
Regulatory Analysis for the Proposed Rule:
**Cost-Benefit Analysis for Power Reactor Radwaste
Systems**

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ABBREVIATIONS AND ACRONYMS

ADAMS	Agencywide Documents Access and Management System
BLS	U.S. Bureau of Labor Statistics
CFR	<i>Code of Federal Regulations</i>
FR	<i>Federal Register</i>
FY	fiscal year
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
PERT	program evaluation and review technique
RG	regulatory guide
SRM	staff requirements memorandum

REGULATORY ANALYSIS

1. INTRODUCTION

In this document, the U.S. Nuclear Regulatory Commission (NRC) presents the regulatory analysis of the NRC's proposed rule to update the dollar per person-rem conversion factor in Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Domestic Licensing of Production and Utilization Facilities." Specifically, the proposed rule would remove the requirement to use a conversion factor of \$1,000 per person-rem for cost-benefit analysis from paragraph II.D of Appendix I to 10 CFR Part 50 and replace it with an updated dollar per person-rem conversion factor. In addition, the NRC would update the regulatory guidance for applying the conversion factor contained in Regulatory Guide (RG) 1.110, Revision 1, "Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors," issued October 2013.

1.1 Statement of the Problem and Objective

1.1.1 Background

The NRC and its predecessor agency, the Atomic Energy Commission, used a conversion factor originally developed in the 1970s of \$1,000 per person-rem as the monetary valuation of the consequences associated with radiological exposure. In the 1980s, the NRC undertook an evaluation of the use of the \$1,000 per person-rem value and subsequently defined it as a surrogate for all averted offsite losses, health as well as property. The value was not discounted over time, such that a person-rem averted was worth the same dollar amount whether it was averted next year, in 10 years, or in 100 years.

The issue of establishing a monetary value for radiation dose in regulatory decisionmaking arose in 1974, during the hearing for a rulemaking addressing routine effluent releases from light-water-cooled nuclear power reactors. The subsequent rule was issued May 5, 1975 (40 FR 19441). The Commission adopted, as an interim measure, the value of \$1,000 per person-rem and \$1,000 per person-thyroid-rem for cost-benefit evaluations. The NRC codified the \$1,000 per person-rem value in paragraph II.D of Appendix I to 10 CFR Part 50 for the evaluation of a radwaste system design and its related radiological effluent releases.

In 1995, the NRC revisited the \$1,000 per person-rem value and issued NUREG-1530, "Reassessment of NRC's Dollar Per Person-Rem Conversion Factor Policy," which updated the dollar per person-rem conversion factor from \$1,000 to \$2,000, limited it to health effects, and defined the value in constant dollars subject to present worth considerations. As part of its reassessment, the NRC considered the impact of a change with regard to regulatory decisions concerning radwaste system design alternatives for nuclear power plants in accordance with Appendix I to 10 CFR Part 50. As documented in NUREG-1530, the NRC identified several reasons why regulatory decisions based on the \$1,000 per person-rem value would not need to be revisited and subsequently concluded not to amend Appendix I to 10 CFR Part 50 to incorporate the \$2,000 per person-rem value.

In 2022, the Commission approved issuance of Revision 1 to NUREG-1530, which updated the dollar per person-rem conversion factor from a constant value of \$2,000 to \$5,200 defined in 2014 dollars and adjusted annually for changes in inflation and real income growth to maintain a

constant purchasing power. Revised Staff Requirements Memorandum (SRM)-SECY-17-0017, “Revised Staff Requirements—SECY-17-0017—Proposed Revision to NUREG-1530, ‘Reassessment of NRC’S Dollar per Person-Rem Conversion Factor Policy,’” dated January 25, 2022, the Commission directed the staff to engage in rulemaking to update the dollar per person-rem value conversion factor in Appendix I to 10 CFR Part 50.

1.1.2 Problem Statement

The dollar per person-rem conversion factor contained in Appendix I to 10 CFR Part 50 is not consistent with the Commission’s revised dollar per person-rem conversion factor policy in NUREG-1530, Revision 1. Furthermore, Appendix I to 10 CFR Part 50 directs applicants to complete their cost-benefit analyses using an undiscounted conversion factor of \$1,000 per person-rem that contains no adjustment for inflation or changes in income growth to current-year dollars.

1.1.3 Objective

In SRM-SECY-17-0017, the Commission directed the staff to engage in rulemaking to update the dollar per person-rem value conversion factor in Appendix I to 10 CFR Part 50 to be consistent with the Commission’s revised dollar per person-rem conversion factor policy in NUREG-1530, Revision 1. The staff has drafted rule language necessary to do so and prepared associated updates to RG 1.110.

2. IDENTIFICATION AND PRELIMINARY ANALYSIS OF ALTERNATIVE APPROACHES

The staff has identified two alternatives for consideration. This analysis includes the “no-action” alternative to provide a baseline for determining the costs and benefits of the rulemaking.

2.1 Alternative 1—Status Quo: No Changes to Appendix I to 10 CFR Part 50 or Regulatory Guide

This alternative would not amend the regulations in Appendix I to 10 CFR Part 50. This alternative would keep the current \$1,000 per person-rem conversion factor. Applicants would continue to use RG 1.110, Revision 1, and deflate their costs to 1975 dollars in order to perform their cost-benefit analyses. The staff would continue to review applications for design approvals for radioactive waste systems submitted under this regulatory framework.

2.2 Alternative 2—Rulemaking to Amend the Dollar per Person-Rem Conversion Factor and Update Regulatory Guide 1.110

The approach under Alternative 2 would amend Appendix I to 10 CFR Part 50 to remove the \$1,000 per person-rem value and replace it with the current conversion factor value. In addition, the staff would update RG 1.110 to provide guidance on how to calculate the current dollar per person-rem conversion factor and perform cost-benefit analyses in current dollars. This alternative would ensure that Appendix I to 10 CFR Part 50 is consistent with the Commission policy in NUREG-1530. Applicants conducting a cost-benefit analysis would use current-year dollars and have guidance on a methodology for updating the dollar per person-rem conversion factor to account for inflation and changes in purchasing power.

2.3 Other Alternatives Considered

The staff considered two other alternatives that were eliminated. The first alternative considered rulemaking to eliminate the dollar per person-rem value from the rule and, instead, include the updated value in the statements of consideration within the *Federal Register* notice and in guidance. The staff would not expect this alternative to significantly reduce future rulemaking costs, as compared to Alternative 2, due to the infrequent revision of the underlying factors used to calculate the dollar per person-rem value. The staff determined that this alternative would not implement the Commission's dollar per person-rem conversion factor policy in NUREG-1530, Revision 1, as it would allow applicants to use a different conversion factor when conducting radwaste system cost-benefit analyses. As a result, the staff concluded this alternative would provide less clarity to potential applicants on what value to use when conducting radwaste system cost-benefit analyses and it may not be consistent with the Commission's direction in the SRM. The second alternative considered revising guidance without performing rulemaking, but the staff concluded that this alternative would not achieve the regulatory objective, for many of the same reasons. Therefore, the staff concluded that both of these alternatives were not viable and, as such, did not consider them further.

3. ESTIMATION AND EVALUATION OF COSTS AND BENEFITS/PRESENTATION OF RESULTS

This section describes the analysis conducted to identify and evaluate the benefits and costs of the rulemaking alternative. Section 3.1.1 identifies the attributes expected to be affected by the action. Sections 3.1.2 through 3.1.4 describe how the analysis evaluates the values and impacts. Finally, Section 3.2 presents the details of the calculations used to generate the estimated values and impacts.

3.1 Methodology

NUREG/BR-0058, draft Revision 5, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," issued February 2020, contains the methodology that governs the NRC's voluntary regulatory analysis process. The regulatory analysis identifies all attributes related to the regulatory action and analyzes them either quantitatively or qualitatively.

For this regulatory analysis, the staff developed, to the fullest extent practicable, 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 estimates of the costs and the benefits for each alternative and compares them.

In addition, to the extent that there are important qualitative considerations of factors that cannot be quantified, the staff discusses these considerations of factors in qualitative terms. Based on the consideration of each attribute, uncertainties, sensitivities, and the quantified costs and benefits, the staff will recommend the alternative that should be implemented.

3.1.1 Identification of Affected Attributes

This section identifies the components of the public and private sectors, commonly referred to as attributes, which are expected to be affected by Alternative 2, the rulemaking alternative, identified in section 2. The staff developed an inventory of the impacted attributes using the list in NUREG/BR-0058, draft Revision 5.

The rule would affect the attributes described below.

3.1.1.1 Industry Implementation

This attribute accounts for the projected net economic effect on the industry of implementing the regulatory action for all affected licensees. Under this action, the industry would review the regulations and update its processes and procedures, as necessary.

3.1.1.2 Industry Operation

This attribute accounts for the projected net economic effect on all affected licensees caused by routine and recurring activities required by Alternative 2. Under Alternative 2, licensees may incur benefits resulting from the implementation of the updated conversion factor in Table 5.

3.1.1.3 NRC Implementation

This attribute accounts for the projected net economic effect on the NRC related to placing the alternative into operation. The NRC's implementation of Alternative 2 would include the agency's cost to develop and issue the final rule and associated guidance.

3.1.1.4 NRC Operation

This attribute accounts for the projected net economic effect on the NRC caused by the routine and recurring activities required by Alternative 2. Under Alternative 2, the NRC would incur costs resulting from the implementation of the updated conversion factor in Table 7.

3.1.1.5 Regulatory Efficiency

This attribute accounts for regulatory efficiency resulting from the implementation of Alternative 2. Under Alternative 2, licensees and the NRC may incur benefits from the consistency between the NRC's guidance and its regulations when performing cost-benefit analyses.

3.1.2 Affected Entities

The staff assumes that the rulemaking alternative will affect multiple entities. The total number of entities is based on the staff's level of knowledge from publicly available information on expected applications for construction permits, combined licenses, design approvals, design certifications, and manufacturing licenses for light-water-cooled nuclear power reactors. The staff did not include applications for advanced reactors in its estimates for this proposed rule, as Appendix I to 10 CFR Part 50 is only applicable to light-water-cooled nuclear power reactors. The staff made low, medium, and high estimates of the number of license applicants within 10 years after the final rule is effective, as shown in Table 1. The affected entities for the low estimate include one application for a construction permit and one application for a combined license that the staff expects applicants will submit in the next 10 years. In the middle estimate, the staff includes applicants from the low estimate plus three additional applications. For the high estimate, the staff included the expected applicants from the middle estimate and five additional applications. In addition, the staff included two applications for design certifications in the high estimate. While it is permissible for licensees to submit cost-benefit analyses as part of the design certification process, in practice it is unlikely, so the staff only included applications for design certifications in the high estimate.

Table 1 Affected Entities

Affected Entities Estimate	Amount
Low Estimate	2
Medium Estimate	5
High Estimate	12

3.1.3 Base Year of Analysis

The base year of the analysis is fiscal year (FY) 2022. Therefore, all quantified benefits and costs will be inflated or discounted to FY 2022 dollars.

3.1.4 Labor Costs

This analysis uses various labor rates. These rates are used consistently for each alternative, and their derivations are described below.

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 2022 hourly labor rate is \$143 based on actual FY 2021 incomes, fringe benefits, and other indirect expenses.

The staff obtained licensee labor wages from national wage data available on the Bureau of Labor Statistics (BLS) website (www.bls.gov), and they are based on BLS May 2021 occupational employment statistics. Depending on the industry (e.g., manufacturing, health, and safety) and the occupation, the staff selected an appropriate 25th percentile hourly labor wage, mean hourly labor wage, and 75th percentile hourly labor wage. A weighted industry labor rate was then calculated based on the estimated number of hours per activity related to the rulemaking. The weighted industry labor rates were then inflated to FY 2022 dollars using the BLS Consumer Price Index inflation calculator to May 2022 and also increased using a multiplier of 2.0 to account for benefits (insurance premiums, pension, and legally required benefits) to calculate the burdened labor rate. Because exact hourly wages are difficult to obtain and may not be sufficiently recent, nationwide mean hourly wages are used. Table 2 lists the selected occupations, the associated wages, and the source of the information.

Table 2 Labor Costs Assumptions

Occupation	Mean Hourly Wage (2021 \$)	Source
Financial Analyst	\$45	BLS May 2021, table 13-2051, Financial Analysts
Lawyer	\$85	BLS May 2021, table 23-1011, Lawyers
Executives	\$132	BLS May 2021, table 11-1011, Chief Executives
Licensing Engineer	\$73	BLS May 2021, table 11-9041, Architectural and Engineering Managers
Licensing Manager	\$94	BLS May 2021, table 11-1021, General and Operations Managers

3.1.5 Present Value Calculations

The present value calculations 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 discount factors for the costs and benefits, it allows for future costs and benefits to be valued equally. Based on Office of Management and Budget Circular No. A-4, "Regulatory Analysis," dated September 17, 2003, and NUREG/BR-0058, present value calculations are given using both 3- and 7-percent real discount rates, while the decision rationale is based on the 7-percent real discount rate.

3.2 Alternative 2—Rulemaking

3.2.1 Industry Implementation

The industry affected entities would incur costs from the proposed and final rules. First, the affected entities' personnel would comment on the proposed rule and draft guidance and participate in public meetings. The industry would also incur costs from reading and understanding the final rule and final RG. For the purposes of this estimate, the staff assumes the following industry implementation hours listed in Table 3.

Table 3 Alternative 2 Industry Labor Mix

Activity	Number of Hours by Industry Labor Category per Entity					Total Hours per Entity
	Financial Analyst	Lawyer	Executive	Licensing Engineer	Licensing Manager	
Review Proposed Rule and Draft Guidance and Submit Comments	80	80	24	80	80	344
Review Final Rule	160	20	8	20	20	228

The staff assumes that the industry would provide comments and review draft guidance in 2023. Implementation of the rule and the RG is estimated to occur in 2025. Based on staff experience with previous cost-benefit analyses and the effects of the rulemaking, the staff anticipates that a future applicant would not be required to install additional equipment in its radwaste system as a result of this rulemaking because staff expects additional equipment will not become cost-beneficial after the rulemaking. Table 4 summarizes the industry implementation hours and costs.

Table 4 Industry Implementation Costs

Year	Activity	Entities	Industry Hours (per Entity)	Weighted Burdened Mean Wage	Net Benefits (Costs)		
					Undiscounted	3% NPV	7% NPV
2023	Proposed Rule and Guidance Review	6	344	\$170	(\$331,000)	(\$322,000)	(\$310,000)
2025	Final Rule and Guidance Implementation	6	228	\$126	(\$163,000)	(\$149,000)	(\$133,000)
Net Industry Implementation Benefits (Costs)					(\$494,000)	(\$471,000)	(\$442,000)

3.2.2 Industry Operation

Alternative 2 would have a negligible to small effect on industry operational costs when preparing cost-benefit analyses for initial licensing. Before the rulemaking, an applicant preparing the cost-benefit analyses would refer to the equipment costs contained in RG 1.110. After the rulemaking, an applicant would use its direct costs supported by invoices or manufacturer information, which may take slightly less time. The staff assumes that while implementation of the rulemaking may reduce the burden on applicants preparing the cost-benefit analysis, the reduction in labor hours would solely affect the financial analyst preparing the cost-benefit analysis and not the other personnel who review the cost-benefit analysis or the license application; these individuals are assumed to require the same level of resources during the preparation of an initial license application.

The update of the conversion factor would result in the applicant's financial analyst no longer having to use costs in 1975 dollars in order to conduct the cost-benefit analysis. The update of RG 1.110 would provide the financial analyst with a methodology to apply the conversion factor that no longer references equipment or work processes that are no longer in use, further reducing the burden on applicants. The staff provides low, medium, and high estimates of the number of hours reduced of 0 hours, 2.5 hours, and 5 hours. Table 5 summarizes the industry operation hours and benefits.

Table 5 Total Industry Operation Cost

Year	Activity	Number of Applicants	Financial Analyst			Incremental Benefits (Cost)		
			Per Entity Effort (Hours)	Total (Hours)	Wage (\$/Hour)	Undiscounted	3% NPV	7% NPV
2025 to 2034	Reduced Application Cost	6	2.5	90	\$96.29	\$1,360	\$1,230	\$1,100

3.2.3 NRC Implementation

The NRC would incur costs for rule promulgation and guidance creation. The staff provides low, medium, and high estimates of the number of hours that are needed to complete the final rule. Based on the complexity of the rule and the RG, the staff assumes that a low level of effort would require 1,143 hours, a medium level of effort would require 1,600 hours, and a high level of effort would require 2,286 hours. The staff estimates that rulemaking would require 655 hours in FY 2024 and 328 hours in FY 2025 for resolving public comments and issuing the final rule.

The staff would publish final regulatory guidance with the final rule. The staff estimates that it would require 437 hours in FY 2024 and 218 hours in FY 2025 for final RG development. Table 6 summarizes the NRC implementation hours and costs.

Table 6 NRC Implementation

Year	Activity	Effort (Hours)	Wage (\$/Hour)	Net Benefits (Costs)		
				Undiscounted	3% NPV	7% NPV
2024	Development of Final Rule	655	\$143	(\$93,700)	(\$88,300)	(\$81,900)
2025		328	\$143	(\$46,900)	(\$42,900)	(\$38,300)
2024	Development of Final RG	437	\$143	(\$62,500)	(\$58,900)	(\$54,600)
2025		218	\$143	(\$31,200)	(\$28,600)	(\$25,500)
Net NRC Implementation Benefits (Costs)		1,640		(\$234,000)	(\$219,000)	(\$200,000)

3.2.4 NRC Operation

Choosing Alternative 2 could increase operational costs for the staff, resulting in a net cost from the status quo (Alternative 1). The staff assumes that updating RG 1.110 to remove costs and allowing applicants to submit their own costs to satisfy the requirements of paragraph II.D in Appendix I to 10 CFR Part 50 may require additional staff labor hours to review those costs. The staff would also have to adjust any cost-benefit analysis for inflation and real income growth. Based on this, the staff assumes that the final rule implementation could add a number of hours per review of each applicant’s cost-benefit analysis. The staff provides low, medium, and high estimates of the increase in staff hours per application of 0 hours, 6 hours, and 12 hours, respectively, based on staff review of previous cost-benefit analyses. The staff also assumes that as the staff gains experience reviewing applications using the new guidance, the resources required to complete these reviews will decrease. The staff used a 90-percent learning curve to model this decrease. Table 7 summarizes the NRC operation costs.

Table 7 NRC Operation Cost

Year	Activity	Entities	Per Entity Increase (Hours)	Wage (\$/Hour)	Net Benefits (Costs)		
					Undiscounted	3% NPV	7% NPV
2025 to 2034	Increased Review Cost	6	6	\$143	(\$3,890)	(\$3,550)	(\$3,190)

3.2.5 Regulatory Efficiency

Alternative 2 would provide regulatory efficiency because it creates consistency of the regulations and current guidelines with the current Commission dollar per person-rem conversion factor policy. In addition, this alternative would provide instructions for applicants to perform their cost-benefit analysis using the guidance in RG 1.110.

3.2.6 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) other government entities, (8) general public, (9) improvements in knowledge, (10) safeguards and security considerations, and (11) environmental considerations.

3.3 Summary

This section provides the totals both quantitatively and qualitatively for each of the alternatives.

Table 8 Summary Table

Net Monetary Savings (or Costs)	Nonquantified Benefits and Costs
<p>Alternative 1: Status Quo: No Changes to Appendix I to 10 CFR Part 50 or RG 1.110</p> <p>\$0</p>	<p><u>Nonquantified Benefits and Costs:</u></p> <p>None</p>
<p>Alternative 2: Rulemaking to Amend the Dollar per Person-Rem Conversion Factor and Update RG 1.110</p> <p>Industry Implementation: (\$442,000) using a 7-percent discount rate (\$471,000) using a 3-percent discount rate</p> <p>Industry Operation: \$1,100 using a 7-percent discount rate \$1,230 using a 3-percent discount rate</p> <p>Industry Total: (\$441,000) using a 7-percent discount rate (\$469,000) using a 3-percent discount rate</p> <p>NRC Implementation: (\$200,000) using a 7-percent discount rate (\$219,000) using a 3-percent discount rate</p> <p>NRC Operations: (\$3,190) using a 7-percent discount rate (\$3,550) using a 3-percent discount rate</p> <p>NRC Total: (\$203,000) using a 7-percent discount rate (\$222,000) using a 3-percent discount rate</p> <p>Total Net: (\$645,000) using a 7-percent discount rate (\$692,000) using a 3-percent discount rate</p>	<p><u>Nonquantified Benefits:</u></p> <p>The rulemaking would promote regulatory efficiency by creating consistency among current regulations and guidelines and would provide applicants with a methodology to conduct their cost-benefit analyses for radwaste systems.</p> <p><u>Nonquantified Costs:</u></p> <p>If the staff has overestimated the number of future applicants affected by this rule, then the averted costs would decrease proportionally, causing the rule to be more costly.</p>

3.4 Uncertainty Analysis

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

3.4.1 Uncertainty Analysis Assumptions

The staff identified the variables contributing the greatest uncertainty to the estimated values by performing a Monte Carlo simulation using the @RISK software program.¹ Monte Carlo simulations involve introducing uncertainty into the analysis by replacing the point estimates of the variables used to represent base-case costs and benefits with probability distributions. By defining input variables as probability distributions instead of point estimates, the user can effectively model the influence of uncertainty on the analysis results (i.e., the net benefits).

The probability distribution chosen to represent each variable was bounded by the range-referenced input and the staff's professional judgment. The probability distributions used in a Monte Carlo simulation need to be characterized by summary statistics. These summary statistics include the minimum, most likely, and maximum values of a program evaluation and review technique (PERT) distribution² and of a TRIGEN distribution.³ The staff used the PERT distribution to reflect the relative spread and skewness of the distribution defined by the three estimates.

Appendix A, "Major Assumptions and Input Data," to this regulatory analysis identifies the data elements, the distributions, and the low, best, and high estimates of the data elements that the staff used in the uncertainty analysis.

3.4.2 Uncertainty Analysis Results

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

For the analysis shown in each figure below, the staff ran 10,000 simulations, changing the key variables to assess the resulting effects on costs and benefits. Figures 1, 2, and 3 display histograms of the incremental costs and benefits relative to the regulatory baseline (Alternative 1—Status Quo). The analysis shows that the rule will result in a net cost to the industry and the NRC.

¹ Information about this software is available at <http://www.palisade.com>.

² 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. Like the triangular distribution, the PERT distribution is bounded on both sides and therefore may not be adequate for modeling that needs to capture tail or extreme events.

³ A TRIGEN distribution is a special form of the triangular distribution with three points—one at the most likely value and two at the specified bottom and top percentiles.

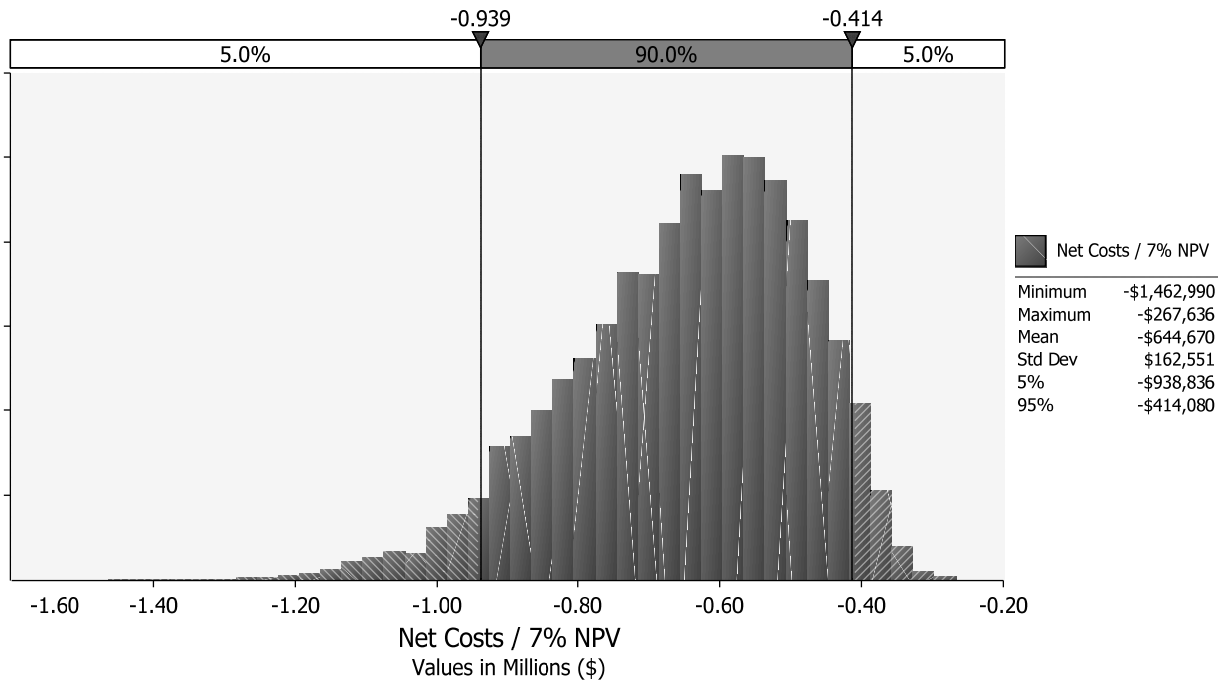


Figure 3 Net Costs (7-Percent NPV)

Table 9 9 presents descriptive statistics for the uncertainty analysis. In particular, the table shows the ranges of the output distributions, which give a clearer picture of the potential incremental costs and benefits of the proposed rule. The 5- and 95-percent values shown (rounded) in Table 9 also appear as numerical values in Figures 1, 2, and 3, above the vertical lines marking the endpoints of the 90-percent confidence intervals.

Table 9 9 Descriptive Statistics for Uncertainty Results (7-Percent NPV)

Uncertainty Results	Incremental Cost-Benefit (2022 Thousand Dollars)					
	Min	Mean	Std Dev	Max	5%	95%
Total Industry Cost	(\$1,120)	(\$441)	(\$160)	(\$115)	(\$732)	(\$215)
Total NRC Cost	(\$278)	(\$203)	(\$26.2)	(\$143)	(\$249)	(\$162)
Total Cost	(\$1,463)	(\$645)	(\$163)	(\$268)	(\$939)	(\$414)

Figure 4 shows a tornado diagram that identifies the cost drivers with the greatest impact for the proposed rulemaking. The figure ranks the top cost drivers based on their contribution to the uncertainty in cost. The largest cost driver is the number of expected entities that will submit cost-benefit analyses. The next largest cost driver is the number of hours it will take the NRC to complete rulemaking activities. After that, the next largest cost driver is the individual labor rates acting in conjunction with the next two variables that have the highest effect when calculating costs: hours for industry review of the proposed rule and guidance, and hours for industry final review and guidance implementation. The remaining key variables show diminishing variation.

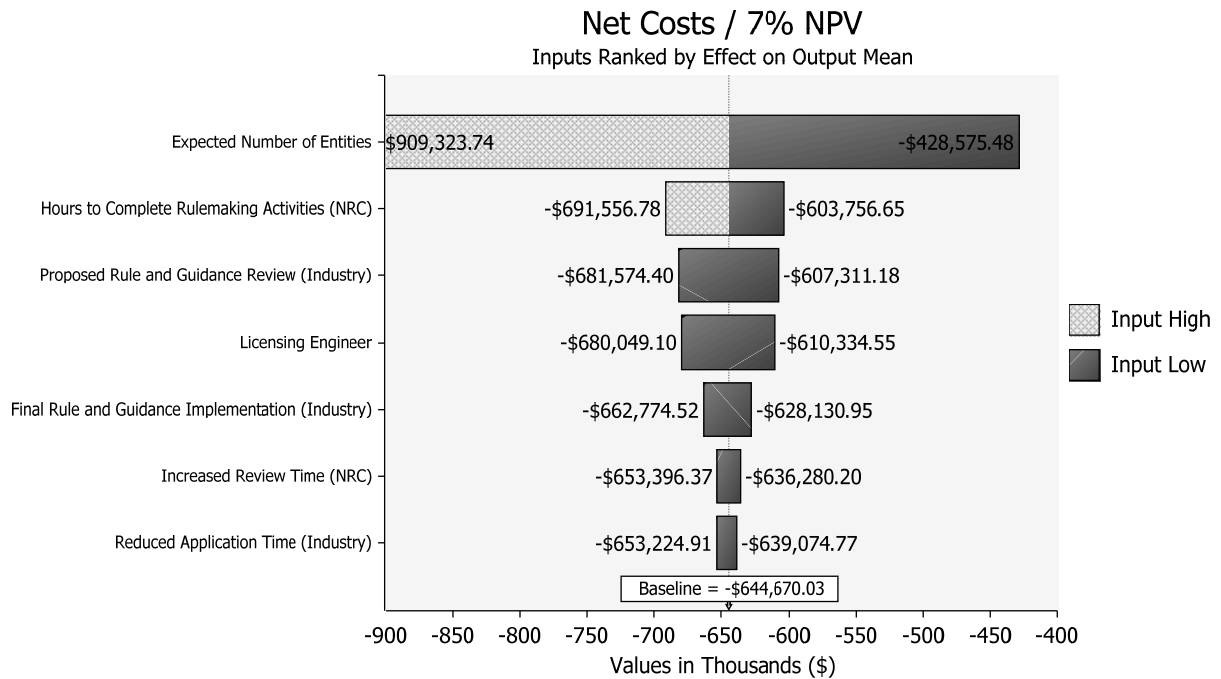


Figure 4 Tornado Diagram (7-Percent NPV)

3.4.3 Summary of Uncertainty Analysis

The uncertainty analysis shows that the estimated mean cost for this proposed rule is (\$645,000) at a 7-percent discount rate. The uncertainty analysis shows a greater than 99-percent chance that the rulemaking would not be cost effective.

3.5 Disaggregation

The NRC performed a screening review to determine whether any of the individual requirements (or set of integrated requirements) of the rule would be unnecessary to achieve the objective of the rulemaking. The objective of this rulemaking is to update the dollar per person-rem conversion factor in Appendix I to 10 CFR Part 50. Each change to the regulatory language is in support of this objective. Therefore, the NRC concludes that each of the requirements in the rule would be necessary to achieve the objective of the rulemaking.

4. DECISION RATIONALE FOR SELECTION OF PROPOSED ACTION

The decision rationale for the selection of the alternative is based on quantitative and qualitative factors for the identified affected attributes. In general, the rulemaking is not quantitatively cost beneficial. The amount of labor needed by an applicant to calculate the cost-benefit analysis using the current conversion factor is relatively small. Similarly, it is not labor intensive for the staff to review cost-benefit analyses using the current conversion factor. The quantitative costs to engage in a rulemaking would be higher than the quantitative benefits on a net basis. However, those costs are relatively low for a rulemaking due to how few revisions are needed to implement the rulemaking, as are the nominal operational costs after the rule is published, again due to the small amount of labor hours the rulemaking would affect.

The staff recommends proceeding with the rulemaking because there is qualitative value in having consistency among the NRC's regulations and published guidance and in keeping the NRC regulations up to date. The rulemaking would ensure that there is a consistent regulatory framework for using the dollar per person-rem conversion factor supporting all NRC regulatory decisions. The consistent framework would promote clarity and transparency among the public and all entities that the NRC regulates. The staff will update its recommendation based on public comment on this proposed rule document, stakeholder involvement, and Commission direction.

5. IMPLEMENTATION

This rule would become effective 30 days after the publication of the final rule in the *Federal Register* in 2025. The NRC estimates that the proposed rule would be published in 2023.

6. REFERENCES

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Office of Management and Budget, Circular No. A-4, "Regulatory Analysis, September 17, 2003.

U.S. Nuclear Regulatory Commission, "Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors," Regulatory Guide 1.110, Revision 1. October 2013, (ML13241A052).

APPENDIX A MAJOR ASSUMPTIONS AND INPUT DATA

Description	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate	Source or Basis of Estimate
Industry Burdened Labor Rates by Activity (2021 Dollars)						
Financial Analyst	\$45	TRIGEN	37.38	46.75	51.45	BLS May 2021 Wage Data (25%, mean, 75%); Labor Code 13-2051
Lawyer	\$85	TRIGEN	61.41	85.39	109.37	BLS May 2021 Wage Data (25, mean, 75); Labor Code 23-1010
Executive	\$132	TRIGEN	81.72	132.15	182.58	BLS May 2021 Wage Data (25, mean, 75); Labor Code 11-1011
Licensing Engineer	\$73	TRIGEN	61.31	77.31	85.11	BLS May 2021 Wage Data (25, mean, 75); Labor Code 11-9041
Licensing Manager	\$94	TRIGEN	72.44	94.25	116.06	BLS May 2021 Wage Data (25, mean, 75); Labor Code 11-1021
Expected Number of Entities	6	PERT	2	5	12	NRC and NEI Estimates
NRC Implementation						
Hours to Complete Rulemaking Activities	1,092	PERT	762	1,067	1,524	NRC Estimates
Industry Implementation						
Proposed Rule and Guidance Review (hours)	344	PERT	275	344	413	NRC Estimates
Final Rule and Guidance Implementation (hours)	228	PERT	182	228	274	NRC Estimates
NRC Operation						
Increased Review Time (hours)	6.00	PERT	0	6	12	NRC Estimates
Industry Operation						
Reduced Application Time (hours)	2.50	PERT	0	2.5	5	NRC Estimates

SUBJECT: REGULATORY ANALYSIS FOR THE PROPOSED RULE: COST-BENEFIT ANALYSIS FOR POWER REACTOR RADWASTE SYSTEMS (RIN 3150-AK75; NRC-2022-0048) DATED: MONTH DD, 2023

ADAMS Accession Nos: Package: ML22264A001; Regulatory Analysis: ML22264A004. *via email

OFFICE	NRR/DRA/ARCB/HP*	NMSS/REFS/RASB/CA*	NMSS/REFS/RASB/TL*	NMSS/REFS/RRPB/PM
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DATE	12/14/2022	12/14/2022	12/16/2022 CB for	12/15/2022
OFFICE	QTE*	NMSS/REFS/RRPB/RS	NMSS/REFS/RRPB/BC	NMSS/REFS/RASB/BC
NAME	KAzariah-Kribbs	GLappert-Jones	IBerrios	CBladey
DATE	10/21/2022	10/31/2022	12/19/2022	12/16/2022
OFFICE	NRR/DRA/ARCB/BC	RES/DSA/AAB	NMSS/REFS/D	NRR/DRA/D
NAME	KHsueh (JDozier for)	LBetancourt	CRegan	MFranovich (MKhanna for)
DATE	12/20/2022	11/5/2022	12/20/2022	12/20/2022
OFFICE	RES/DSA/D	OCFO	OCIO/GEMSD/FLICB/CT/CO	OGC (NLO)
NAME	KWebber	RAllwein	DCullison	BHarris
DATE	11/17/2022	11/21/2022	11/22/2022	1/19/2023
OFFICE	NMSS/D	NRR/D	EDO	
NAME	JLubinski	AVeil (AKock for)	DDorman	
DATE	2/3/2023	2/1/2023		

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