for the requirements under Alternative 2. These total industry costs represent averted costs of \$826,607 using a 7-percent discount rate and \$1,054,702 using a 3-percent discount rate.

Table 6 Total Industry Costs

Attribute	Industry Costs		
	Undiscounted	7% NPV	3% NPV
Industry Development Costs	(\$73,299)	(\$73,299)	(\$73,299)
Industry Implementation Costs	\$1,350,077	\$899,905	\$1,128,001
Industry Operation Costs	\$0	\$0	\$0
Total Industry Cost	\$1,276,778	\$826,607	\$1,054,702

5.2 NRC Implementation

The current threshold for FQ, also referred to as the regulatory baseline in this document, impedes initial licensing for merchant plant applicants. Therefore, for the regulatory baseline, NRC implementation costs consist of the approval of FQ paperwork and the approval of exemption requests and the issuance of orders.

The proposed rule would permit the NRC to issue licenses with conditions to applicants that have 50 percent or less funding identified at the outset of the license application review. As a result, the NRC's costs to issue orders and exemption requests become averted costs.

The NRC development costs to complete the rulemaking include the final rule, a final regulatory guide, and other guidance changes. Proposed rulemaking costs are considered sunk costs at this stage of the rulemaking process. For the purpose of this analysis, the staff estimates 1,224 staff hours to prepare the final Regulatory Guide (RG)-9004; 1,855 staff hours to make final revisions to NUREG-1537 and NUREG-1577; and 290 staff hours to revise final NRC procedures. The staff estimates that 2,136 hours would be required to resolve public comments and to revise and issue the final rule package. This results in an estimate ranging from (\$646,710) using a 7-percent NPV to (\$681,532) using a 3-percent NPV, as shown in Table 7 for NRC rulemaking development costs.

Table 7 NRC Rulemaking Development Costs

	Activity	Number of Actions	Hours	Weighted Hourly Rate	Cost		
					Undiscounted	7% NPV	3% NPV
2018	Prepare final regulatory guide	1	1,224	\$129	(\$157,887)	(\$147,558)	(\$153,288)
2018	Prepare final NUREG	1	1,855	\$129	(\$239,285)	(\$223,631)	(\$232,316)
2018	Prepare final NRC procedures	1	290	\$129	(\$37,346)	(\$34,903)	(\$36,258)
2019	Finalize and publish final rule package	1	2,136	\$129	(\$275,484)	(\$240,618)	(\$259,670)
Total:					(\$710,002)	(\$646,710)	(\$681,532)

For Alternative 2, the NRC would incur further implementation costs for imposing license conditions and ministerial confirmation that the license conditions have been met before the licensee begins construction. These incremental costs are offset by the reduced burden of performing a less rigorous FQ review at the time of license application and eliminating exemption requests to the current FQ requirements. Table 8 summarizes these NRC implementation costs. These total NRC implementation costs represent averted costs of \$587,113 using a 7-percent discount rate and \$720,550 using a 3-percent discount rate.

Table 8 NRC Implementation Costs

Year	Activity	Number of Actions	Hours	Weighted Hourly rate	Cost		
					Undiscounted	7% NPV	3% NPV
Averted NRC Implementation Costs - Reasonable Assurance FQ reviews at License Application							
2020	Averted FQ submittal review to the reasonable assurance standard	2	1400	\$129	\$391,209	\$319,343	\$358,012
2025		3	1400	\$129	\$451,395	\$262,716	\$356,336
2020	Averted FQ exemption request review	2	350	\$129	\$97,930	\$79,940	\$89,620
2025		3	350	\$129	\$112,996	\$65,765	\$89,200
2020	Averted cost to prepare and issue a FQ license condition	2	97	\$129	\$26,972	\$22,017	\$24,683
2025		3	97	\$129	\$31,122	\$18,113	\$24,568
<i>Subtotal</i>					<i>\$1,111,624</i>	<i>\$767,895</i>	<i>\$942,418</i>
NRC Implementation Costs for appears to be qualified FQ reviews at License Application							
2020	FQ submittal review to appears to be qualified standard	2	338	\$129	(\$94,533)	(\$77,167)	(\$86,511)
2025		3	338	\$129	(\$109,077)	(\$63,484)	(\$86,106)
2020	Cost to prepare and issue a FQ license condition if less than 50% funded	2	97	\$129	(\$26,972)	(\$22,017)	(\$24,683)
2025		3	97	\$129	(\$31,122)	(\$18,113)	(\$24,568)
<i>Subtotal</i>					<i>(\$261,704)</i>	<i>(\$180,781)</i>	<i>(\$221,869)</i>
NRC Implementation Costs - Ministerial Review of Financial Plan at Beginning of Construction							
2023	Ministerial review of AFCP submittal	2	12	129	(\$3,224)	(\$2,148)	(\$2,700)
2028	Ministerial review of AFCP submittal	3	12	129	(\$3,720)	(\$1,767)	(\$2,687)
<i>Subtotal</i>					<i>(\$6,943)</i>	<i>(\$3,915)</i>	<i>(\$5,387)</i>
NRC Implementation Costs Total:					\$849,920	\$587,113	\$720,550

Table 9 shows the total NRC costs broken down between development, implementation, and operation costs for Alternative 2. These total NRC costs represent incurred costs and are estimated to range from a cost of (\$59,597) using a 7-percent discount rate to an averted cost (benefit/savings) of \$39,018 using a 3-percent discount rate.

Table 9 Total NRC Costs

Attribute	NRC Costs		
	Undiscounted	7% NPV	3% NPV
NRC Development Costs	(\$710,002)	(\$646,710)	(\$681,532)
NRC Implementation Costs	\$849,920	\$587,113	\$720,550
NRC Operation Costs	\$0	\$0	\$0
Total NRC Cost	\$139,919	(\$59,597)	\$39,018

5.3 Total Implementation Costs

Table 10 shows the total averted costs for Alternative 2 broken down between development, implementation, and operation for industry and the NRC. These total averted costs are estimated to range from \$767,010 using a 7-percent discount rate to \$1,093,720 using a 3-percent discount rate.

Table 10 Total Implementation Costs

Attribute	Total Averted Costs (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry Development	(\$73,299)	(\$73,299)	(\$73,299)
Industry Implementation	\$1,350,077	\$899,905	\$1,128,001
Industry Operation	\$0	\$0	\$0
<i>Total Industry Cost</i>	<i>\$1,276,778</i>	<i>\$826,607</i>	<i>\$1,054,702</i>
NRC Development	(\$710,002)	(\$646,710)	(\$681,532)
NRC Implementation	\$849,920	\$587,113	\$720,550
NRC Operation	\$0	\$0	\$0
<i>Total NRC Cost</i>	<i>\$139,919</i>	<i>(\$59,597)</i>	<i>\$39,018</i>
Net Cost	\$1,416,697	\$767,010	\$1,093,720

5.4 Other Governments

According to the NRC's "Information Digest," 209 power reactor applicants submitted applications for CPs or COLs and went through the regulatory baseline FQ review. As Figure 1 shows, 100 of these applicants received an OL and 4 received COLs and were under construction as of June 2017; combined, these two categories account for about 50 percent of the total number of applicants. The rest of the applicants cancelled their projects during the CP review (25 percent) or the COL review (3 percent), cancelled their projects after beginning construction (20 percent), deferred the completion of construction (1 percent) under a CP, or deferred the start of construction under a COL (1 percent). All but two of these licensees were rate-regulated electric-utility companies operating in protected markets.¹⁷ Therefore, approximately one-third of all power reactor applicants under the NRC's current FQ regulations never operated. If the NRC lowers its review standard of licensee FQ, the number of cancelled construction projects is expected to be equivalent or more than in the past, which would place a burden on the community and government organizations in the vicinity of the uncompleted project.

¹⁷ The two merchant power reactor units were South Texas Project, Units 3 and 4, which requested and were granted under 10 CFR 52.7 a regulatory exemption to 10 CFR 50.33(f).

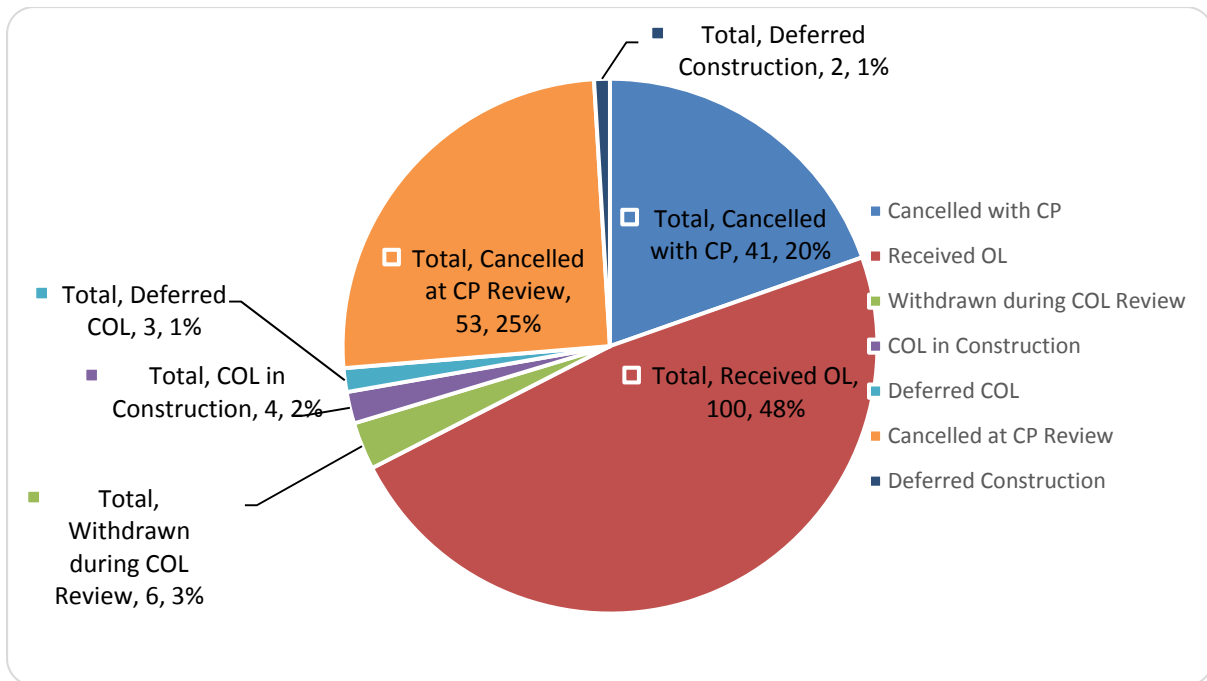


Figure 1 Completion Status of Nuclear Power Plant Licenses

State, local, and Tribal governments may create strategic plans assuming a power reactor will be built and operated for the term of its license in their communities. If power reactor construction is not completed, these plans may no longer be viable, and the governments may need to reevaluate their strategic plans and resource allocations. Reducing or removing this certainty could increase the budget risk to the State, local, and Tribal governments because they may not know how well capitalized the company is to build and operate a power reactor. Depending on local regulations and laws, the State, local, and Tribal governments may also be required to place the site back into greenfield status if the licensee stops construction or enters bankruptcy.

Alternative 2 may give these governments some certainty that the licensee has the financial ability to build and operate. This certainty would be greater than that offered by the regulatory baseline. The regulatory baseline requires 5-year pro forma cash flow analyses at the time that the licensee believes it will begin construction and operation. Alternative 2 would require the same information, but before construction and after the issuance of the license. Therefore, the analysis would be performed closer to the actual start of construction, not the predicted start of construction.

5.5 General Public

The staff's FQ review determines "whether an applicant is financially prepared to construct and operate the facility. Preparing an application that will be accepted and docketed by the staff, as well as engaging in the licensing process, in and of itself, already provides some indication of an applicant's financial capacity."¹⁸ With merchant applicants, some of the project risk is placed on

¹⁸ SECY-13-0124, "Policy Options for Merchant (Non-Electric Utility) Plant Financial Qualifications," Enclosure 4, page 2.

the business applying for the initial license.¹⁹ Historically, when electric utilities were applying for initial licenses, the State would provide rate relief (or something similar) to cover the costs of construction. Instead of every member of the electric utility's service population bearing some of the project risk, it now falls solely on the local general public near the reactor, if the applicant is a merchant. With respect to electric utilities, because the general public (i.e., the ratepayers) cover the costs, electric utility licensees place all project risk on the ratepayers. However, in either case, when a licensee or applicant does not finish the project, the general public would likely have to assume the cost of returning the site to greenfield status.²⁰ Alternative 2 would allow the NRC and the general public to know how well capitalized the licensee is before construction begins. The analysis will be performed closer to the actual start of construction, not the predicted start, as required under the regulatory baseline.

The staff notes that market factors have a great, if not greater, impact on whether a reactor will complete construction and begin operation than do the FQ requirements.

5.6 Regulatory Efficiency

Alternative 2 would require a less involved financial data collection and staff FQ review process compared to the current FQ regulations (at initial licensing or license transfer and then before construction as applicable to verify that license conditions have been met, as opposed to only at initial licensing or license transfer). Compared to the regulatory baseline, Alternative 2 is more efficient because it eliminates some regulatory burden and the current licensing impediment for merchant plant applicants and NPUF applicants as shown in the quantitative estimates.

5.7 Environmental Considerations

Section 102 of NEPA requires Federal agencies to consider environmental impacts in carrying out their missions. The NRC regulations to implement NEPA are in 10 CFR Part 51. When licensing new power reactors, the NRC publishes environmental impact statements (EISs) that analyze the environmental impacts of building and operating a nuclear power plant. Benefits discussed in EISs are typically related to jobs created, income earned, tax revenues, and electricity creation along with its many beneficial indirect impacts. Costs discussed in EISs typically center on the affected environment near the plant such as wetlands, water impacts, and terrestrial and aquatic ecosystems. All EISs published for early site permits and COLs since the promulgation of 10 CFR Part 52 in 1989 have deemed the new nuclear power plant to have more environmental benefits than environmental costs. Therefore, revising the requirements may allow more plants to be licensed, which would allow their potential benefits to be realized compared to having no plants licensed.

¹⁹ However, companies typically do as much as possible to limit their market risk. Parent firms have been known to divest a failing subsidiary, leaving regulators without recourse for reimbursement (Ringleb and Wiggins, 1990).

²⁰ Decommissioning, as defined under 10 CFR 50.2, requires licensees to return the site to a point where residual radioactivity is low enough to terminate the license. Therefore, certain systems and structures with no radioactivity may still be at the site when the license is terminated (e.g., cooling towers, switchyard). Any other work done at the site is deemed site restoration (i.e., greenfield restoration), which is under the jurisdiction of other government entities.

5.8 Other Considerations—Judgment-Proof Strategies

Judgment-proof strategies are techniques used to limit financial risk. These strategies allow entities to limit their liability through contractual arrangements with nearly insolvent firms. However, the use of judgment-proof firms triggers countervailing effects: it provides opportunities to externalize liability, but the insolvency of these firms can generate more liability costs.²¹ For Alternative 2, the licensee would be required to meet applicable license conditions before construction, as previously discussed.

The staff notes that market factors have an impact as great, if not greater, than the impact of the FQ requirements on the chance that a reactor will complete construction and begin operations.

5.9 Attributes Not Affected

The following attributes are not affected by this alternative: (1) public health (accident), (2) public health (routine), (3) occupational health (accident), (4) occupational health (routine), (5) offsite property, (6) onsite property, (7) improvements in knowledge, and (8) safeguards and security considerations.

5.10 Uncertainty Analysis

The staff completed a Monte Carlo sensitivity analysis for this draft regulatory analysis using the @Risk software package by Palisade Corporation.²² The Monte Carlo approach answers the question, “What distribution of net benefits results from multiple draws of the probability distribution assigned to key variables?”

5.10.1 Uncertainty Analysis Assumptions

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

The probability distributions chosen to represent the different variables in the analysis were bounded by the range of referenced input, historical data, and the staff’s professional judgment. When defining the probability distributions for use in the Monte Carlo simulation, summary statistics are needed to characterize the distributions. These summary statistics include the minimum, most likely, and maximum values of a program evaluation and review technique

²¹ Many economists and legal scholars have addressed problems stemming from the practice of using judgment-proof entities to externalize costs (Barney et al., 1992; Rebitzer, 1995; and Ringleb and Wiggins, 1990).

²² Information about this software is available on line at www.palisade.com.

(PERT) distribution,²³ the minimum and maximum values of a Rayleigh-alt distribution that allows the specification of the percentile of the minimum and maximum values and the specified integer values of a discrete population. The staff used these distribution functions to reflect the relative spread and skewness defined by the estimates.

Appendix A identifies the data elements, the distribution function and summary statistics, and the mean value of the distribution used in the uncertainty analysis.

5.10.2 Uncertainty Analysis Results

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

For the analysis shown in each figure below, 10,000 simulations were run in which the key variables were changed to assess the resulting effect on costs and benefits. Figures 2, 3, and 4 display the histograms of the incremental costs and benefits from the regulatory baseline (Alternative 1). The analysis shows that industry would benefit and the NRC would incur costs if this rule is issued.

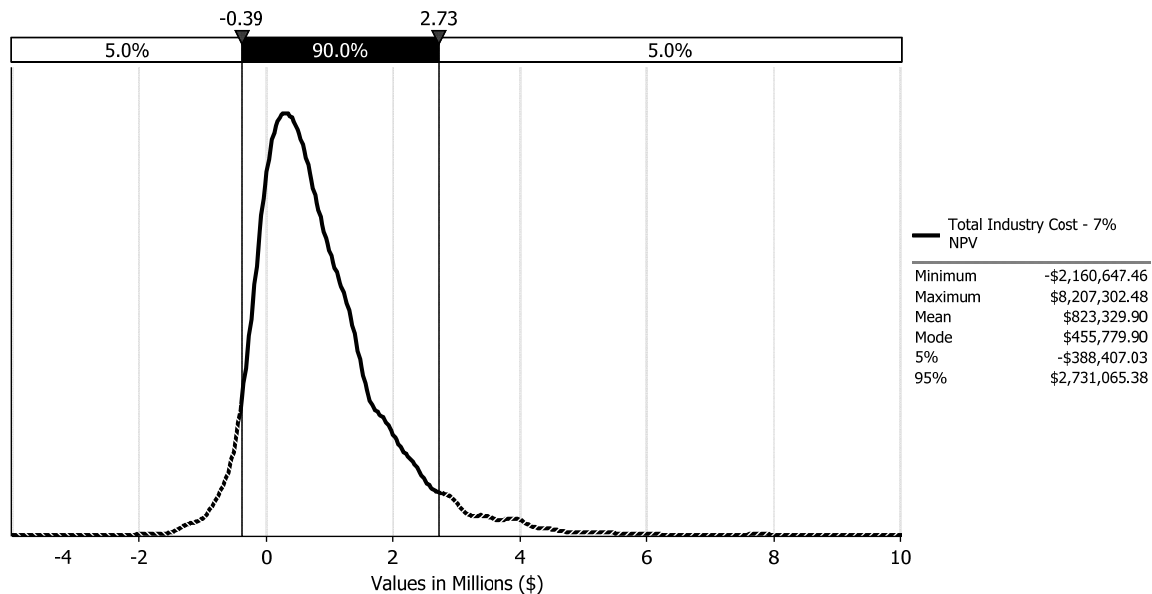


Figure 2 Total Industry Costs (7% NPV)—Alternative 2

²³ 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, as 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 it is desired to capture tail or extreme events.

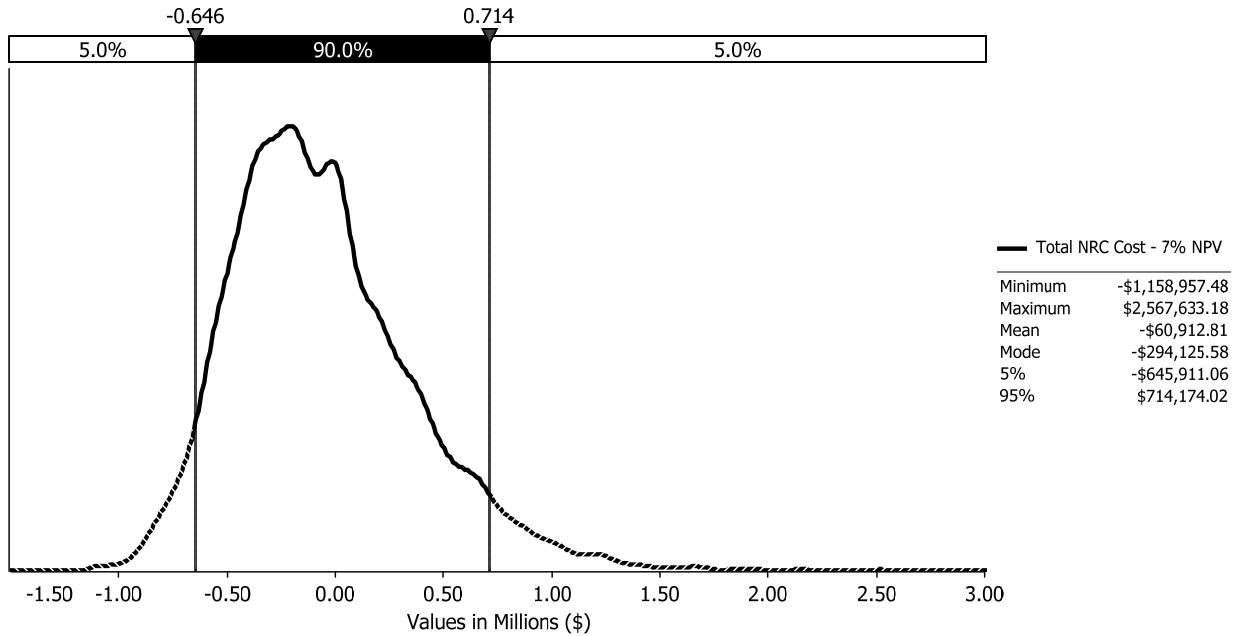


Figure 3 Total NRC Costs (7% NPV)—Alternative 2

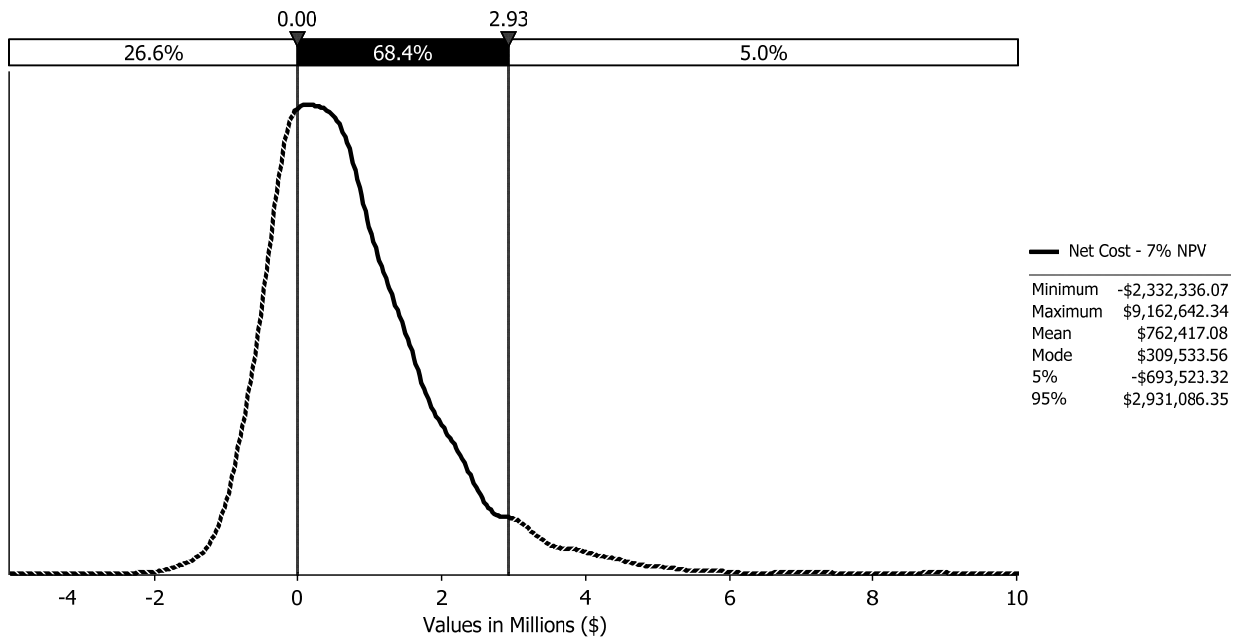


Figure 4 Total Costs (7% NPV)—Alternative 2

Table 11 presents descriptive statistics on the uncertainty analysis. The 5-percent and 95-percent values (i.e., the bands marked 5.0 percent on either side of the 90-percent confidence interval) that appear as numerical values on the top of the vertical lines in Figures 2 and 3 appear in Table 11 as the 0.05 and 0.95 values, respectively.

Table 11 Descriptive Statistics on the Uncertainty Results (7-Percent NPV)

Uncertainty Result	Incremental Cost-Benefit (2017 million dollars)				
	Min	Mean	Max	0.05	0.95
Total Industry Cost	(\$2.16)	\$0.82	\$8.21	(\$0.39)	\$2.73
Total NRC Cost	(\$1.16)	(\$0.06)	\$2.57	(\$0.65)	\$0.71
Net Cost	(\$2.33)	\$0.76	\$9.16	(\$0.69)	\$2.93

By examining the range of the resulting output distributions in Table 11, it is possible to more confidently discuss the potential incremental costs and benefits of the draft proposed rule. This table displays the key statistical results, including the 90-percent confidence interval in which the net benefits would fall between the 5-percent and 95-percent percentile values. Furthermore, Figure 4 shows that there is a 73-percent likelihood (i.e., $1 - 0.266$) that the proposed rule is cost beneficial.

Figure 5 shows a tornado diagram that identifies the key variables with uncertainty that drives the largest impact on total costs (and averted costs) for this proposed rulemaking. This figure ranks the variables based on their contribution to cost uncertainty. The key variables driving the uncertainty in costs are the industry costs to submit FQ information based on the current regulations versus the proposed “reasonable assurance” standard (i.e., the first and fourth variables), the number of FQ submittals that industry will prepare and the staff will review (i.e., the second and third variables), and the NRC’s costs to review and approve the FQ submittals. The remaining key variables show diminishing variation.

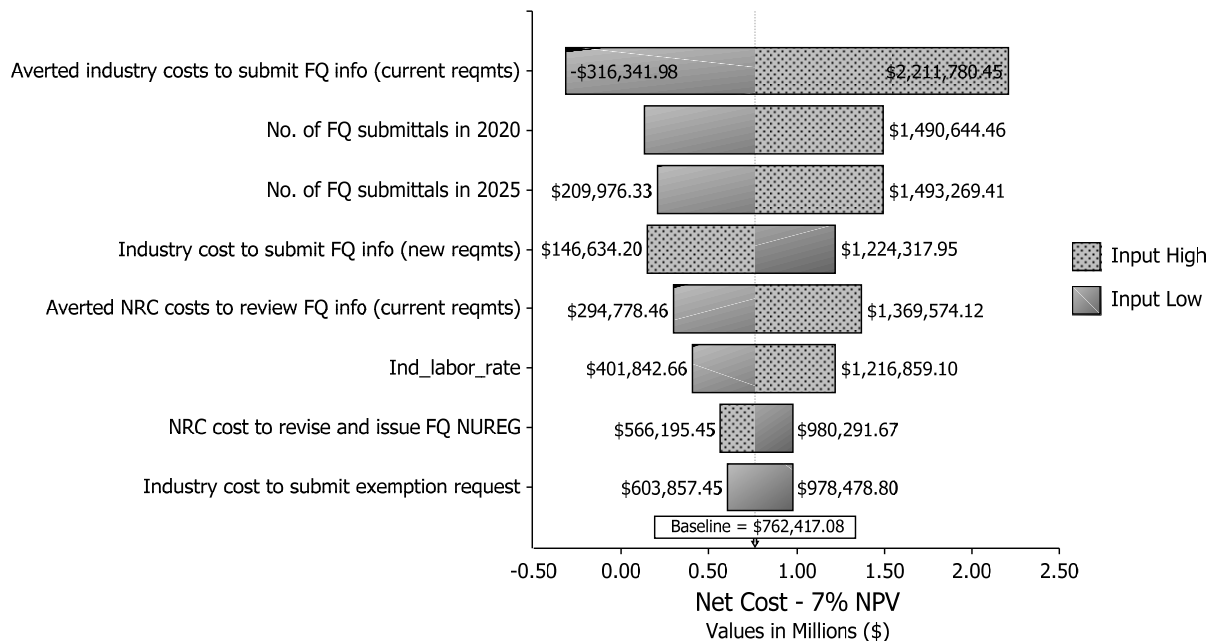


Figure 5 Top Eight Variables for Which Uncertainty Drives the Largest Impact on Total Costs (7-Percent NPV)—Alternative 2

5.10.3 Summary of Uncertainty Analysis

The simulation analysis shows that the estimated mean benefit for this proposed rule is \$762,000 with 90-percent confidence that the benefit is between (\$0.69 million) and \$2.93 million using a 7-percent discount rate and with a 73-percent likelihood that the proposed rule is cost beneficial. A reasonable inference from the uncertainty analysis is that proceeding with the proposed rule represents an efficient use of resources and averted costs to the NRC and the industry. Considered separately, the rule is deemed cost beneficial to industry with a mean NPV averted cost of \$823,000 using a 7-percent discount rate and with an 83-percent likelihood that the industry would experience burden reduction. Because of the immediate rulemaking costs and the lag in recognizing projected benefits within the next 10 years, the rule is cost neutral to the NRC with an NPV cost of (\$61,000) using a 7-percent discount rate and a 61-percent likelihood of experiencing a net cost.

5.11 Disaggregation

The proposed rule seeks to amend the current FQ requirements of “reasonable assurance” under 10 CFR Part 50 to conform to the 10 CFR Part 70 review standard of “appears to be financially qualified” and to remove Appendix C to 10 CFR Part 50. In SRM-SECY-13-0124, the Commission approved the staff recommendation to engage in a rulemaking and directed the staff to develop a standard of review for FQ during initial licensing of nuclear power reactors and NPUFs that is not below the FQ standard in 10 CFR 70.23 for applicants to have and maintain special nuclear material. The Commission also directed that the rulemaking reflect both initial licensing and license transfers. The proposed changes would not affect the NRC’s decommissioning funding requirements. This analysis presents the costs and benefits of implementing this change. This proposed rule change would affect entities at initial licensing, at the time of application, at the time before construction, and at the time of license renewal.

The staff is aware of 12 entities, as discussed in Section 4.2.2 above, that currently have plans that the proposed rule would affect.

5.12 Summary

This regulatory analysis identifies both quantifiable and nonquantifiable costs and benefits that would result from incorporating the proposed FQ requirements into the *Code of Federal Regulations*. Although quantifiable costs and benefits appear to be more tangible, the staff urges decisionmakers not to discount costs and benefits that cannot be quantified. Such costs or benefits can be just as important as or even more important than costs or benefits that can be quantified and monetized.

5.12.1 Quantified Net Benefit

As shown in Table 10, the estimated quantified incremental averted costs for Alternative 2 compared to the regulatory baseline (Alternative 1) is \$767,000 (7-percent NPV) and \$1.09 million (3-percent NPV). The average net incurred costs estimated for each entity affected by this rule range from approximately \$177,000 (7-percent NPV) to \$226,000 (3-percent NPV) in averted costs. Additionally, Table 10 shows that Alternative 2 would be cost beneficial for the industry but cost neutral to the NRC when they are considered separately using a 7-percent discount rate.

5.12.2 Nonquantified Benefits

In addition to the quantified costs discussed in this draft regulatory analysis, the attributes of other governments, general public, environmental considerations, and other considerations would produce a number of nonquantified costs and benefits for the industry and the NRC, which are discussed below and summarized in Table 12. Alternative 2 has a net qualitative benefit, mostly because of the alleviation of some of the risk that may fall to local, State, and Tribal governments and the general public. Alternative 2 also realizes benefits from environmental considerations.

Table 12 Summary of Qualitative Costs and Benefits

Qualitative Attribute	Discussion of Qualitative Costs	Discussion of Qualitative Benefits	Net Benefit
Other Governments	Revising the FQ requirement may result in an equivalent or larger number of cancelled construction projects than under the current rule, which would place a burden on the community and government organizations in the vicinity of the uncompleted project.	Ministerial inspections just before construction would provide some certainty to State, local, and Tribal governments about the financial health of the licensee. This certainty would be greater than under the status quo.	No change to slight benefit
General Public	Revising the FQ requirement may result in applicants that are not adequately capitalized receiving a CP or a COL. If the licensee or CP holder starts but does not finish the project, the local community could be adversely impacted (i.e., loss of jobs, reduced property values).	Ministerial inspections just before construction would provide some certainty to the general public about the financial health of the licensee. This certainty would be greater than under the status quo.	Benefit
Regulatory Efficiency	None	Financial data collection and the staff FQ review process would be less involved than under the current FQ regulations (at initial licensing and then before construction, as opposed to only at initial licensing).	Benefit
Other Considerations	None	More would be known about the potential use of judgment-proof strategies to risk compared to under the status quo.	Benefit

Qualitative Attribute	Discussion of Qualitative Costs	Discussion of Qualitative Benefits	Net Benefit
Net Qualitative Benefit (Cost)	None	Having ministerial confirmation that license conditions have been met before the start of construction represents a net qualitative benefit and benefits to State, local, and Tribal governments and the general public.	Benefit

5.12.3 Nonquantified Costs

Table 12 also summarizes the qualitative costs. As discussed in the table, for Alternative 2, revising the FQ requirement may result in an increase in (1) cancelled construction projects, which would place a burden on the surrounding community and government, and (2) risk to tax- and rate-payers near the site.

6 DECISION RATIONALE FOR SELECTION OF PROPOSED ACTION

Table 13 shows that the rationale for selecting Alternative 2 is based on quantitative and qualitative factors. Specifically, the costs of the rule are given quantitatively and qualitatively, and the benefits are provided only qualitatively.

Table 13 Summary of Totals

Net Quantified Benefits or (Costs)	Net Nonquantified Benefits or (Costs)
Alternative 1: No Action \$0	None
Alternative 2: Conform Nuclear Power Reactor FQ Requirements to 10 CFR Part 70 Standards Industry: (all provisions) \$826,607 using a 7% discount rate \$1,054,702 using a 3% discount rate NRC: (all provisions) (\$59,597) using a 7% discount rate \$39,018 using a 3% discount rate Net Benefit (Cost): (all provisions) \$767,010 using a 7% discount rate \$1,093,720 using a 3% discount rate	Benefits: <ul style="list-style-type: none"> • <u>Other Governments</u>: Ministerial inspections just before construction would provide some certainty to State, local, and Tribal governments about the financial health of the licensee. This certainty would be greater than under the regulatory baseline. • <u>General Public</u>: Ministerial inspections just before construction would provide some certainty to State, local, and Tribal governments about the financial health of the licensee. This certainty would be greater than under the regulatory baseline. • <u>Regulatory Efficiency</u>: The financial data collection and staff FQ review process

Net Quantified Benefits or (Costs)	Net Nonquantified Benefits or (Costs)
	<p>would be less detailed compared to the current FQ regulations (at initial licensing and ministerial review confirming that license conditions have been met before construction, as opposed to only at initial licensing).</p> <ul style="list-style-type: none"> • <u>Environmental Considerations</u>: Licensing a nuclear power plant has associated environmental benefits, such as jobs created, income earned, tax revenues, and electricity creation and its many beneficial indirect impacts. • <u>Other Considerations</u>: More would be known about the potential use of judgment-proof strategies to risk than under the regulatory baseline.

In general, Alternative 2 is considered to be a cost-beneficial alternative compared to the regulatory baseline (Alternative 1), as the qualitative benefits outweigh the quantitative and qualitative costs.

7 IMPLEMENTATION SCHEDULE

The final version of this proposed rule, if approved by the Commission, would become effective 30 days after its publication in the *Federal Register*.

8 REFERENCES

Atomic Energy Act of 1954, as amended, § 182a, 42 United States Code (U.S.C.) 2011 et seq.

Barney, Jay B., Frances L. Edwards, and A.H. Ringleb, "Organizational Responses to Legal Liability: Employee Exposure to Hazardous Materials, Vertical Integration, and Small Firm Production," *Academy of Management Journal*, 35:2, 328–349, June 1, 1992.

Capitol Airways, Inc., v. Civil Aeronautics Bd., 292 F. 2d 755, 758 (D.C. Cir., 1961).

Code of Federal Regulations (CFR). Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities." Available at <http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/>.

CFR, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." Available at <https://www.nrc.gov/reading-rm/doc-collections/cfr/part051/>.

CFR, Title 10, *Energy*, Part 70, “Domestic Licensing of Special Nuclear Material.” Available at <https://www.nrc.gov/reading-rm/doc-collections/cfr/part070/>.

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

Delta Airlines v. United States, 490 F. Supp. 907, 912–13 (N.D. Ga., 1980).

Hydro Resources, Inc. (Albuquerque, New Mexico), CLI-00-08, 51 NRC 227.

Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 1), CLI-80-16, 11 NRC 674, 1980.

National Environmental Policy Act (NEPA) of 1969, as amended, 42 U.S.C. 4321 et seq.

Nuclear Energy Institute, letter from E. Ginsberg to Dr. Allison M. Macfarlane, Chairman, NRC, November 13, 2012. Agencywide Documents Access and Management System (ADAMS) Accession No. ML12334A187.

Nuclear Innovation North America, LLC (NINA), letter from Mark A. to R. William Borchardt, U.S. Nuclear Regulatory Commission, May 31, 2012. ADAMS Accession No. ML12158A229.

Office of the President, “Executive Order 13563: Improving Regulation and Regulatory Review,” *Federal Register*, January 18, 2011 (76 FR 3821). Available at <https://obamawhitehouse.archives.gov/the-press-office/2011/01/18/executive-order-13563-improving-regulation-and-regulatory-review>.

Private Fuel Storage, LLC, CLI-00-13, 52 NRC 23, 34, 2000.

Rebitzer, James B., “Job Safety and Contract Workers in the Petrochemical Industry,” *Industrial Relations: A Journal of Economy and Society*, Volume 34, Issue 1, 40–57, January 1995.

Ringleb, A.H., and S.N. Wiggins, “Liability and Large-Scale, Long-Term hazards,” *Journal of Political Economy*, 98, 574–595, 1990.

SHINE Medical Technologies, Inc., Construction Permit No. CPMIF-001, February 29, 2016. ADAMS Accession No. ML16041A471.

South Texas Project, Unit 3, Combined License NPF-097, February 12, 2016. ADAMS Accession No. ML16033A020.

South Texas Project, Unit 4, Combined License NPF-098, February 12, 2016. ADAMS Accession No. ML16033A047.

U.S. Department of Labor (DOL), Bureau of Labor Statistics, “Databases, Tables & Calculators by Subject: CPI Inflation Calculator,” 2017. Accessed at <http://www.bls.gov>. Last accessed June 19, 2017.

U.S. Nuclear Regulatory Commission (NRC), “Financial Qualifications for Reactor Licensing,” *Federal Register*, Vol. 80, June 17, 2015, p. 34559.

NRC, "Generic Cost Estimates: Abstracts from Generic Studies for Use in Preparing Regulatory Impact Analyses," NUREG/CR-4627, Rev. 2, February 1992. ADAMS Accession No. ML13137A259.

NRC, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," NUREG-1537, Parts 1 and 2, February 1996.

NRC, "Regulatory Analysis Technical Evaluation Handbook," NUREG/BR-0184, January 1997. ADAMS Accession No. ML050190193.

NRC, "Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance," NUREG-1577, Rev. 1, February 1999.

NRC, "Policy Options for Merchant (Non-Electric Utility) Plant Financial Qualifications," SECY-13-0124, November 22, 2013, 2013a. ADAMS Accession No. ML13057A006.

NRC, "Public Meeting on Financial Qualifications for Merchant Plant Combined License Applicants," Public Meeting Transcript, January 8, 2013, 2013b. ADAMS Accession No. ML13022A446.

NRC, "Policy Options for Merchant (Non-Electric Utility) Plant Financial Qualifications," Staff Requirements Memorandum (SRM) to SECY-13-0124, April 24, 2014. ADAMS Accession No. ML14114A358.

NRC, "Information Digest, 2016–2017," NUREG-1350, Vol. 28, September 2016, 2016a. ADAMS Accession No. ML16243A018.

NRC, "Financial Qualifications for Reactor Licensing Rulemaking," Regulatory Basis Document, October 2016, 2016b. ADAMS Accession No. ML15322A185.

NRC, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," Draft NUREG/BR-0058, Rev. 5, April 2017. ADAMS Accession No. ML17101A355.

U.S. Office of Management of the Budget (OMB), "Regulatory Analysis," Circular A-4, September 17, 2003.

OMB, "Regulation and Independent Regulatory Agencies," Executive Order 13579, July 11, 2011 (76 FR 41587).

APPENDIX A—MAJOR ASSUMPTIONS AND INPUT DATA

Activity	Mean estimate	Distribution	Low estimate	Best estimate	High estimate
General Assumptions					
Seed for Monte Carlo simulation	1,234				
Base year	2017				
Discount rate	7%				
Alternative discount rate	3%				
Industry labor rate multiplier	2.4				
CPI inflator from 2016\$ to 2017\$	1.0126				
Years that licenses are issued with financial qualification (FQ) license conditions	2020				
	2025				
No. of FQ submittals in 2020	2	PERT	0	2	5
No. of FQ submittals in 2025	3	PERT	0	2	7
Alternative 1—Status Quo					
Industry Exemption Request Submittal Averted at License Application					
Hours to submit exemption request	526	Rayleigh-alt	240		900
No. of exemption requests in 2020	2				
No. of exemption requests in 2025	3				
NRC Issue Exemption Request Averted at License Application					
Hours to review and approve exemption request	350	Rayleigh-alt	160		480
No. of exemption request reviews in 2020	2				
No. of exemption request reviews in 2025	3				
Alternative 2—Rulemaking Alternative					
Industry Review FQ Proposed Rule during Public Comment Period					
No. of hours for industry to review proposed rule	6	Rayleigh-alt	4		8
No. of hours for industry to review draft guidance	12	Rayleigh-alt	8		16
No. of industry reviewers on proposed rule and guidance	19	Rayleigh-alt	5		30
No. of hours for industry to prepare and submit comments on proposed rule and draft guidance	47	Rayleigh-alt	12		80
No. of industry commenters on proposed rule	6	Rayleigh-alt	3		8

Activity	Mean estimate	Distribution	Low estimate	Best estimate	High estimate
Industry Review Final FQ Rule Requirements					
Number of industry applicants, combined license holders, or licensees expected to review final FQ rule	10	Rayleigh-alt	5		14
No. of hours per entity to review FQ final rule and make limited updates to procedures, programs, or plans	165	Rayleigh-alt	80		260
FQ submittal demonstrating “reasonable assurance” and NRC review					
Industry submittal demonstrating “reasonable assurance” of FQ (averted)					
No. of hours averted to submit a “reasonable assurance” FQ submittal	3,582	Rayleigh-alt	1,500		5,000
No. of FQ “reasonable assurance” submittals averted in 2020	2				
No. of FQ “reasonable assurance” submittals averted in 2025	3				
NRC FQ review to “reasonable assurance” standard (averted)					
Averted hours to review “reasonable assurance” FQ submittal and issue a safety evaluation	1,400	Rayleigh-alt	750		2,000
No. of FQ “reasonable assurance” submittal reviews averted in 2020	2				
No. of FQ “reasonable assurance” submittal reviews averted in 2025	3				
FQ submittal demonstrating “appears to be financially qualified”					
Industry submittal demonstrating “appears to be” FQ and NRC review					
No. of hours for industry applicant to prepare “appears to be qualified” FQ submittals	1,495	Rayleigh-alt	600		2,500
No. of “appears to be qualified” FQ submittals in 2020	2				
No. of “appears to be qualified” FQ submittals in 2025	3				
No. of hours for licensee to prepare and submit financing plan at beginning of construction	106	Rayleigh-alt	40		180
Time lag between receipt of license and start of construction	3	PERT-Discrete	0	2	10
NRC FQ review to “appears to be” FQ standard					
No. of hours for the NRC to review “appears to be qualified” FQ submittal	338	Rayleigh-alt	130		480
No. of “appears to be qualified” FQ submittal reviews in 2020	2				

Activity	Mean estimate	Distribution	Low estimate	Best estimate	High estimate
No. of "appears to be qualified" FQ submittal reviews in 2025	3				
No. of hours for the NRC to perform ministerial review to confirm license conditions have been met at the beginning of construction	12	Rayleigh-alt	4		20
New FQ Regulatory Guide					
No. of hours for the NRC to resolve public comments, finalize, and issue regulatory guide	1,224	Rayleigh-alt	600		1,600
Revise FQ NUREGs					
No. of hours for the NRC to resolve public comments, finalize, and issue revised FQ NUREGs	1,855	Rayleigh-alt	1,200		2,400
Revise NRC FQ procedures					
No. of hours for the NRC to revise FQ procedures	290	Rayleigh-alt	120		480
Final Rule					
No. of hours for the NRC to resolve public comments and finalize final rule package	2,136	Rayleigh-alt	1,200		3,000
NRC To Prepare and Issue FQ License Condition					
NRC hours to prepare and issue condition	97	Rayleigh-alt	40		160
No. of "appears to be qualified" FQ applicants issued a license condition in 2025	2				
No. of "appears to be qualified" FQ applicants issued a license condition in 2025	3				
Labor Rates (per hour)					
NRC labor rate	\$129				
Industry labor rate	\$134.6	TriGen	\$84	\$133	\$156