Draft Regulatory Analysis for Proposed Rulemaking: Incorporation by Reference of Institute of Electrical and Electronics Engineers Standard 603-2018

NRC-2024-0045; RIN 3150-AL06

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U.S. Nuclear Regulatory Commission

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ABSTRACT

This proposed rule recommends incorporation by reference, through the U.S. Nuclear Regulatory Commission (NRC) regulations at Title 10 of the *Code of Federal Regulations* 50.55a(h), of the new provisions in Institute of Electrical and Electronics Engineers Standard 603-2018, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations." These are provisions that the NRC finds acceptable without NRC-specified conditions. This document presents a regulatory analysis of the benefits and costs of the proposed rule requirements relative to the baseline case (i.e., the no-action alternative).

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ABBREVIATIONS

10 CFR	Title 10 of the *Code of Federal Regulations*
ADAMS	Agencywide Documents Access and Management System
BLS	U.S. Bureau of Labor Statistics
CCF	common-cause failures
CFR	*Code of Federal Regulations*
CRGR	Committee to Review Generic Requirements
D3	defense in depth
DG	draft guide
IEEE	Institute of Electrical and Electronics Engineers
LOE	level of effort
NAICS	North American Industry Classification System
NPV	net present value
NRC	U.S. Nuclear Regulatory Commission
NTTAA	National Technology Transfer and Advancement Act of 1995
OMB	Office of Management and Budget
PERT	program evaluation and review technique
RAI	request for additional information
RG	regulatory guide
SOC	standard occupational classification
SRM	staff requirements memorandum
Std	standard

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EXECUTIVE SUMMARY

This proposed rule recommends incorporation by reference, through the U.S. Nuclear Regulatory Commission's (NRC's) regulations at Title 10 of the *Code of Federal Regulations* 50.55a(h), of the provisions in Institute of Electrical and Electronics Engineers (IEEE) Standard 603-2018, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," without conditions. This means that the NRC is not imposing any requirements (or relaxations) in addition to what is in the standard itself. The first sentence within Clause 5.16 captures the only regulatory requirement, that the safety system design and development shall address common-cause failures (CCF) that create a potential to degrade or defeat the safety system function. Clause 5.16 contains additional language which the staff considers to be guidance rather than regulatory requirements. Licensees or applicants may use the methods described in Clause 5.16 in their overall defense-in-depth and diversity (D3) analyses. The NRC is also issuing Draft Regulatory Guide (DG) DG-1251, Revision 1, "Guidance for the Power, Instrumentation, and Control Portions of Safety Systems for Nuclear Power Plants," which provides guidance to implement the requirements for the power, instrumentation, and control portions of safety systems for nuclear power plants as specified along with the proposed rule.

This regulatory action would allow nuclear power plant licensees and applicants for construction permits, operating licenses, combined licenses, standard design certifications, standard design approvals, and manufacturing licenses to voluntarily use the provisions in the IEEE standard as alternatives to those standards currently in use.

This document examines the benefits and costs associated with the proposed rulemaking and guidance relative to the baseline case (i.e., the no-action alternative).

The NRC made the following key findings:

- Proposed Rule Analysis: The proposed rule recommended by the staff would result in a cost-justified change relative to the regulatory baseline. The quantified net costs to the industry are estimated to be ($9,000). The NRC would incur a quantified net cost of ($154,000) at a 7 percent discount rate and ($169,000) at 3 percent. In total, the net costs to the industry and the NRC would be ($163,000) at a 7 percent discount rate and ($178,000) at 3 percent. **Error! Reference source not found.** shows the breakdown of costs and benefits. The NRC has determined that the rule is cost justified based on the fact that the costs are all incurred during the rulemaking process and justified by the nonquantified benefits described in this report.

Table ES-1 Total Quantified Costs and Benefits for Rulemaking Alternative

Attribute	Costs		
	Undiscounted	7% NPV	3% NPV
Total Industry Costs:	($10,000)	($9,000)	($9,000)
Total NRC Costs:	($182,000)	($154,000)	($169,000)
Total:	($192,000)	($163,000)	($178,000)

Attribute	Benefits		
	Undiscounted	7% NPV	3% NPV
Total Industry Benefits:	$0	$0	$0
Total NRC Benefits:	$0	$0	$0
Total:	$0	$0	$0

Attribute	Net Benefits (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry:	($10,000)	($9,000)	($9,000)
NRC:	($182,000)	($154,000)	($169,000)
Total:	($192,000)	($163,000)	($178,000)

* Values are rounded to the nearest thousand dollars.

- Nonquantified Benefits: The proposed rule would enable the NRC to continue to protect public health and safety and the environment by approving new and updated provisions from the 2018 IEEE standards, which would allow licensees and applicants to use current methods and technology. The proposed rule is consistent with the spirit of the National Technology Transfer and Advancement Act of 1995 and implementing guidance in Office of Management and Budget (OMB) Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," dated January 27, 2016, which encourage Federal regulatory agencies to adopt voluntary consensus standards as an alternative to de novo agency development of standards affecting an industry.
- Uncertainty Analysis: The regulatory analysis includes a simulation analysis that shows that the estimated mean quantified cost of this proposed rule is ($163,000) using a 7-percent discount rate, with greater than 99 percent confidence that the proposed rule will impose costs for rulemaking and implementation.

- Decision Rationale: The staff concludes that the proposed rule is cost justified, relative to the no-action baseline, for the reasons stated above. The costs of the proposed rule are small and would be incurred primarily by the NRC during the final rule stage.

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1. INTRODUCTION

This document presents the draft regulatory analysis for the subject proposed rule (Agencywide Documents Access and Management System Accession No. ML24353A318). The proposed rule would amend the regulations to incorporate by reference Institute of Electrical and Electronics Engineers (IEEE) Standard (Std) 603-2018, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations," without conditions. This means that the U.S. Nuclear Regulatory Commission (NRC) would not impose any requirements (or relaxations) in addition to what is in the standard itself. The NRC proposes to update 10 CFR 50.55a to incorporate by reference IEEE Std 603-2018. When applying IEEE Std 603-2018, the first sentence within Clause 5.16, "Common cause failure," captures the only regulatory requirement of Clause 5.16, that the safety system design and development shall address common-cause failures (CCF) that create a potential to degrade or defeat the safety system function. Clause 5.16 contains additional language which the staff considers to be guidance rather than regulatory requirements. Licensees or applicants may use the methods described in Clause 5.16 as part of their overall D3 analyses.

Section II, "Background," of the proposed rule explains the NRC's practice for using the relevant IEEE standards. The NRC last updated its regulations incorporating by reference IEEE Std 603 after the IEEE published Std 603-1991. The IEEE subsequently issued new versions of the standard in 1998, 2009, and 2018.

2. STATEMENT OF THE PROBLEM AND OBJECTIVE

The objective of the proposed rule is to incorporate a nuclear industry consensus standard, IEEE Std 603-2018, into the NRC regulations to establish minimal functional and design requirements for nuclear power plant protection and safety systems. This action is consistent with the provisions of the National Technology Transfer and Advancement Act of 1995 (NTTAA), which encourages Federal regulatory agencies to adopt voluntary consensus standards as an alternative to de novo agency development of standards affecting an industry.

The action also conforms to the NRC policy of evaluating whether the latest versions of consensus standards are suitable for regulations or regulatory guides (RGs). It is intended to maintain the safety of nuclear power plants and to make NRC activities more effective and efficient.

The development of an IEEE voluntary consensus standard and its incorporation into the NRC regulations is a three-step process: (1) the standard is drafted, (2) consensus on publishing the standard is reached, and (3) the NRC adopts the standard. This process is described in more detail in Section III, "Discussion," of the *Federal Register* notice for the proposed rule.

The NRC reviewed the changes in IEEE Std 603-2018, which is the most recent version of IEEE Std 603 and addresses the power, instrumentation, and control systems of nuclear power reactors. The NRC concluded, in accordance with the process for reviewing changes to IEEE consensus standards, that IEEE Std 603-2018 is technically adequate, follows current NRC regulations, and is approved for use subject to specified conditions.

Under the proposed rule, IEEE Std 603-2018 would apply to future nuclear power plant applicants, including applicants for final design approvals, design certifications, and combined licenses under either Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," or 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The licensee of an operating nuclear power plant would be permitted either to continue to meet the requirements stated in the edition or revision of IEEE Std 279, "Criteria for Protection Systems for Nuclear Power Generating Stations," in effect on the formal date of its application for a construction permit, or, at its option, to use IEEE Std 603-1991 or IEEE Std 603-2018, provided the licensee complied with all applicable requirements for making changes to its nuclear power plant's licensing basis.

3. IDENTIFICATION AND ANALYSIS OF ALTERNATIVE APPROACHES

Given existing information, the NRC considers a rule change to be the most effective way to implement the updated IEEE standards. If the NRC adopted the no-action alternative, under which IEEE Std 603-2018 would not be incorporated into 10 CFR 50.55a(h), then licensees wishing to use the updated standard would seek exemptions or other relief.

The NRC considered five alternatives regarding IEEE Std 603-2018:

(1) Take no action.

(2) Use rulemaking to incorporate IEEE Std 603-2018 by reference in 10 CFR 50.55a(h).

(3) Revise RG 1.153, "Criteria for Safety Systems," to endorse the provisions in IEEE Std 603-2018.

(4) Issue a generic communication to summarize the licensing pathway that will enable licensees and applicants to use IEEE Std 603-2018 in satisfying the current requirements in 10 CFR 50.55a(h).

(5) Remove IEEE references from the regulations.

Under the first alternative, the NRC would approve the use of the criteria in IEEE Std 603-2018 without conditions, enabling licensees and applicants to implement the standard without seeking prior NRC approval. Under the second alternative, the NRC would include IEEE Std 603-2018 in guidance as an acceptable approach for licensees to use. Under the third alternative, licensees and applicants would be able to use IEEE Std 603-2018 without specific NRC endorsement. Alternative four was not further analyzed because it did not provide the same level of clarity or regulatory efficiency as Alternatives 2 and 3, due to there being no direct ties to NRC regulations. In addition, Alternative 4 would not give the public the opportunity to provide feedback in the form of public comments, which could cause the NRC to miss out on important considerations related to IEEE Std 603 2018. The fifth alternative, which would end all NRC endorsement of IEEE standards, is not included as an alternative in this regulatory analysis because it would entail considerable regulatory costs and has unclear benefits.

3.1. Alternative 1: No Action

Alternative 1, the no-action alternative, represents the nonrulemaking alternative. Under this alternative, the NRC would not revise its regulations to incorporate by reference the most recent revision of IEEE Std 603, and so licensees and applicants wishing to explicitly use IEEE Std 603-2018 would need to request and receive approval from the NRC for the use of alternatives under 10 CFR 50.55a(z).[1] However, because there is no substantive difference between the updated (IEEE Std 603-2018) and the previously approved standard (IEEE Std 603-1991), following the updated standard is compliant with NRC regulations, so no alternative request would be needed.

3.2. Alternative 2: Incorporate by Reference IEEE Std 603-2018

Under Alternative 2, the NRC would incorporate IEEE Std 603-2018 by reference into the *Code of Federal Regulations*; therefore, licensees and applicants could implement the standard without seeking prior NRC approval. Alternative 2 would establish a process of periodic rulemakings by which the NRC could incorporate IEEE standards by reference into its regulations. The alternative would thus promote the NRC's goal of protecting public health and safety and the environment by approving up-to-date standards that allow for the use of current methods and technology. In addition, it would reduce regulatory burden by eliminating the need for licensees to submit plant-specific requests for alternatives in accordance with 10 CFR 50.55a(z) and for the NRC to review those submittals.

3.3. Alternative 3: Endorse IEEE Std 603-2018 in Guidance

Under Alternative 3, the NRC would revise RG 1.153 to endorse the new provisions in IEEE Std 603-2018, which would include identifying the requirements related to these provisions. While this endorsement would aid licensees and applicants, regulatory uncertainty would remain, because 10 CFR 50.55a(h) would still incorporate by reference a standard 27 years older. Alternative 3 would require fewer resources to implement than the rulemaking alternative (Alternative 2).

3.4. Alternative 4: Issue Generic Communications on Licensing Pathway

Under Alternative 4, the NRC staff would draft and issue a generic communication to summarize the licensing pathway that would enable licensees and applicants to use IEEE Std 603-2018 in satisfying the current requirements in 10 CFR 50.55a(h). This communication would not be accompanied by a change in regulations or any new or revised guidance. While Alternative 4 would provide the simplest and quickest path to enabling licensees and applicants to use the 2018 standard, it would not provide the same level of clarity or regulatory efficiency as Alternatives 2 and 3, because there would be no direct ties to NRC regulations. Also, because Alternative 4 would not give the public the opportunity to provide feedback in the form

[1] All U.S. operating nuclear power plant units have analog control systems. Many nuclear plant licensees have at least partially upgraded their control systems, both safety related and nonsafety related, from analog to digital technology. Many plants have installed digital technology in at least a small portion of their safety-related instrumentation and control systems, even if only to support operator indications (DiSandro and Torok, 2005).

of public comments, the NRC could miss out on important considerations related to IEEE Std 603-2018. Because of these drawbacks, and because generic communications are always available as an option for the NRC to pursue outside of rulemaking, the staff did not further analyze Alternative 4.

3.5. Alternative 5: Remove IEEE References from the Regulations

Under Alternative 5, the NRC would remove the current IEEE references from 10 CFR and thereby end all endorsement of IEEE standards. This alternative would entail considerable regulatory costs and has unclear benefits and was therefore not analyzed further in this regulatory analysis.

4. ANALYSIS OF BENEFITS AND COSTS

This section identifies the components of the public and private sectors, commonly referred to as “attributes,” expected to be affected by the rulemaking. The proposed rule would be applicable to pressurized-water reactors, boiling-water reactors, and future nuclear power plant design certifications. The NRC believes that nuclear power plant licensees and new reactor design developers will be the primary beneficiaries of the rule. The staff developed an inventory of the affected attributes using the list in section 5 of NUREG/BR-0058, draft Revision 5, “Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,” dated January 28, 2020.

The sign convention used in this analysis is that all favorable consequences of the alternative are positive and all adverse consequences of the alternative are negative. Negative values are shown using parentheses (e.g., negative $500 is displayed as ($500)).

4.1. Identification of Affected Attributes

This rulemaking is expected to affect the attributes listed below; the impact on each is quantified where possible. Section **Error! Reference source not found.** of this document gives the results of an uncertainty analysis, providing confidence levels for benefit and cost estimates and identifying the variables that contribute the most to the variation in the results. The expected effects of the rule on regulatory efficiency, public confidence, and consistency with NTTAA are considered qualitatively:

- Industry Implementation: This attribute accounts for the projected net economic effect on licensees of implementing the changes mandated by the new rule. Industry stakeholders may expend resources to follow the development of the rule, attend public meetings, and provide comments on the proposed rule during the public comment period.

- NRC Implementation: This attribute accounts for the projected net economic effect on the NRC of activities such as carrying out the rulemaking or issuing guidance. The NRC would incur costs to develop the final rule or to update the guidance in RG 1.153.

- Industry Operation: This attribute accounts for the projected net economic effect on all licensees of the routine and recurring activities required by the new rule. Reactor

protection and safety systems in the United States must be designed in accordance with 10 CFR 50.55a(h), which incorporate by reference the requirements stated in IEEE Std 603-1991, including the correction sheet dated January 30, 1995. NRC licensees may apply for deviations from these requirements, including deviations that have been incorporated into newer versions of IEEE standards, subject to NRC approval in accordance with 10 CFR 50.55a(z). These requests are termed "alternative requests" (ARs), and those related to newer versions of IEEE Std 603 would be averted by Alternatives 2 and 3. Because there is no substantive difference between the updated (IEEE Std 603-2018) and the previously approved standard (IEEE Std 603-1991), following the updated standard is compliant with NRC regulations, so no alternative requests would be required in the absence of the rulemaking.

Thus, no relative costs or benefits to industry operation are expected between the recommended Alternative 2 and the baseline Alternative 1.

- NRC Operation: This attribute accounts for the projected net economic effect on the NRC after the proposed rule is implemented. Because there is no substantive difference between the updated (IEEE Std 603-2018) and the previously approved standard (IEEE Std 603-1991), following the updated standard is compliant with NRC regulations, so no alternative requests would be required in the absence of the rulemaking. Thus, no relative costs or benefits to NRC operation are expected between the recommended Alternative 2 and the baseline Alternative 1.

- Regulatory Efficiency: This attribute accounts for regulatory and compliance improvements resulting from the implementation of the proposed rule. NRC regulations are not currently consistent with the latest IEEE standards, requiring licensees to perform additional work and verification as they seek to make changes to reactor systems. The proposed action to incorporate IEEE Std 603-2018 by reference would increase regulatory efficiency because it would make the IEEE standards and NRC regulations consistent.

- Consistency with the NTTAA: The NTTAA encourages Federal agencies to adopt voluntary consensus standards as an alternative to de novo agency development of standards affecting an industry. Updating the IEEE standard incorporated by reference in the NRC's regulations would be consistent with this policy.

- Public Confidence: By enabling licensees to use the latest tools, techniques, and designs in accordance with industry standards, the rulemaking would increase public confidence in the NRC as a regulator.

Attributes that are not expected to be affected by this rulemaking include public health (accident and routine), occupational health (accident and routine), offsite and onsite property, other government, general public, improvements in knowledge, antitrust considerations, safeguards and security considerations, and environmental considerations.

4.2. Analytical Methods

This section describes the process used to evaluate the benefits and costs associated with the proposed rule. The benefits of the proposed rule include any desirable changes in affected attributes (e.g., monetary savings, improved safety, improved security), while the costs include any undesirable changes in affected attributes (e.g., monetary costs, increased exposures). This draft regulatory analysis was developed following the guidance contained in NUREG/BR-0058.

The analysis evaluates four attributes—industry implementation, NRC implementation, industry operation, and NRC operation—on a quantitative basis. Quantitative analysis requires a baseline characterization of the affected universe, including characterization of factors such as the number of affected entities and the application process that licensees would use as a result of the proposed rule. The remainder of the affected attributes are considered qualitatively. Sections 4.2.1 through 4.2.8 describe the analytical method and assumptions used in the quantitative and qualitative analysis of these attributes.

4.2.1. Regulatory Baseline

This regulatory analysis identifies the incremental impacts of the proposed rule relative to a baseline that reflects anticipated behavior if the NRC does not undertake regulatory or nonregulatory action. The regulatory baseline assumes full compliance with existing NRC requirements, including current regulations and relevant orders. This is consistent with NUREG/BR-0058, which states that "in evaluating a new requirement…the staff should assume that all existing NRC and Agreement State requirements have been implemented." Section **Error! Reference source not found.** of this regulatory analysis presents the estimated incremental costs and benefits of the alternatives compared to this baseline. This regulatory baseline is the no-action alternative (i.e., Alternative 1).

4.2.2. Affected Entities

The IEEE standard applies to the design of protection and safety systems for both currently operating and future nuclear power reactors. The proposed rule would thus affect both current licensees and future applicants. This regulatory analysis does not consider costs or averted costs specifically derived from the number of affected entities; therefore, a detailed list of affected entities is not relevant to the analysis and is not provided.

4.2.3. Discount Rates

The staff calculated monetary costs and benefits in terms of net present value (NPV), which represents how much society would need to invest today to ensure that a certain dollar amount is available in a given year in the future. By using NPVs, the staff can translate costs and benefits to a reference year for comparison, regardless of when they are incurred. In accordance with NUREG/BR-0058, the NPV 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; this

reflects the concept of discounting based on the social rate of time preference.[2] A 7 percent discount rate approximates the marginal pretax real rate of return on an average investment in the private sector; it is the appropriate discount rate whenever the main effect of a regulation is to displace or alter the use of capital in the private sector. A 7 percent rate is consistent with the concept of the opportunity cost[3] of capital; it reflects the time value of resources directed to meet regulatory requirements.

4.2.4. Labor Rates

For the purposes of this regulatory analysis, the staff applied strict incremental cost principles to develop labor rates that include only labor and material costs directly related to the implementation, operation, and maintenance of the proposed rule requirements. This approach is consistent with the guidance in NUREG/CR-3568, "A Handbook for Value-Impact Assessment," issued December 1983, and with general cost-benefit methodology. The NRC's incremental labor rate is $152 per hour.[4]

The staff used the 2023 Occupational Employment and Wages data published by the U.S. Bureau of Labor Statistics (BLS) (www.bls.gov), which provide labor categories and mean hourly wage rates by job type. The labor rates used in the analysis reflect total hourly compensation, which includes wages and nonwage benefits (using a burden factor of 2.4, which is applicable for contract labor and conservative for regular utility employees). The staff used the BLS data tables to select appropriate hourly labor rates for the estimated procedural, licensing, and utility-related work necessary during and after implementation of the proposed rule. These labor rates include wages paid to the individuals performing the work plus the associated fringe benefit component of labor costs (i.e., the time for plant management exceeding those directly expensed), which are considered incremental expenses. **Error! Reference source not found.** summarizes the BLS labor categories that the staff used to estimate industry labor costs to implement this proposed rule. Appendix A lists the industry labor rates used in the analysis.

[2] The social rate of time preference is the rate at which society is willing to postpone a marginal unit of current consumption in exchange for more future consumption.

[3] The opportunity cost of a given action is what is forgone by undertaking that action. In the context of the proposed rulemaking, if industry personnel were not performing certain incremental tasks (e.g., revising procedures) to meet the new requirements, they would be performing other work activities. Throughout this analysis, the NRC estimates the opportunity cost of performing these incremental tasks as the industry personnel's pay for the designated amount of time.

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

Table 1 Position Titles and Occupations

Position Title (in This Regulatory Analysis)	Standard Occupational Classification
Executive	Top Executives (111000)
	Chief Executives (111011)
Managers	General and Operations Managers (111021)
	Industrial Production Managers (113051)
	First-Line Supervisors of Mechanics, Installers, and Repairers (491011)
	First-Line Supervisors of Production and Operating Workers (511011)
Technical Staff	Nuclear Engineers (172161)
	Physicists (192012)
	Nuclear Technicians (194051)
	Industrial Machinery Mechanics (499041)
	Nuclear Power Reactor Operators (518011)
Administrative Staff	Office and Administrative Support Occupations (430000)
	First-Line Supervisors of Office and Administrative Support Workers (431011)
	Office Clerks, General (439061)
Licensing Staff	Lawyers (231011)
	Paralegals and Legal Assistants (232011)

Source: BLS, May 2023 National Industry-Specific Occupational Employment and Wage Estimates: NAICS 221113—Nuclear Electric Power Generation and NAICS 221100—Electric Power Generation, Transmission, and Distribution.

4.2.5. Analysis Horizon

The NRC assumes that each alternative under consideration would become effective in 2026. Since the year of the current IEEE standard is 2018, this means the process of review through approval and incorporation by reference will have taken approximately 8 years. This regulatory analysis assumes that the next standard will be published in 2028, and that, thanks to efficiency gains, the next incorporation by reference will occur 6 years later, in 2034. These assumptions define the analysis horizon for this regulatory analysis; therefore, ongoing costs and benefits in the cost estimate end in 2034.

4.2.6. Base Year

All monetized costs are expressed in 2023 dollars. Unless stated otherwise, ongoing costs of operation under the alternatives are assumed to begin no earlier than 30 days after the action is finalized and published/issued, which is expected to be in 2026, and they are modeled on an annual cost basis. Estimates of one-time NRC implementation costs are based on staff experience with similar rulemakings. The NRC assumes that these costs would be incurred in 2025 and 2026.

Estimates of recurring annual operating expenses are based on staff experience and stakeholders' statements about costs. 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 2023-dollar values.

4.2.7. Cost Estimation

To estimate the costs of each alternative, the staff used a work breakdown approach to deconstruct each requirement into mandated activities. For each mandated activity, the staff further subdivided the work across labor categories (i.e., executives, managers, technical staff, administrative staff, and licensing staff). The staff estimated the level of effort (LOE) needed 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 working group members to develop LOE and unit cost estimates. The staff applied several cost estimation methods and used its collective professional knowledge and judgment to estimate many of the costs and benefits. It also used a buildup method and extrapolation techniques to estimate costs and benefits.

The staff began by using the engineering buildup method of cost estimation, which combines the incremental costs of an activity from the bottom up to estimate a total cost. For this step, the staff reviewed previous license submittals, determined the number of pages in each section of a submittal, and used these data to develop preliminary LOEs.

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 licensee costs and averted costs (benefits) related to the NRC conditions on the code cases in the proposed rule, the staff consulted licensees about the associated LOE. NRC staff members themselves contributed to LOE estimates for review-related activities.

The staff extrapolated some costs, relying on actual past or current activity costs to estimate the future costs of similar activities. For example, to estimate the costs of preparing the proposed 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 to estimate the amount of time required under each category. 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 employed Monte Carlo simulation, which is an approach that input variables are expressed as distributions. The simulation was run 10,000 times, and values were chosen at random from the distributions of the input variables provided in **Error! Reference source not found.**. The result was a distribution of values for the output variable of interest. Monte Carlo simulation also enables users to determine which input variables most strongly affect the value of the output variable. Section 5.13 describes the Monte Carlo simulation methods in detail and presents the results.

4.2.8. IEEE Standard Incorporated by Reference

When the NRC adds conditions to industry standards, licensees may incur additional regulatory costs to meet the conditions. For each applicable standard, the conditions specify the additional activities that must be performed, the limits on the activities identified in the standard, and the supplemental information needed to provide clarity. The NRC is not adding any conditions to IEEE Std 603-2018. The *Federal Register* notice for this proposed rule gives further details on

the NRC's reasoning for this decision. Because there are no conditioned standards involved, the NRC does not associate any incremental costs or benefits to the incorporation of the standards by reference. Disapproval of a new standard is not considered an incremental cost or benefit either, because that disapproval does not change the options available to licensees before the new standards are incorporated by reference.

The NRC will include approved industry standards in its rulemakings whether or not licensees are likely to use the standards. The costs and benefits of including any standard the NRC does not expect the industry to use are estimated as negligible.

4.3. Data

The staff used data from subject-matter experts, knowledge gained from past rulemakings, and the NRC budget for this rulemaking to estimate the costs and benefits associated with this proposed rule. Staff members provided quantitative and qualitative information on attributes affected by the proposed rule. The staff considered the potential differences between the proposed and existing requirements and incorporated these incremental changes into the regulatory analysis.

5. PRESENTATION OF RESULTS

This section presents the results of the regulatory analysis. Sections 5.1 through 5.4 present results on the benefits and costs of the proposed rule by attribute, and then section 5.8 presents these results in aggregate. Sections 5.5 through 5.7 discuss the qualitative factors in this analysis. Sections 5.9 and 5.10 evaluate the uncertainties in the benefit and cost estimates and identifies the variables that contribute the most to the variation in the results. Section 5.11 discusses disaggregation of the requirements in the proposed rule, as well as disaggregated results for each of the regulatory requirements that comprise the proposed rule. Section 5.12 addresses the applicability of a safety goal evaluation to the proposed rule, and section 5.13 discusses information relevant to the Committee to Review Generic Requirements (CRGR).

5.1. Industry Implementation

Under Alternative 2, the NRC would incorporate IEEE-603-2018 by reference into the *Code of Federal Regulations*, while under Alternative 3 it would endorse the standard in guidance. Both alternatives would allow licensees and applicants to implement this standard without seeking prior NRC approval. The rulemaking alternative would establish an NRC process of periodic rulemakings to incorporate IEEE standards by reference.

The NRC assumes that the Nuclear Energy Institute, digital equipment vendors, and current licensees would follow the development of this rule, provide feedback during public meetings, and comment on the documents when issued for public comment. Costs to perform these activities include procedural and administrative activities.

Similarly, the NRC would interact with the public to develop and issue guidance for an acceptable approach to implement IEEE Std 603-2018 (e.g., developed as DG-1251). This guidance would be developed under Alternative 3, but not under Alternative 2. The costs for

reviewing and commenting on the proposed rule and on standalone guidance are estimated to be similar; they are shown in **Error! Reference source not found.**.

Table 2 Industry Implementation—Rule and Guidance Review

Year	Activity	Labor Hours	Weighted Hourly rate	Cost		
				Undiscounted	7% NPV	3% NPV
2025	Review Rule/RG and Submit Public Comments	68	$143	($9,767)	($8,531)	($9,207)
			Total:	**($9,767)**	**($8,531)**	**($9,207)**

5.2. NRC Implementation

Under Alternative 2, the NRC would incur costs associated with finalizing the rule and RG 1.153, and under Alternative 3, the NRC would incur costs associated with finalizing the RG. The NRC assumes that the development of the final rule and RG would take place in 2025 and 2026 and would require 1,200 hours in total. Finalization of the guidance is assumed to take place in 2026 to simplify the modeling; it is estimated to require 215 hours. **Error! Reference source not found.** and **Error! Reference source not found.** show the costs for Alternatives 2 and 3, respectively. **Error! Reference source not found.** includes the RG finalization as part of developing and issuing the final rule.

Table 3 NRC Implementation—Rulemaking

Year	Activity	Number of Actions	Hours	Weighted Hourly Rate	Cost		
					Undiscounted	7% NPV	3% NPV
2025	Develop / Issue Final Rule	1	600	$152	($91,200)	($79,658)	($85,965)
2026	Develop / Issue Final Rule	1	600	$152	($91,200)	($74,446)	($83,461)
				Total:	**($182,400)**	**($154,104)**	**($169,426)**

Table 4 NRC Implementation—Guidance

Year	Activity	Number of Actions	Hours	Weighted Hourly Rate	Cost		
					Undiscounted	7% NPV	3% NPV
2026	Finalize / Issue Regulatory Guide	1	215	$152	($32,680)	($26,677)	($29,907)
				Total:	**($32,680)**	**($26,677)**	**($29,907)**

5.3. Industry Operation

Because there is no substantive difference between the updated (IEEE Std 603-2018) and the previously approved standard (IEEE Std 603-1991), following the updated standard is compliant with NRC regulations, so no alternative requests would be required in the absence of the rulemaking. Thus, no relative costs or benefits to industry operation are expected between the recommended Alternative 2 and the baseline Alternative 1.

5.4. NRC Operation

Because there is no substantive difference between the updated (IEEE Std 603-2018) and the previously approved standard (IEEE Std 603-1991), following the updated standard is compliant with NRC regulations, so no alternative requests would be required in the absence of the rulemaking. Thus, no relative costs or benefits to NRC operation are expected between the recommended Alternative 2 and the baseline Alternative 1.

5.5. Consistency with the NTTAA

Alternative 2 is consistent with the provisions of the NTTAA, which encourages Federal regulatory agencies to adopt voluntary consensus standards as an alternative to de novo agency development of standards affecting an industry. Section 12(d)(3) of the NTTAA and implementing guidance in OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," dated January 27, 2016, require each Federal government agency (should it decide that regulation is necessary) to use a voluntary consensus standard instead of developing a government-unique standard. An exception to this requirement is allowed where the use of a voluntary consensus standard is inconsistent with applicable law or is otherwise impractical. The NTTAA requires Federal agencies to use industry consensus standards rather than developing government-unique standards to the extent practical; it does not require the use of any standard in its entirety. Neither the NTTAA nor OMB Circular A-119 prohibits an agency from adopting a voluntary consensus standard while taking exception to specific portions of the standard, if those portions are deemed to be "inconsistent with applicable law or otherwise impractical." Furthermore, taking specific exceptions furthers the spirit of the NTTAA by allowing an agency to adopt substantial portions of a standard rather than rejecting the standard in its entirety because it contains limited provisions that are not acceptable to the agency.

In Alternative 2, the NRC proposes to amend its regulations to incorporate by reference the most recent revision of IEEE Std 603. IEEE Std 603-2018 is a national consensus standard developed by stakeholders with broad and varied interests, in whose development all interested parties (including the NRC and licensees and designers of nuclear power plants) participated.

5.6. Regulatory Efficiency

Alternative 2 would increase regulatory efficiency by making NRC regulations consistent with IEEE standards. This regulatory efficiency would not exist under Alternative 3, because the guidance issued under that alternative would be inconsistent with regulatory language.

5.7. Public Confidence

The incorporation by reference of the latest industry standards enables licensees to use risk-informed, performance-based approaches and current methods and technology to design, construct, operate, examine, and test nuclear power plant components, while maintaining NRC oversight of these activities. It thus increases public confidence and reassures the public that the NRC continues to improve as a modern, risk-informed regulator.

5.8. Quantified Net Benefits

Error! Reference source not found. and **Error! Reference source not found.** summarize the estimated incremental costs of Alternatives 2 and 3 relative to the regulatory baseline. Both Alternatives 2 and 3 result in net quantitative costs. These costs are associated with two affected attributes: industry implementation and NRC implementation. The proposed rule (Alternative 2) would result in estimated costs of between ($163,000) (at a 7 percent discount rate) and ($178,000) (at a 3 percent discount rate). The guidance alternative (Alternative 3) would result in estimated costs of between ($36,000) (at a 7 percent discount rate) and ($39,000) (at a 3 percent discount rate).

Table 5 Estimated Incremental Net Costs, Alternative 2

Attribute	Total Averted Costs (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry Implementation:	($10,000)	($9,000)	($9,000)
Industry Operation:	$0	$0	$0
Industry Totals:	*($10,000)*	*($9,000)*	*($9,000)*
NRC Implementation:	($182,000)	($154,000)	($169,000)
NRC Operation:	$0	$0	$0
NRC Totals:	*($182,000)*	*($154,000)*	*($169,000)*
Net:	***($192,000)***	***($163,000)***	***($178,000)***

* Values are rounded to the nearest thousand dollars.

Table 6 Estimated Incremental Net Costs, Alternative 3

Attribute	Total Averted Costs (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry Implementation:	($10,000)	($9,000)	($9,000)
Industry Operation:	$0	$0	$0
Industry Totals:	*($10,000)*	*($9,000)*	*($9,000)*
NRC Implementation:	($33,000)	($27,000)	($30,000)
NRC Operation:	$0	$0	$0
NRC Totals:	*($33,000)*	*($27,000)*	*($30,000)*
Net:	***($43,000)***	***($36,000)***	***($39,000)***

* Values are rounded to the nearest thousand dollars.

Alternatives 2 and 3 are not cost beneficial, because of the one-time NRC costs associated with developing and publishing the final rule or regulatory guidance, as well as industry costs for activities related to reviewing and commenting on the rule or guidance. Qualitatively, the analysis shows that both the industry and NRC will benefit from Alternatives 2 and 3. Furthermore, there is evidence that the regulatory baseline costs will continue to rise as analog instrumentation and control equipment becomes obsolete. In general, Alternatives 2 and 3 may significantly reduce the number of NRC-generated requests for additional information (RAIs) needed for a major digital upgrade project, thereby eliminating the need for licensees to prepare and submit multiple supplements. The NRC staff believes that these factors would reduce the

industry and NRC implementation impacts of Alternatives 2 and 3. Finally, Alternative 2 would most increase public confidence, regulatory efficiency, and consistency with the NTTAA, whereas Alternative 3 would have a smaller impact on those factors.

5.9. Uncertainty Analysis

As this analysis is based on estimates of values and unknown amounts of risk, it is useful to run a sensitivity analysis of the variables in which there is the greatest amount of uncertainty. The staff therefore performed a Monte Carlo sensitivity analysis using the software @Risk. The Monte Carlo approach shows what distribution of net benefits results from multiple draws of the probability distributions assigned to key variables.

NUREG/BR-0058 instructs analysts to perform formal uncertainty analysis as a best practice, since such analysis can provide valuable information for policymakers evaluating proposed regulations. Findings about uncertainty can provide context for interpreting an estimate of the expected value of a proposed regulation's net benefits. In addition, consideration of the uncertainties in the inputs, and how those uncertainties interact, can lead to estimates of expected net benefits that differ from the estimates that would be produced if uncertainties were disregarded and a single value were used for each input.

5.9.1. Uncertainty Analysis Assumptions

Monte Carlo analysis requires the identification of the variables whose values are uncertain. In this uncertainty analysis, for Alternative 2 (Alternative 3 is similar and is therefore not included in the analysis), those variables are (1) the time taken for industry representatives to review and comment on the proposed rule package, (2) NRC implementation costs (the costs of developing and issuing the final rule), and (3) the labor categories and rates for individuals assigned to perform this work. A program evaluation and review technique (PERT) distribution[5] was used to model the data inputs. Table 10 summarizes the variable assumptions in the analysis.

Table 7 Uncertainty Analysis Variables

Uncertainty Variable Description	Value	Distribution	Low Estimate	Best Estimate	High Estimate
Base year	2023				
Industry implementation (one-time)					
Review and provide feedback and comments on NRC proposed rule documents					
Industry labor rate	$142.76	PERT	$116.92	$143.85	$164.24
Hours	68	PERT	50	67	92
NRC implementation (one-time)					

[5] A PERT distribution is a special form of the beta distribution with a minimum and maximum value specified. 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. It 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. Like the triangular distribution, the PERT distribution is bounded on both sides and therefore may not be adequate for some modeling purposes where it is desirable to capture tail or extreme events.

Uncertainty Variable Description	Value	Distribution	Low Estimate	Best Estimate	High Estimate
Rulemaking					
NRC labor rate	$152				
Hours to develop and issue final rule	1,200	PERT	500	600	700
Guidance					
Hours to finalize and issue guidance	215	PERT	90	200	400
Labor rates					
Industry executives	$311.06/hour	PERT	$204.78	$311.06	$417.35
Industry managers	$202.91/hour	PERT	$167.17	$202.91	$232.84
Industry technical staff	$133.45/hour	PERT	$117.33	$133.45	$148.92
Industry administrative staff	$101.20/hour	PERT	$75.14	$101.20	$121.67
Industry licensing staff	$175.57/hour	PERT	$140.60	$175.57	$207.31
Weighted industry rate	$142.76/hour	PERT	$116.92	$143.85	$164.24
NRC	$152/hour	PERT	$152	$152	$152

5.9.2. Uncertainty Analysis Results

Five thousand simulations were run. Figures 1 through 4 show the distributions of the estimated benefits and costs for Alternative 2. Because Alternatives 2 and 3 are similar in not having monetized benefits, only the uncertainty analysis for Alternative 2 is shown. The results for Alternative 3 would be similar but smaller in magnitude, with the same confidence interval showing that costs will be incurred.

Error! Reference source not found. presents the industry incremental costs for Alternative 2 at a 7 percent discount rate. The distribution shows that the industry will incur incremental costs with greater than 99 percent confidence, with a mean cost of ($8,500).

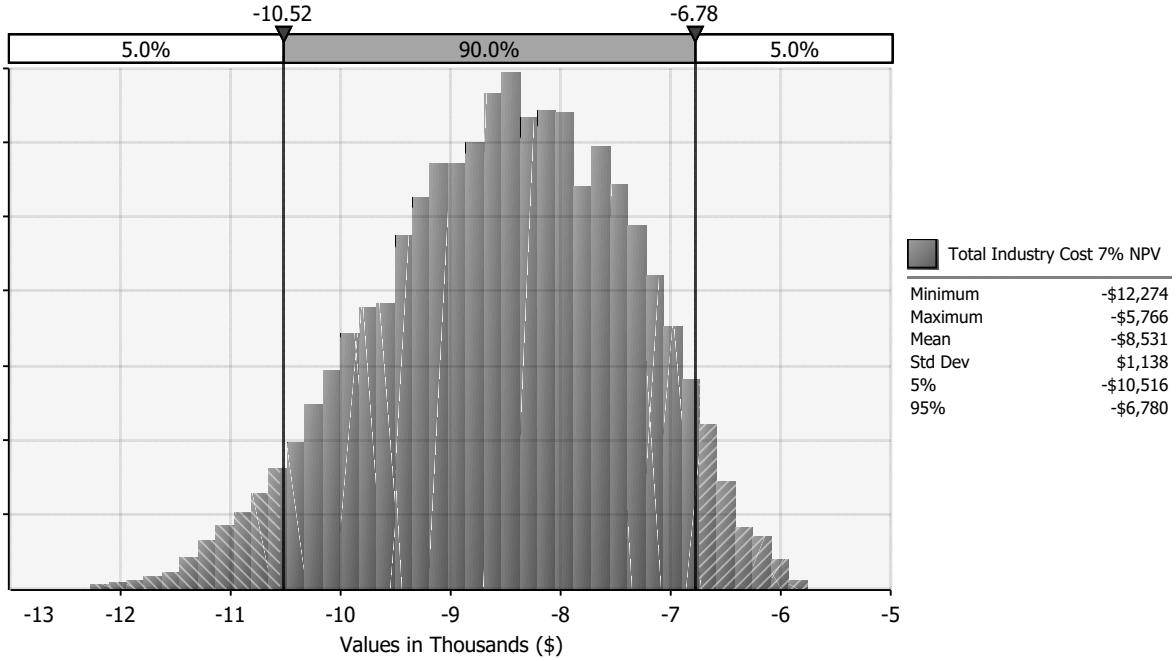

Figure 1 Industry Costs, 7 Percent NPV

Error! Reference source not found. presents the NRC incremental costs for Alternative 2 at a 7 percent discount rate. The distribution shows that the NRC will incur incremental costs with greater than 99 percent confidence, with a mean cost of ($154,000).

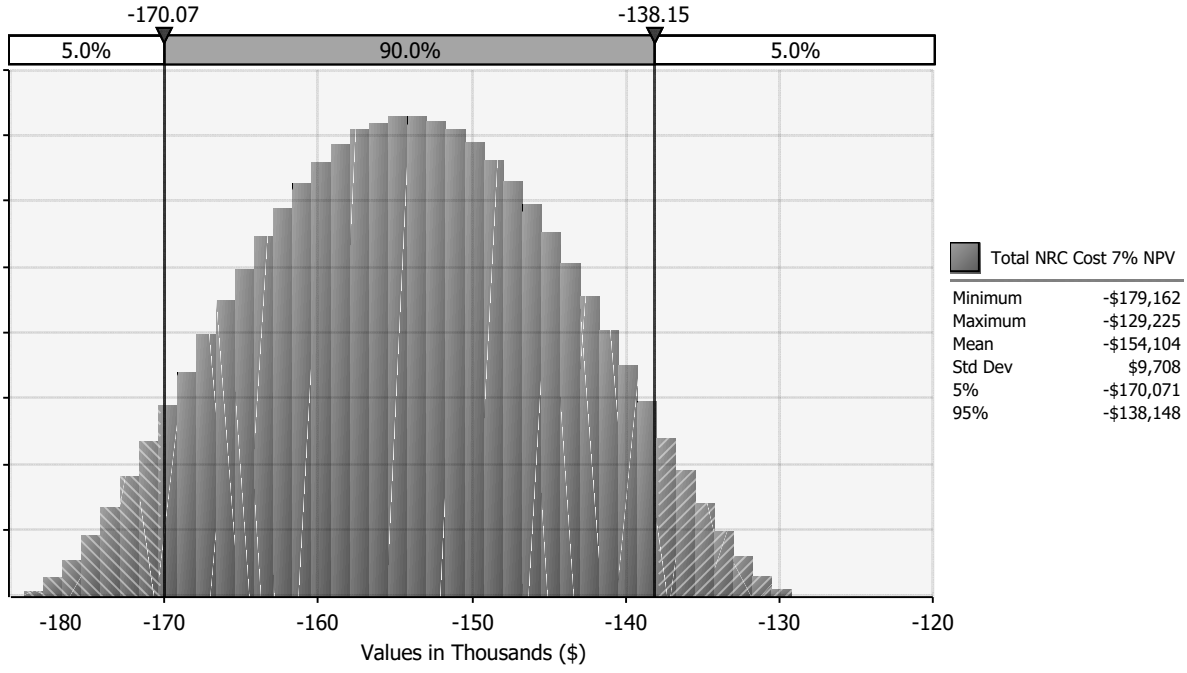

Figure 2 NRC Costs, 7 Percent NPV

Error! Reference source not found. presents the net costs for Alternative 2 at a 7 percent discount rate. The distribution shows that Alternative 2 will result in incremental costs with greater than 99 percent confidence, with a mean cost of ($163,000).

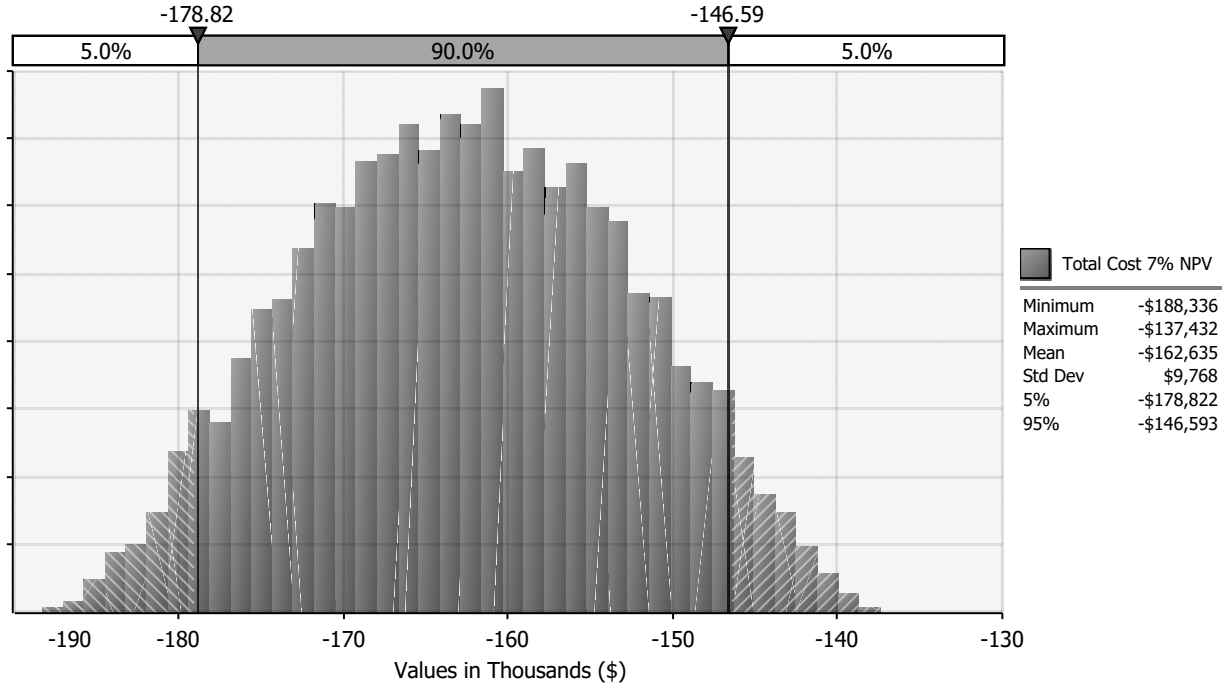

Figure 3 Net Costs, 7 Percent NPV

The analysis shows that the industry and the NRC would realize net costs under Alternative 2, compared to the regulatory baseline.

Error! Reference source not found. shows a tornado diagram illustrating how the three primary factors in the estimates drive the uncertainty in the net costs. The uncertainty in the number of hours required to complete the final rule have the most significant impact on the outcome.

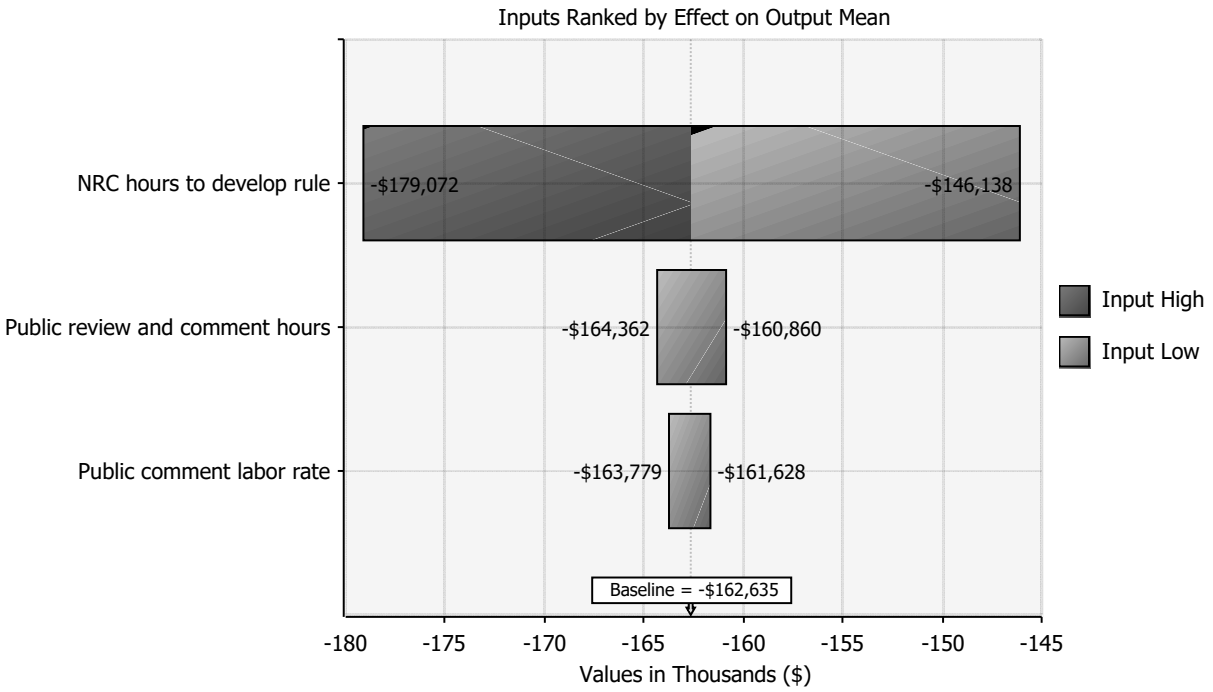

Figure 4 Inputs for Net Cost (7 Percent NPV) Ranked by Effect on Output Mean

5.9.3. Uncertainty Analysis Summary

The uncertainty analysis found that the proposed rule (Alternative 2) would result in incremental costs for industry and the NRC, due to the rulemaking activities themselves. **Error! Reference source not found.** provides pertinent descriptive statistics for the uncertainty analysis.

Table 8 Uncertainty Results—Descriptive Statistics (2023 dollars)

Uncertainty Result	Incremental Cost or Benefit (2023 Dollars)					
	Minimum	Mean	Standard Deviation	Maximum	0.05	0.95
Net Industry Costs	($12,300)	($8,500)	$1,100	($5,800)	($10,500)	($6,800)
Net NRC Costs	($179,000)	($154,000)	$9,700	($129,000)	($170,000)	($138,000)
Net Costs	($188,000)	($163,000)	$9,800	($137,000)	($179,000)	($147,000)

5.10. Disaggregation

To comply with the guidance in Section 4.3.2, “Criteria for the Treatment of Individual Requirements,” of NUREG/BR-0058, the NRC staff conducted a screening review to determine whether any of the individual requirements (or the integrated set of requirements) of the proposed rule were unnecessary to achieve the objectives of the rulemaking. The staff identified

the following as the objectives of the rulemaking: (1) to establish a streamlined process to incorporate updated IEEE standards by reference into the NRC regulations, and (2) to establish minimum functional and design requirements for the power, instrumentation, and control portions of safety systems for nuclear power generating stations. The staff reviewed the entirety of IEEE Std 603-2018 and considers it to be technically adequate and complete; it should therefore not be broken apart. Because these are the only objectives for the proposed rule, the staff concludes that each of the proposed rule's requirements is necessary to achieve the objectives of the rulemaking.

5.11. Safety Goal Evaluation

Alternative 2 would allow licensees and applicants to use the most recent version of IEEE Std 603. The NRC's safety goal evaluation applies only to regulatory initiatives considered to be generic safety-enhancement backfits subject to the standard at 10 CFR 50.109(a)(3). The NRC does not regard the incorporation by reference of IEEE Std 603-2018 to be backfitting. The proposed rule published in the *Federal Register* gives the basis for this determination. For these reasons, a safety goal evaluation is not appropriate for this regulatory analysis.

5.12. Results for the Committee to Review Generic Requirements

This section addresses regulatory analysis information requirements for rulemaking actions or staff positions subject to review by the CRGR. All information called for by the CRGR charter (NRC, 2018) is presented in this regulatory analysis or in the *Federal Register* notice for the proposed rule. **Error! Reference source not found.** provides cross-references for the relevant information in this document or the *Federal Register* notice.

Table 9 Specific CRGR Regulatory Analysis Information Requirements

CRGR Charter Citation (NRC, 2018)	Information Item to Be Included in a Regulatory Analysis Prepared for CRGR Review	Where Item Is Discussed
Appendix C, (i)	The new or revised generic requirement or staff position sent out to licensees or issued for public comment	Proposed rule text in *Federal Register* notice for the proposed rule
Appendix C, (ii)	Draft papers or other documents supporting the requirements or staff positions	*Federal Register* notice for the proposed rule
Appendix C, (ii)	Documents supporting the requirements or staff positions	*Federal Register* notice for the proposed rule
Appendix C, (iii)	The sponsoring office's position on each requirement or staff position as to whether the change would modify, implement, or relax or reduce existing requirements or staff positions	Regulatory analysis, section 5, and Section VII, "Backfitting and Issue Finality," in *Federal Register* notice for the proposed rule

CRGR Charter Citation (NRC, 2018)	Information Item to Be Included in a Regulatory Analysis Prepared for CRGR Review	Where Item Is Discussed
Appendix C, (iv)	The method of implementation	Regulatory analysis, section 7
Appendix C, (vi)	Identification of the category of power reactors, new reactors, or nuclear materials facilities or activities to which the generic requirement or staff position applies	Regulatory analysis, section 4.2.2
Appendix C, (vii)–(viii)	If the action involves a power reactor backfit and the exceptions at 10 CFR 50.109(a)(4) do not apply, the items required at 10 CFR 50.109(c) and the required rationale at 10 CFR 50.109(a)(3)	Does not apply
Appendix C, (xi)	An assessment of how the action relates to the Commission's Safety Goal Policy Statement	Regulatory analysis, section 5.16

6. DECISION RATIONALE FOR SELECTION OF THE PROPOSED ACTION

As shown in **Error! Reference source not found.**, relative to the regulatory baseline, Alternative 2 results in minor costs to the industry from reviewing and commenting on the proposed rule, with an estimated net cost of between ($8,500) (at a 7 percent discount rate) and ($9,200) (at a 3 percent discount rate). For the NRC, Alternative 2 is not quantitatively cost beneficial, although, as discussed below, there are significant benefits that were not quantified in this analysis. The estimated net costs for the NRC range from ($154,000) (at a 7 percent discount rate) to ($169,000) (at a 3 percent discount rate).

Table 10 Net Results for Alternatives 2 and 3

Net Monetary Savings or (Costs)— Total Present Value	Nonquantified Benefits or (Costs)
Alternative 1: No action $0	None
Alternative 2: Incorporate IEEE Std 603-2018 by reference Industry: ($8,500) using a 7% discount rate ($9,200) using a 3% discount rate NRC: ($154,000) using a 7% discount rate ($169,000) using a 3% discount rate Net benefit (cost): ($163,000) using a 7% discount rate ($178,000) using a 3% discount rate	Benefits: • **Consistent with the NTTAA and Implementing Guidance:** Alternative 2 is consistent with the spirit of the NTTAA and implementing guidance in OMB Circular A-119, which encourage Federal regulatory agencies to adopt voluntary consensus standards as an alternative to de novo agency development of standards affecting an industry. • **Regulatory Efficiency:** Alternative 2 would increase regulatory efficiency by clearly

Net Monetary Savings or (Costs)— Total Present Value	Nonquantified Benefits or (Costs)
Alternative 2 (continued)	allowing licensees to use IEEE-603-2018. It would give licensees flexibility and decrease their uncertainty when preparing to upgrade digital control systems. Furthermore, Alternative 2 would increase regulatory efficiency by making NRC regulations consistent with IEEE standards. • **Public Confidence:** The incorporation by reference of the latest industry standards enables licensees to use risk-informed, performance-based approaches and current methods and technology to design, construct, operate, examine, and test nuclear power plant components, while maintaining NRC oversight of these activities. It thus increases public confidence and reassures the public that the NRC continues to improve as and transform into a modern, risk-informed regulator.
Alternative 3: Endorse IEEE Std 603-2018 in guidance Industry: ($8,500) using a 7% discount rate ($9,200) using a 3% discount rate NRC: ($27,000) using a 7% discount rate ($30,000) using a 3% discount rate Net benefit (cost): ($35,000) using a 7% discount rate ($39,000) using a 3% discount rate	• **Consistent with the NTTAA and Implementing Guidance:** Alternative 3 is consistent with the spirit of the NTTAA and implementing guidance in OMB Circular A-119, which encourage Federal regulatory agencies to adopt voluntary consensus standards as an alternative to de novo agency development of standards affecting an industry.

The quantitative analysis shows that Alternative 2 is not cost beneficial because of the one-time NRC costs associated with developing and publishing the final rule, including the costs of the rulemaking activities required to address internal and public comments. However, the qualitative factors described above, and the relatively low cost of the rulemaking provide compelling reasons to move forward with Alternative 2.

Alternative 2 would create a regulatory framework that could accelerate the pace at which licensees upgrade nuclear plant instrumentation and control systems from analog to digital instrumentation. Such upgrades carry numerous potential benefits, including decreased

obsolescence (leading to lower operation and maintenance costs), performance improvements, increased safety, and a decreased need for licensee event reports.

The nuclear industry is familiar with the NRC's well-established practice of approving the use of certain IEEE standards in 10 CFR 50.55a, "Codes and standards," through the rulemaking process of incorporation by reference. This practice ensures consistency across the industry and demonstrates that the NRC supports the use of the newest and most technically sound techniques available to provide adequate protection to the public.

It is the NRC's judgment that the benefits considered qualitatively above (including safety improvements, averted costs, and other nonquantified benefits) outweigh the costs identified for the rulemaking. Furthermore, the NRC staff expects that the public may identify additional benefits during the public comment period, which the staff would use to refine its estimates. The staff believes that this approach is consistent with Commission direction in SRM-SECY-14-0087, "Staff Requirements—SECY-14-0087—Qualitative Consideration of Factors in the Development of Regulatory Analyses and Backfit Analyses," dated March 4, 2015.

7. IMPLEMENTATION

The proposed rule will be published for public comment in the *Federal Register*. After the public comment period, the NRC staff will develop a final rule and publish it in the *Federal Register*. The NRC staff assumes in this draft regulatory analysis that the final rule will be effective in 2027.

8. REFERENCES

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

— — — — —, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Part 52, Chapter I, Title 10, "Energy."

— — — — —, "Fees for Facilities, Materials, Import and Export Licenses, and Other Regulatory Services under the Atomic Energy Act of 1954, as Amended," Part 170, Chapter I, Title 10, "Energy."

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— — — — —, IEEE Standard 603-1991, "Criteria for Safety Systems for Nuclear Power Generating Stations," 1991. Available at https://standards.ieee.org/ieee/603/837/.

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— — — — —, "Charter: Committee to Review Generic Requirements," Revision 9, June 2018 (ML17355A532).

— — — — —, NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," Revision 5 (draft), January 28, 2020 (ML19261A277).

— — — — —, NUREG-1350, Vol. 34, "2022–2023 Information Digest," January 2023 (ML25051A094).

— — — — —, NUREG/BR-0053, "United States Nuclear Regulatory Commission Regulations Handbook," Revision 6, September 2005 (ML052720461).

— — — — —, NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook," January 1997 (ML050190193).

— — — — —, NUREG/CR-4627, "Generic Cost Estimates," Revision 2, January 1992 (ML13137A259).

— — — — —, DG-1251, Revision 1, "Guidance for the Power, Instrumentation, and Control Portions of Safety Systems for Nuclear Power Plants, December 2025 (ML25114A021).

— — — — —, SRM-SECY-99-029, "NRC Participation in the Development and Use of Consensus Standards," February 17, 1999 (ML003751820).

APPENDIX A: REGULATORY ANALYSIS INPUT DATA

Table A-1 Regulatory Analysis Input Data

Position Title	Occupation (SOC Code)	Hourly Mean Wage (2023 Dollars)	Hourly 25th Percentile Wage (2023 Dollars)	Hourly 75th Percentile Wage (2023 Dollars)	Source
Executive	Top Executives (111000)	$107.57	$79.80	$135.34	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	Chief Executives (111011)	$151.65	$90.85	$212.45	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Average	**$129.61**	**$85.33**	**$173.90**	
Managers	First-Line Supervisors of Production and Operating Workers (511011)	$78.48	$66.07	$86.80	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	First-Line Supervisors of Mechanics Installers and Repairers (491011)	$65.32	$54.76	$73.45	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Industrial Production Managers (113051)	$91.55	$78.75	$101.18	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	General and Operations Managers (111021)	$102.84	$79.04	$126.64	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Average	**$84.55**	**$69.66**	**$97.02**	
Technical Staff	Nuclear Engineers (172161)	$60.10	$49.54	$67.63	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	Nuclear Technicians (194051)	$50.85	$46.36	$57.41	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Nuclear Power Reactor Operators (518011)	$59.14	$50.49	$65.83	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	Industrial Machinery Mechanics (499041)	$52.32	$49.16	$57.33	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Average	**$55.60**	**$48.89**	**$62.05**	

Position Title	Occupation (SOC Code)	Hourly Mean Wage (2023 Dollars)	Hourly 25th Percentile Wage (2023 Dollars)	Hourly 75th Percentile Wage (2023 Dollars)	Source
Administrative Staff	Office and Administrative Support Occupations (430000)	$39.15	$28.71	$49.97	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	First-Line Supervisors of Office and Administrative Support Workers (431011)	$56.18	$39.08	$65.61	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Office Clerks General (439061)	$31.17	$26.14	$36.51	https://www.bls.gov/oes/current/oes439061.htm
	Average	**$42.17**	**$31.31**	**$50.70**	
Licensing Staff	Paralegals and Legal Assistants (232011)	$43.62	$37.71	$49.53	https://www.bls.gov/oes/current/naics4_221100.htm#11-0000
	Lawyers (231011)	$102.69	$79.46	$123.23	https://www.bls.gov/oes/current/naics4_221100.htm#11-0001
	Average	**$73.16**	**$58.59**	**$86.38**	
Physicist	Physicists (192012)	$60.40	$50.53	$64.49	https://www.bls.gov/oes/current/oes192012.htm

Source: U.S. Bureau of Labor Statistics, "May 2023 National Industry-Specific Occupational Employment and Wage Estimates," May 2023. Available at https://www.bls.gov/oes/current/naics5_221113.htm; accessed June 18, 2024.