Regulatory Analysis for Revision 2 of NUREG-1757, "Consolidated Decommissioning Guidance," Volume 2, "Characterization, Survey, and Determination of Radiological Criteria"

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Abstract

The U.S. Nuclear Regulatory Commission (NRC) is revising NUREG-1757, “Consolidated Decommissioning Guidance,” Volume 2, “Characterization, Survey, and Determination of Radiological Criteria,” Revision 1, issued September 2006, to incorporate lessons learned and best practices from decommissioning experience to date. This practice increases consistency across the industry and demonstrates the NRC’s willingness to support the use of the most up-to-date and technically sound methodologies and techniques available to adequately protect public health and safety.

This document is a regulatory analysis for Revision 2 of NUREG-1757, Volume 2. The NRC’s analysis demonstrates that the revision of the NUREG results in negligible cost impacts and considerable benefits to licensees and the NRC.

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The NRC is revising NUREG-1757, "Consolidated Decommissioning Guidance, Volume 2, "Characterization, Survey, and Determination of Radiological Criteria," Revision 1, issued September 2006, to incorporate lessons learned and best practices from decommissioning experience to date. This practice increases consistency across the industry and demonstrates the NRC's willingness to support the use of the most up-to-date and technically sound methodologies and techniques available to adequately protect public health and safety.

This regulatory analysis evaluates the costs and benefits associated with the NUREG revision relative to the baseline case (i.e., the no-action alternative). The staff makes the following key findings based on this analysis:

- Cost Benefit Analysis. The revision recommended by the staff is estimated to result in minimal averted costs to the NRC and licensees. The primary source of averted costs is an expected reduction in requests for additional information (RAIs) as a result of more transparent and clear guidance. There are other potential sources of reduced costs from the changes in Revision 2; however, these were difficult to quantify and uncertain in the extent to which they would apply to each licensee. They were therefore considered qualitative benefits. The staff did not quantify any estimated costs to the NRC or licensees as a result of this update and expects that any costs will be minor. Table ES-1 shows the net averted costs to licensees and the NRC. These averted costs are conservative and do not take into account those from any potential rework that may be avoided (e.g., additional remediation or radiological surveys). Rework may result from a lack of clear guidance on expectations with respect to the timing and necessary documentation to provide reasonable assurance that license termination rule criteria can be met. Due to the difficulty of estimating licensee costs associated with rework, the staff has only quantified averted costs associated with RAI responses.

- Uncertainty Analysis. The staff conducted an uncertainty analysis that estimated averted costs to industry and the NRC range from $14,000 (minimum) to $1.13 million (95-percent confidence level) using a 7-percent discount rate, meaning the NUREG revision is cost beneficial in all simulations.

- Decision Rationale. Relative to the no-action baseline, the NRC concludes that the NUREG revision is acceptable when considering all costs and benefits, because of the non-quantified benefits and the averted costs. The analysis quantifies the current staff practice to issue RAIs when the basis for the demonstration of compliance with the license termination rule criteria is unclear or not adequately supported. Potential costs associated with rework actions (e.g., additional remediation or radiological surveys) due to a lack of clear guidance are another qualitative averted cost that should be reduced by the revision of NUREG-1757, Volume 2, and further justifies issuing this revision.

Table ES-1 Net Costs and Benefits

Attribute	Costs		
	Undiscounted	7% NPV	3% NPV
Industry Costs	$0	$0	$0
NRC Costs	$0	$0	$0
Total	$0	$0	$0
Attribute	**Benefits**		
	Undiscounted	7% NPV	3% NPV
Industry Benefits	$450,000	$350,000	$400,000
NRC Benefits	$230,000	$180,000	$200,000
Total	$680,000	$530,000	$600,000
Attribute	**Net Benefits (Costs)**		
	Undiscounted	7% NPV	3% NPV
Industry Net	$450,000	$350,000	$400,000
NRC Net	$230,000	$180,000	$200,000
Total Net	$680,000	$530,000	$600,000

Note: There may be small differences in totals due to rounding.

Abbreviations and Acronyms

ADAMS	Agencywide Documents Access and Management System
BLS	Bureau of Labor Statistics
CFR	*Code of Federal Regulations*
CPI-U	Historical Consumer Price Index for All Urban Consumers
K_d	distribution coefficient
NPV	net present value
NRC	U.S. Nuclear Regulatory Commission
PERT	program evaluation and review technique
RAI	request for additional information
SRM	Staff Requirements Memorandum

1. Introduction

This document presents the regulatory analysis for the issuance of Revision 2 of NUREG-1757, "Consolidated Decommissioning Guidance," Volume 2, "Characterization, Survey, and Determination of Radiological Criteria."

2. Statement of the Problem and Objective

2.1 Background

Since 2002, the NRC has used NUREG-1757 to detail expected decommissioning actions and standards for licensees, as described below. This NUREG revision continues that practice.

2.2 Statement of the Problem

The NRC originally published NUREG-1757, Volume 2, in September 2003 to provide decommissioning guidance to licensees and the NRC. It issued Revision 1 to Volume 2 in 2006 (NRC, 2006). Volume 2 of the NUREG specifically details dose modeling and radiological survey approaches associated with demonstrating compliance with the radiological criteria for license termination. In the nearly 15 years since the last major update to the NUREG, lessons learned from decommissioning reviews and changes in technology have provided the NRC with valuable experience and insights, necessitating an update to the NUREG. This revision identifies and addresses the following issues:

- Licensees may encounter circumstances that make it difficult to demonstrate compliance with release criteria when background variability is high relative to the cleanup criteria.

- Overly conservative dose/risk estimates may result when multiple elevated areas are present when assessing the cumulative risk associated with residual radioactivity in both the wider area and local elevated areas.

- Sampling for hard-to-detect radionuclides may become cost prohibitive, due to a lack of ability to scan for such radionuclides and the need for a relatively high sampling density to be able to detect elevated areas.

- Limited guidance on dose modeling and radiological surveys associated with sites with significant subsurface residual radioactivity could lead to uncertainty in compliance methods and costly rework (e.g., additional survey of excavated materials or reused materials).

- Uncertainty in risk-significant parameters (e.g., distribution coefficients) could lead to over- or under-predictions of risk, unnecessary or inadequate remediation, and compliance risk.

- Limited guidance on restricted release scenarios, and associated requirements to keep doses as low as reasonably achievable, could lead to inefficient reviews of more complex sites and increased compliance risk.

- Limited guidance on the use of engineered barriers as part of the compliance demonstration could lead to inefficient reviews for more complex sites and increased compliance risk.

Considering these new findings and knowledge, the NRC staff has determined that it is appropriate to update the NUREG, leveraging the decommissioning experience acquired to date. The NUREG revision will better inform licensees on decommissioning best practices, reducing the need for the staff to issue RAIs, and may reduce unplanned costs associated with rework and associated inspection costs. This analysis considers the rework and inspection averted costs qualitatively. Section 2.3 of this document discusses the various changes in this revision to the NUREG that address these and other issues.

2.3 Objective

The objective of this regulatory action is to update NUREG-1757, Volume 2, to incorporate lessons learned and best practices from recent reviews of decommissioning plans, license termination plans, and final status surveys for complex material and reactor decommissioning sites. This revision includes numerous changes to address issues discovered from this experience, including those identified in Section 2.2. The NRC has updated the NUREG primarily in the areas of dose modeling, hydrogeological and source term abstractions, exposure scenarios for buried residual radioactivity, conduct of uncertainty analysis, radiological surveys, surveys of excavations, composite sampling, surveys associated with soil reuse, and application of Scenario B (an alternative null hypothesis/scenario that assumes the site is clean until proven dirty). This section describes these changes and the issues they are meant to address.

Current guidance approaches could cause licensees to remediate residual radioactivity to levels below background if background variability is high and the derived cleanup criteria are relatively low. The updated guidance includes increased emphasis and worked-out examples for an alternative survey approach, referred to as Scenario B, for sites with relatively low cleanup levels within the range of background variability.

The NRC has also updated the guidance to address the treatment of multiple elevated areas. Overly conservative dose/risk estimates may result if multiple elevated areas are present and simplified approaches are taken (e.g., the receptor may be assumed to spend the entire occupancy period on each of the elevated areas 100 percent of the time, leading to unrealistic exposure times). The revision includes updated guidance and several pages of practical examples related to the consideration of multiple elevated areas to reduce overly conservative dose modeling assumptions.

Scan surveys are typically conducted to detect elevated areas between sampling locations. However, costs associated with sampling hard-to-detect radionuclides (i.e., radionuclides that cannot be detected easily with scan instrumentation) may start to become prohibitive due to the increased sampling density necessary to detect potential elevated areas between sampling locations. The NRC has included new guidance on composite sampling to provide a method for licensees to utilize to perform reasonable surveys that may reduce laboratory analysis costs when a large number of samples is needed.

Uncertainty in the information required to demonstrate compliance for the decommissioning criteria could lead to increased costs due to a lack of transparent guidance on data requirements associated with subsurface surveys. The revised NUREG includes updated guidance related to surveys of open excavations and the reuse of soils and other materials based on lessons learned. Additionally, it includes guidance on the use of tools such as geographic information systems and geostatistical tools available in commonly used software to provide suggested methods for the development of site conceptual models for complex sites.

The revision of NUREG-1757, Volume 2, provides various options for license termination, including unrestricted, restricted, and alternative release criteria with more stringent requirements for higher risk sites (e.g., requirements for durable institutional controls for restricted release). It uses the concept of decommissioning groups based on the potential risk significance of residual radioactivity at sites, resulting in scalable requirements. Additionally, the NUREG revision establishes an iterative approach to the process for screening sites and determining the need for additional data collection, using a level of complexity and rigor of analysis commensurate with the level of risk posed by the site. Licensees will be able to optimize resource expenditures as needed to demonstrate compliance (e.g., they can consider the costs and benefits of remediation, additional modeling, and increased radiological survey effort). The NRC provides additional flexibility by allowing a graded approach commensurate with the availability of screening values for simpler sites and site-specific analyses for more complex sites. Licensees will be able to use either a dose modeling approach or a derived concentration guideline level approach for compliance demonstration, providing further flexibility. Finally, the NUREG revision supports a risk-informed and graded approach to the use of engineered barriers.

The revision may result in additional work for licensees compared to the existing guidance with respect to support for an assumed distribution coefficient (K_d) in a dose modeling analysis. Under the current version, licensees are able to use the upper or lower quartile of the parameter distributions available in dose modeling software, whichever is more conservative. However, experience has shown that this approach may lead to overly conservative or overly optimistic results for a particular radionuclide or site, due to the lack of representativeness of the parameter distributions, which were developed generically for all types of sites. Inadequate parameter distributions have led to RAIs and additional analysis and reporting from licensees (a cost) and could also result in overly conservative values of K_d. Overly conservative K_d values could lead to unnecessary remediation costs.

Revision 2 of the NUREG describes how field, experimentally derived, or other site-specific K_d values may sometimes be necessary to obtain a more accurate estimate of the potential dose associated with a particular radionuclide. Experimentally derived K_d values in particular may result in increased costs. Each sample could cost from hundreds to thousands of dollars, and the number of samples needed, and the specific costs are site dependent. Because this approach offsets the additional analysis, reporting, and remediation that could otherwise result, the staff considers that the incremental cost or benefit of this change in the NUREG would likely be negligible to licensees but difficult to estimate.

3. Identification and Preliminary Analysis of Alternative Approaches

This section analyzes the two alternatives that the NRC considered for NUREG-1757, Volume 2: (1) do not revise the NUREG, and (2) revise the NUREG to incorporate decommissioning lessons learned and best practices.

3.1 Alternative 1—No Action

Under this alternative, the NRC would not revise NUREG-1757, Volume 2, and licensees undergoing decommissioning would continue to use Revision 1 of this NUREG. This alternative is considered the "no-action" alternative and provides a baseline condition from which any other alternatives will be assessed. This alternative would not leverage the lessons learned and best practices from decommissioning experience, and licensees would not benefit from the improvements and changes to the guidance that are planned for Revision 2.

3.2 Alternative 2—Revise NUREG-1757, Volume 2

Under this alternative, the NRC would revise NUREG-1757, Volume 2. This revision would incorporate lessons learned and best practices, resulting in the changes described above. By doing so, the NRC would ensure that the NUREG relies upon the best available information and practices.

Based on this regulatory analysis, the NRC staff concludes that a revision of NUREG-1757, Volume 2, is warranted because this alternative does the following:

- results in averted costs to industry and the NRC
- provides numerous qualitative benefits related to alternatives, flexibility, and scalability of analyses and other activities
- incorporates lessons learned and best practices from industry and NRC experience with decommissioning

Section 5 of this analysis discusses the costs and benefits of this alternative compared to the regulatory baseline (Alternative 1).

4. Estimation and Evaluation of Costs and Benefits

This section describes the process for evaluating the costs and benefits expected to result from Alternative 2 relative to the regulatory baseline (Alternative 1). This regulatory analysis monetizes costs and benefits where meaningful quantification is possible.

4.1 Identification of Affected Attributes

This section identifies the components of the public and private sectors, commonly referred to as "attributes," that the staff expects the alternatives identified in Section 3 to affect. The alternatives would apply to licensees preparing for or undergoing decommissioning activities. The NRC developed an inventory of the impacted attributes using the list provided in NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," Revision 4, issued September 2004 (NRC, 2004), as augmented with Commission direction provided in Staff Requirements Memorandum (SRM)-SECY-18-0042, "Staff Requirements—SECY-18-0042—Draft Final NUREG/BR-0058, Revision 5, 'Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission,' [NRC, 2020a]" dated July 26, 2019 (NRC, 2019).

Revision of NUREG-1757, Volume 2, would affect the following attributes:

- Industry Operation. This attribute accounts for the projected net economic effect on new applications and applicants caused by routine and recurring activities required by the alternative. The effect on industry operation would be the changes to the licensee's testing and inspection practices because of the new guidance in this NUREG revision. Some of the changes may result in an increase in burden, and some of the changes may result in a decrease in burden. For example, providing alternative approaches for lower risk sites that reduce the cost of decommissioning activities would provide a net benefit (i.e., averted cost) to licensees undergoing decommissioning. Fewer RAIs and fewer inspection activities are other examples of averted industry operation costs that could result from this NUREG revision.

- NRC Operation. This attribute accounts for the projected net economic effect on the NRC after the rule is implemented. If the NRC submits fewer RAIs and performs fewer inspection activities as a result of the modified, more risk-informed and varied alternative approaches in the NUREG, that would result in a reduction in NRC operation costs.

- Improvements in Knowledge. This attribute accounts for improvements in knowledge as industry and the NRC staff gain experience with training, qualifications, inspection, and test procedures as a result of implementing the updated NUREG.

- Regulatory Efficiency. This attribute accounts for regulatory and compliance improvements resulting from the implementation of the updated NUREG. Updating the NUREG would constitute a best practice by improving NRC regulations with lessons learned and best practices, providing licensees undergoing decommissioning with regulatory certainty through a path for compliance that is more flexible and predictable.

- Other Considerations. This attribute accounts for considerations not captured in the preceding attributes. Specifically, it accounts for how updating the NUREG would improve public confidence.

- Attributes with No Effects. Attributes not expected to be affected under either alternative include industry implementation, NRC implementation, considerations of public health (accident and routine), occupational health (accident and routine), offsite property, onsite property, other governments, the general public, safeguards and security, and the environment.

4.2 Analytical Methodology

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

The analysis evaluates industry operation and NRC operation on a quantitative basis. It evaluates the remaining three of the five affected attributes on a qualitative basis because those benefits are not quantifiable or because the data necessary to quantify and monetize the impacts on these attributes are not available.

The staff documents its assumptions throughout this regulatory analysis.

4.2.1 Regulatory Baseline

This regulatory analysis identifies the incremental impacts of Alternative 2 compared 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, Revision 4, as augmented by SRM-SECY-18-0042, which states that "in evaluating a new requirement…, the staff should assume that all existing NRC and Agreement State requirements have been implemented." Section 5 of this regulatory analysis presents the estimated incremental costs and benefits of Alternative 2 compared to this baseline.

4.2.2 Affected Entities

The NUREG revision affects 26 nuclear power and early demonstration reactors, 4 research and test reactors, 9 complex materials facilities, and part of 1 fuel cycle facility (40 entities in total) that are undergoing decommissioning or are in long-term safe storage. This regulatory analysis used these entities, including the related RAIs that the NRC has issued each year under NUREG-1757, Volume 2, as the basis for the quantitative calculations. Beyond these known entities, it is difficult to speculate about specific other entities that may enter decommissioning in the future. Therefore, this analysis uses only the aforementioned entities in quantified cost and benefit calculations.

4.2.3 Base Year

The NRC assumes that the NUREG will be effective in 2022. The staff assumes that the ongoing costs of operation related to the alternative being analyzed begin no earlier than 30 days after publication of the NUREG unless otherwise stated and models these costs on a per-applicant basis.

One-time NRC implementation costs related to NUREG changes and issuance are considered sunk costs at this stage.

4.2.4 Sign Conventions

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

4.2.5 Analysis Horizon

This NUREG will remain in effect as long as the NRC regulates decommissioned reactor licensees. This analysis assumes that all licensees will use NUREG-1757, Volume 2, Revision 2, after publication. The quantitative estimates in this analysis run through 2030, after which the number of sites entering decommissioning becomes too uncertain. Furthermore, the NRC may issue another revision to the NUREG in or soon after 2030; therefore, the staff chose to end quantitative estimates in that year.

4.3 Data

Analysts obtained qualitative (i.e., non-quantified) information on attributes affected by the alternatives from the staff and from public comments on the NUREG revision. The NRC considered the potential differences between the new guidance and the current guidance and incorporated the incremental changes into this regulatory analysis. Subject matter experts provided quantitative information on the costs of laboratory testing to determine site-specific K_d values, as well as current quantities and level of effort estimates for RAIs. The labor rate for the NRC is based on a calculation the NRC performs annually, and the labor rate for industry is a blended labor rate from the most recent data from the Bureau of Labor Statistics (BLS) (2021a, 2021b). Appendix A to this regulatory analysis shows the data inputs.

5. Results

This section presents the qualitative and quantitative results by attribute for Alternative 2, relative to the regulatory baseline (Alternative 1). As described in the previous sections, costs and benefits are quantified when possible and are shown to be either positive or negative, depending on whether the alternative has a favorable or adverse effect compared to the regulatory baseline. Those attributes that are not presented with monetary values are discussed in qualitative terms.

5.1 Industry Operation

This attribute accounts for the projected net economic effect of routine and recurring activities resulting from the update of NUREG-1757, Volume 2. The additional clarity in the NRC's guidance document may obviate the need to generate RAIs on various decommissioning activities and reports. Additionally, decreased NRC inspection activity to verify the adequacy of licensee decommissioning activities may result. The following provides examples of areas where the staff updated the guidance to include alternative methods that might reduce costs or to increase transparency on acceptable methods to demonstrate compliance with release criteria:

- The addition of Scenario B, an alternative survey approach for use when background variability is relatively high compared to the cleanup criteria, provides a benefit to licensees by avoiding a situation in which licensees are compelled to clean up to below background levels to adequately demonstrate that potential exposure meet the dose criteria.

- The new guidance on consideration of elevated areas, including practical examples, will benefit licensees by allowing them to reduce the conservatism of modeling assumptions (for example, related to unrealistic occupancy periods).

- Composite sampling provides a method to combine samples to reduce costs associated with laboratory analysis when a large number of samples is required.

- Based on lessons learned, the revised guidance clarifies expectations for surveys of excavations, reuse of soils or other materials, exposure scenarios for buried radioactivity, and surveys and dose modeling associated with subsurface soil investigations, which will decrease uncertainty in acceptable methods to demonstrate compliance with release criteria and could result in reduced costs.

Quantitative estimates for these benefits are difficult to determine; therefore, they are considered qualitatively. As previously discussed, the site-specific approaches to determining the K_d of particular radionuclides could result in both costs and benefits to licensees. Laboratory costs can be thousands or tens of thousands of dollars, depending on the number of elements to sample for. Due to the uncertainty in both the number of sites where this would apply and the particular radionuclides that would need to be examined, the staff used licensing experience to estimate that the benefits and costs of this approach would be relatively similar and did not quantify this change.

The NRC staff estimates the averted costs of no longer having to respond to as many decommissioning RAIs to range from $350,000 (using a 7-percent net present value [NPV] [discount rate]) to $400,000 (using a 3-percent NPV). Table 1 shows this estimate using a mean hourly labor rate for industry of $139 (based on BLS data) and an hourly estimate of 12 hours to respond to RAIs. This is a conservative estimate, because increased transparency in guidance may also obviate the need for costly rework and additional inspections, and those averted costs are considered qualitatively due to their uncertainty. As discussed in Section 4.2.5, the staff considered data beyond 2030 too uncertain and ended the quantitative estimate in that year. The staff considered the current number of annual RAIs related to Volume 2 of NUREG-1757 and assumed that on average the NUREG update would avert 35 percent of those RAIs.

Table 1 Industry Averted Costs from a Reduction in RAIs

Year	Activity	Averted RAIs per Year	Average Labor Hours per Request	Weighted Hourly Rate	Cost		
					Undiscounted	7% NPV	3% NPV
2022	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$50,000	$50,000
2023	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$50,000	$50,000
2024	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$40,000	$50,000
2025	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$40,000	$50,000
2026	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$40,000	$40,000
2027	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$40,000	$40,000
2028	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$30,000	$40,000
2029	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$30,000	$40,000
2030	Responding to a Reduced Number of RAIs from the NRC	15	25	$139	$50,000	$30,000	$40,000
				Total:	**$450,000**	**$350,000**	**$400,000**

5.2 NRC Operation

Many of the benefits to licensees discussed in Section 5.1 in terms of industry operation could also result in benefits for the NRC's review activities, which were also not quantified. The NRC may experience incremental averted costs due to a reduction in RAIs and inspection actions due to the additional clarity in the revised NUREG. The staff estimates the averted costs to the NRC to range from $181,000 (using a 7-percent NPV) to $200,000 (using a 3-percent NPV), at an NRC labor rate of $137 per hour and 6 hours for generating the RAIs. Table 3 shows this calculation. Inspection actions associated with these RAIs were not quantified yet should be considered qualitatively as an additional averted cost.

Table 2 NRC Averted Costs from a Reduction in RAIs

Year	Activity	Requests Reviewed per Year	Average NRC Staff Hours per Request	Weighted Hourly Rate	Benefits (Costs)		
					Undiscounted	7% NPV	3% NPV
2022	Reduced Number of RAIs Generated	15	13	$137	$26,000	$26,000	$30,000
2023	Reduced Number of RAIs Generated	15	13	$137	$26,000	$24,000	$30,000
2024	Reduced Number of RAIs Generated	15	13	$137	$26,000	$23,000	$20,000
2025	Reduced Number of RAIs Generated	15	13	$137	$26,000	$21,000	$20,000
2026	Reduced Number of RAIs Generated	15	13	$137	$26,000	$20,000	$20,000
2027	Reduced Number of RAIs Generated	15	13	$137	$26,000	$19,000	$20,000
2028	Reduced Number of RAIs Generated	15	13	$137	$26,000	$17,000	$20,000
2029	Reduced Number of RAIs Generated	15	13	$137	$26,000	$16,000	$20,000
2030	Reduced Number of RAIs Generated	15	13	$137	$26,000	$15,000	$20,000
				Total:	**$234,000**	**$181,000**	**$200,000**

5.3 Total Costs

The staff estimates averted costs to industry and the NRC ranging from $531,000 (using a 7-percent NPV) to $600,000 (using a 3-percent NPV).

Table 3 Total Averted Costs (Industry and the NRC) for Alternative 2

Attribute	Net Benefits (Costs)		
	Undiscounted	7% NPV	3% NPV
Industry Implementation	$0	$0	$0
Industry Operation	$450,000	$350,000	$400,000
Net Industry Cost	*$450,000*	*$350,000*	*$400,000*
NRC Implementation	$0	$0	$0
NRC Operation	$234,000	$181,000	$200,000
Net NRC Cost	*$234,000*	*$181,000*	*$200,000*
Net Cost:	***$684,000***	***$531,000***	***$600,000***

5.4 Improvements in Knowledge

Compared to the regulatory baseline (Alternative 1), Alternative 2 would improve guidance by providing additional information on acceptable methods to meet regulatory requirements for license termination for complex materials and reactor sites. Updates to the guidance document are based on lessons learned and best practices from recent decommissioning experience. The updates also reflect improvements in science, with additional flexibility in several areas related to dose modeling to derive cleanup levels and radiological survey approaches.

5.5 Regulatory Efficiency

By incorporating lessons learned and best practices from recent decommissioning experience, the updated guidance is expected to improve regulatory efficiency. As a result of this updated guidance, licensees undergoing decommissioning activities will better understand the NRC's requirements and should experience greater efficiencies from a resultant decrease in RAIs from the NRC. This leads to a qualitative benefit in addition to the quantitative benefit evaluated in Section 5.1.

5.6 Other Considerations—Increased Public Confidence

Public confidence will increase as a result of the NRC using lessons learned and best practices gained from experience with the review of complex material and reactor decommissioning to improve the effectiveness and efficiency of licensee review actions, as detailed above. Updating the NUREG with the changes in Revision 2 will reassure the public that the NRC continues to improve and transform into a modern, risk-informed regulator.

5.7 Uncertainty Analysis

The NRC conducted an uncertainty analysis based on the costs and averted costs of Alternative 2, using a Monte Carlo analysis. The uncertainty analysis showed that the alternative has a greater than 99-percent chance of resulting in averted costs to industry and the NRC, with a mean estimate of $538,000 using a 7-percent NPV. Appendix A shows the inputs for the uncertainty analysis. This mean differs from the previous totals due to the simulation and rounding in the model.

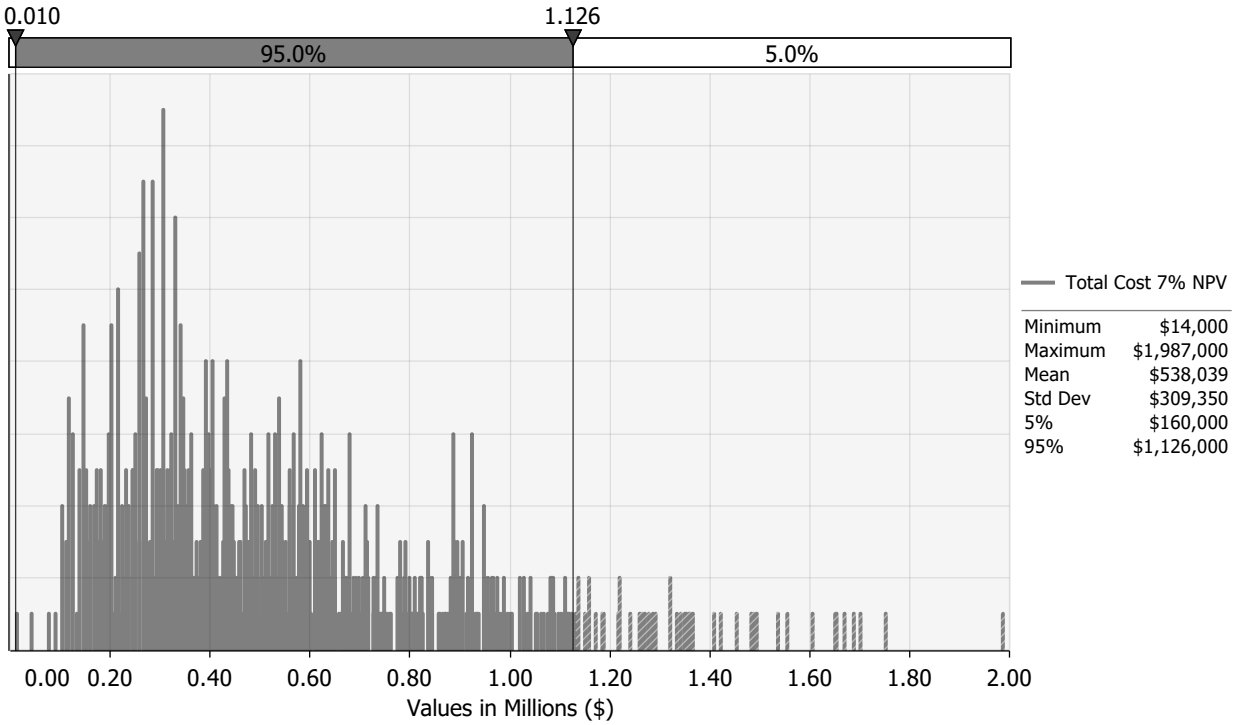

Figure 1 Total costs (industry and the NRC) for Alternative 2—7-percent NPV

5.8 Summary

This regulatory analysis identified both quantifiable and nonquantifiable costs and benefits that would result from the issuance of NUREG-1757, Volume 2, Revision 2.

5.8.1 Quantified Net Cost

The staff estimates a quantified averted cost of $531,000 (using a 7-percent NPV) as a result of issuing NUREG-1757, Volume 2, Revision 2. The uncertainty analysis has a slightly different cost-beneficial mean value of $538,000.

5.8.2 Non-quantified Benefits

The NUREG revision would produce a number of non-quantified benefits for industry and the NRC under the attributes of improvements in knowledge, regulatory efficiency, and other considerations (increased public confidence). Sections 5.4, 5.5, and 5.6 detail these benefits.

5.9 Safety Goal Evaluation

The NRC's safety goal evaluation applies only to regulatory initiatives considered to be generic safety enhancement backfits subject to the substantial additional protection standard at Title 10 of the *Code of Federal Regulations* (10 CFR) 50.109(a)(3). The NRC does not regard the changes to NUREG-1757, Volume 2, to be backfitting or to represent an inconsistency with any issue finality provisions in 10 CFR Part 52, "Licensees, Certifications, and Approvals for Nuclear Power Plants." Based on the reasons described, a safety goal evaluation is not appropriate for this regulatory analysis.

6. Decision Rationale

Table 4 provides the quantified and qualified costs and benefits for Alternative 2. The quantitative analysis used best estimate values.

Table 4 Summary of Totals

Net Monetary Savings or (Costs)— Total Present Value	Non-quantified Benefits or (Costs)
Alternative 1: No Action $0	None
Alternative 2: Issue NUREG-1757, Volume 2, Revision 2 Industry: $350,000 using a 7% discount rate $400,000 using a 3% discount rate NRC: $181,000 using a 7% discount rate $200,000 using a 3% discount rate Net Benefit (Cost): $531,000 using a 7% discount rate $600,000 using a 3% discount rate	Benefits: • **Improvements in Knowledge:** Alternative 2 would improve guidance by providing additional information on acceptable methods to meet regulatory requirements for license termination for complex materials and reactor sites. Updates to the guidance document are based on lessons learned and best practices from recent decommissioning experience. The updates also reflect improvements in science with additional flexibility in several areas related to dose modeling to derive cleanup levels and radiological survey approaches.

Net Monetary Savings or (Costs)—Total Present Value	Non-quantified Benefits or (Costs)
Alternative 2 (continued)	• **Regulatory Efficiency:** By incorporating lessons learned and best practices from recent decommissioning experience, the updated guidance is expected to improve regulatory efficiency. As a result of this updated guidance, licensees undergoing decommissioning activities will better understand the NRC's requirements and should experience greater efficiencies from a resultant decrease in RAIs from the NRC. This leads to a qualitative benefit in addition to the quantitative benefit evaluated in Section 5.1. • **Increased Public Confidence:** Public confidence will increase as a result of the NRC using lessons learned and best practices gained from experience with the review of complex material and reactor decommissioning to improve the effectiveness and efficiency of licensee review actions, as detailed above. Updating the NUREG with the changes in Revision 2 will reassure the public that the NRC continues to improve and transform into a modern, risk-informed regulator.

Issuing Revision 2 of NUREG-1757, Volume 2, in accordance with Alternative 2 will avert costs due to fewer RAIs and inspection actions, affecting both licensees and the NRC. Industry and the NRC are expected to have net averted costs of approximately $531,000 (7-percent NPV) from Alternative 2. Alternative 2 would also have the qualitative benefits of an improvement in knowledge, regulatory efficiency, and public confidence.

Considering quantified and non-quantified costs and benefits, the regulatory analysis shows that issuing NUREG-1757, Volume 2, Revision 2, is cost justified and supports the issuance of the revision to the NUREG.

7. Implementation Schedule

The NUREG will become effective upon publication, as announced in the *Federal Register*.

8. References

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NRC, 2003. NUREG-1757, “Consolidated Decommissioning Guidance,” Volume 2, “Characterization, Survey, and Determination of Radiological Criteria,” September 2003, Agencywide Documents Access and Management System (ADAMS) Accession No. ML14093A221.

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NRC, 2020b. Draft NUREG-1757, “Consolidated Decommissioning Guidance,” Volume 2, “Characterization, Survey, and Determination of Radiological Criteria,” draft Revision 2, November 2020, ADAMS Accession No. ML20273A010.

Appendix A: Major Assumptions and Input Data

Data Element	Mean Estimate	Distribution	Low Estimate	Best Estimate	High Estimate
Issue RAI (NRC)					
Weighted hourly rate (NRC)	$137				
Hours to generate RAI	13	LogNormal	2	6	50
Respond to RAI					
Weighted hourly rate (Industry)	$139.05	PERT	$110.57	$141.05	$159.56
Hours to respond to RAI	25	LogNormal	4	12	100

PERT: program evaluation and review technique
RAI: request for additional information