
Draft Regulatory Analysis for the Final Rule— Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning

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ABBREVIATIONS

AEA	Atomic Energy Act of 1954, as amended
BLS	Bureau of Labor Statistics
BWR	boiling-water reactor
CFH	certified fuel handler
CFR	<i>Code of Federal Regulations</i>
COL	combined license
CRGR	Committee to Review Generic Requirements
CSP	cybersecurity plan
DBA	design-basis accident
DBT	design-basis threat
DCSS	dry cask storage system
DTF	decommissioning trust fund
EAL	emergency action level
ECL	emergency classification level
ENO	extraordinary nuclear occurrence
EP	emergency preparedness
EPA	U.S. Environmental Protection Agency
EPZ	emergency planning zone
ERDS	Emergency Response Data System
ERO	emergency response organization
ESA	Endangered Species Act of 1973, as amended
ETE	evacuation time estimate
FEMA	Federal Emergency Management Agency
FFD	fitness-for-duty
FOCD	foreign ownership, control, or domination
FR	<i>Federal Register</i>
GWd	gigawatt-day
IFMP	irradiated fuel management plan
IMP	insider mitigation program
IOEP	ISFSI-only emergency plan
IP	inspection procedure
ISFSI	independent spent fuel storage installation
LLW	low-level radioactive waste

MTHM	metric ton of heavy metal
NEPA	National Environmental Policy Act of 1969, as amended
NHPA	National Historic Preservation Act of 1966, as amended
NLO	non-licensed operator
NPUF	nonpower production or utilization facility
NPV	net present value
NRC	U.S. Nuclear Regulatory Commission
NUREG	NRC technical report
OL	operating license
OMB	Office of Management and Budget
ORO	offsite response organization
PA	protected area
PAA	Price-Anderson Act
PAG	protective action guide
PAR	protective action recommendation
PDEP	permanently defueled emergency plan
PERT	program evaluation and review technique
PSDAR	post-shutdown decommissioning activities report
PSEP	post-shutdown emergency plan
PWR	pressurized-water reactor
RAI	request for additional information
REP	radiological emergency preparedness
RG	regulatory guide
SSC	structure, system, or component
SFP	spent fuel pool
SOC	Standard Occupational Classification
SRM	staff requirements memorandum
STA	shift technical advisor
UA	unescorted access
UAA	unescorted access authorization
VA	vital area

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) is amending its regulations related to the decommissioning of production and utilization facilities. In response to Commission direction, the NRC issued a proposed rule, “Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning,” on March 3, 2022. Based on public feedback on the proposed rule, the NRC made several high-level changes to the proposed requirements. Major provisions of the final rule include new or revised regulations in the areas of emergency preparedness; physical security; cybersecurity; drug and alcohol testing; certified fuel handler training; decommissioning funding assurance; offsite and onsite financial protection requirements and indemnity agreements; environmental considerations; record retention requirements; low-level waste transportation time; spent fuel management planning; the NRC’s Backfit Rule; foreign ownership, control, or domination; and the scope of the license termination plan requirement.

In this draft regulatory analysis, the NRC presents the costs, benefits, and other effects for the industry, the NRC, and society from the final rule. The economic impact of the changes in the above areas of decommissioning are summarized in **Table 1**.

Table 1 Decommissioning Areas of the Final Rule

Area of Decommissioning	Proposed Alternative	Total Net Benefit (Cost) ^a (2022 million dollars, 7% NPV ^b)
Emergency Preparedness	EP-2	\$2.71
Physical Security	PS-2	\$0.50
Cybersecurity	CS-2	\$0.05
Drug and Alcohol Testing	DA-2	\$0.51
Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor	CFH/STA-2	\$0.20
Decommissioning Funding Assurance	DTF-2	\$0.21
Offsite and Onsite Financial Protection	FP-2	\$0.19
Environmental Considerations	ENV-2	\$0.02
Record Retention Requirements	R-2	\$0.08
Low-Level Waste Transportation	TR-2	\$0.06
Spent Fuel Management Planning	SFM-2	\$0.00
Backfit Rule	BF-2	\$0.00
Foreign Ownership, Control, or Domination	F-2	\$0.02
Scope of License Termination Plan	T-2	\$0.00
	Total:	\$4.57

^a The total net benefit results are sensitive to the timing of when costs and benefits occur and to the discount rate for these decommissioning areas.

^b NPV = net present value.

1 INTRODUCTION

This document presents the draft regulatory analysis for the final rule, “Regulatory Improvements for Production and Utilization Facilities Transitioning to Decommissioning.” The U.S. Nuclear Regulatory Commission (NRC) substantively amended its requirements for the decommissioning of nuclear power plants in 1996. The NRC staff proposed improvements to the decommissioning requirements in 1999, but after the terrorist attacks of September 11, 2001, the NRC discontinued work on the decommissioning rulemaking and redirected resources toward higher priority work on safeguards and security. Because no reactors were planning to shut down at that time, the NRC decided there was no immediate need to complete the rulemaking. However, in 2013, four power reactor units permanently shut down and defueled without significant advance notice or preplanning. These licensees and the associated shutdown reactors were Duke Energy Florida for Crystal River Unit 3 Nuclear Generating Plant; Dominion Energy Kewaunee for Kewaunee Power Station; and Southern California Edison for San Onofre Nuclear Generating Station, Units 2 and 3. On December 29, 2014, Entergy Nuclear Operations, Inc., shut down Vermont Yankee Nuclear Power Station, and on January 12, 2015, the licensee certified that Vermont Yankee had permanently ceased operation and removed fuel from the reactor vessel. In addition, the Omaha Public Power District board of directors shut down Fort Calhoun Station on October 24, 2016. After the proposed rule was drafted, Oyster Creek Nuclear Generating Station shut down in September 2018; Pilgrim Nuclear Power Station shut down in May 2019; Three Mile Island Nuclear Station, Unit 1, shut down in September 2019; Indian Point Nuclear Generating Units 2 and 3 shut down in May 2020 and May 2021, respectively; Duane Arnold Energy Center shut down in August 2020; Palisades Nuclear Plant shut down in April 2022 (but the licensee is now working to resume operations); and Diablo Canyon Power Plant, Units 1 and 2, were planned to shut down in 2024 and 2025, respectively (but the licensee submitted a license renewal application in November 2023).

Both the licensees and the NRC expended substantial resources to process licensing actions for these power reactors during their transition period to a decommissioning status. These licensing actions came in the form of exemptions and amendments to reduce requirements no longer needed to protect public health and safety and the common defense and security for permanently shutdown reactors. To date, the NRC has not identified any safety or security concerns in the current regulatory framework for decommissioning power reactors. However, insights from the licensing activities associated with decommissioning power reactors indicate that the decommissioning process could be made more efficient, predictable, and less costly by reducing the processing of individual licensing actions and revising the NRC regulations to create a long-term regulatory framework for decommissioning. Therefore, the NRC's goal is to make appropriate regulatory changes to reduce the number of licensing actions needed for the transition to and during decommissioning, while still ensuring safety. Furthermore, the staff, consistent with Commission direction, has considered other issues deemed relevant to decommissioning as part of this rulemaking effort.

1.1 Background

Before 1988, the NRC rules did not include detailed regulations for the decommissioning of nuclear power reactors. In that year, the NRC published a final rule in the *Federal Register* (FR) (Ref. 1) establishing decommissioning requirements for various types of licensees (53 FR 24018). By the early 1990s, the NRC recognized a need for more changes to the power reactor decommissioning regulations. In 1995, it published a proposed rule to amend its regulations for reactor decommissioning (Ref. 2). In 1996, the NRC amended its regulations for reactor decommissioning to clarify ambiguities, make generically applicable certain procedures being used on a case-by-case basis, and allow for greater public participation in the decommissioning process (Ref. 3). However, as more power reactor licensees began decommissioning their reactors in the 1990s, it became apparent that the NRC should consider rulemaking on specific topics to make the decommissioning process more effective and efficient.

In a series of Commission papers issued between 1997 and 2001, the NRC staff provided options and recommendations to the Commission to address regulatory improvements related to power reactor decommissioning. In the staff requirements memorandum (SRM) to SECY-99-168, "Staff Requirements—SECY-99-168—Improving Decommissioning Regulations for Nuclear Power Plants," dated December 21, 1999 (Ref. 4), the Commission directed the NRC staff to proceed with a single, integrated, risk-informed decommissioning rule addressing the areas of emergency preparedness (EP), insurance, safeguards, staffing and training, and backfitting. The objective of this rulemaking was to clarify and remove certain regulations for decommissioning power reactors, insofar as they present less radiological risk to public health and safety and the common defense and security than operating reactors.

During reactor decommissioning, the principal safety concern is the storage of spent fuel in the spent fuel pool (SFP) or an independent spent fuel storage installation (ISFSI). Based on NRC technical report (NUREG)-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," issued February 2001 (Ref. 5), the only accident that might lead to a significant radiological release at a decommissioning reactor is a zirconium fire from an SFP accident, within a few months after the reactor has been permanently shut down. The zirconium fire scenario is a postulated, but highly unlikely, beyond-design-basis accident that involves a major loss of water inventory from the SFP, resulting in a significant heatup of the spent fuel, which leads to substantial zirconium cladding oxidation and fuel damage. The analyses of spent fuel heatup scenarios that might result in a zirconium fire take into

consideration the decay heat of the irradiated fuel stored in the SFP and the exothermic reactions of the zirconium with oxygen, water, or both. Therefore, the probability of a zirconium fire scenario continues to decrease as a function of the time that the decommissioning reactor has been permanently shut down.

With the permanent cessation of reactor operations and the permanent removal of the fuel from the reactor core, the risk of an accident at decommissioning plants and the number of events that can have significant offsite consequences are significantly reduced. Upon shutdown and fuel removal, the reactor, reactor coolant system, and supporting systems no longer operate and therefore have no function. Hence, postulated accidents involving failure or malfunction of the reactor, reactor coolant system, or supporting systems are no longer applicable for a decommissioned power reactor.

On June 28, 2000, the NRC submitted SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning" (Ref. 6), to the Commission, proposing an integrated decommissioning rulemaking plan that would amend regulations in the areas of EP, insurance, safeguards, staffing and training, and backfitting for licensees that certified, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.82(a), that they had permanently ceased facility operations and permanently removed fuel from the reactor vessel. The rulemaking plan was contingent on the completion of the zirconium fire risk study provided in NUREG-1738. NUREG-1738 does not completely rule out the possibility of a zirconium fire after extended spent fuel decay times. However, NUREG-1738 does demonstrate that it is safe to store spent fuel in a high-density configuration in SFPs, and that the risk of accidental release of a significant amount of radioactive material to the environment is extremely low.

Because of uncertainty in the NUREG-1738 conclusions about the risk of SFP fires, the NRC faced a challenge in developing a generic decommissioning rule for EP, physical security, and insurance. To seek additional Commission direction, on June 4, 2001, the NRC submitted to the Commission SECY-01-0100, "Policy Issues Related to Safeguards, Insurance, and Emergency Preparedness Regulations at Decommissioning Nuclear Power Plants Storing Fuel in Spent Fuel Pools" (Ref. 7). However, because NUREG-1738 showed the risk of an SFP fire to be extremely low, and because of the reactor security implications of the terrorist attacks of September 11, 2001, the NRC redirected its rulemaking efforts toward programmatic regulatory changes related to safeguards and security.

In SRM-SECY-14-0118, "Staff Requirements—SECY-14-0118—Request by Duke Energy Florida, Inc., for Exemptions from Certain Emergency Planning Requirements," dated December 30, 2014 (Ref. 8), the Commission directed the NRC staff to proceed with rulemaking on reactor decommissioning. The Commission also stated that this rulemaking should address the following:

- Issues discussed in SECY-00-0145, such as the graded approach to EP.
- Lessons learned from the plants that had already (or were currently) going through the decommissioning process.
- The advisability of requiring a licensee's post-shutdown decommissioning activities report (PSDAR) to be approved by the NRC.
- The possibility of maintaining the three existing decommissioning options and the associated timeframes.

-
- The role of State and local governments and nongovernmental stakeholders in the decommissioning process.
 - Any other issues deemed relevant by the NRC.

In SECY-15-0014, “Anticipated Schedule and Estimated Resources for a Power Reactor Decommissioning Rulemaking,” dated January 30, 2015 (Ref. 9), the NRC committed to proceeding with a rulemaking on reactor decommissioning. The NRC issued a draft regulatory basis on March 15, 2017 (Ref. 10), and the associated regulatory analysis on May 9, 2017 (Ref. 11), for public comment. After receiving public comments, the NRC issued the final regulatory basis on November 27, 2017 (Ref. 12). The agency also issued the associated regulatory analysis in January 2018 (Ref. 13). The NRC published the proposed rule for this rulemaking (Ref. 14), and the associated regulatory analysis (Ref. 15), in February 2022. In response to public comments, the NRC modified the rule language and associated supporting documents to create this draft final rule and regulatory analysis.

1.2 Statement of the Problem

Once a licensee enters the decommissioning phase, certain regulations that applied during the operating phase may no longer be necessary, owing to the shutdown condition of the plant. During its review of the overall decommissioning regulations, the NRC identified areas where the existing regulations could be updated or clarified to be more consistent with, or more appropriately reflect, the requirements necessary to maintain reasonable assurance of adequate protection of public health and safety and the common defense and security at a decommissioning power reactor. These areas are discussed in more detail below, along with the regulatory changes in the final rule.

In developing the regulatory basis, the NRC explored multiple alternatives for each area of decommissioning, including developing guidance, pursuing rulemaking, and maintaining the status quo. Pursuant to 10 CFR 50.12, “Specific exemptions,” the Commission may grant exemptions from regulations if the Commission determines the exemptions are authorized by law, will not present an undue risk to public health and safety, and are consistent with the common defense and security, and when special circumstances are present, such as when application of the regulation is not necessary to achieve the underlying purpose of the rule. Experience has demonstrated that licensees for decommissioning power reactors seek multiple exemptions and license amendments per site to establish a long-term licensing framework for decommissioning. By issuing a decommissioning rule, the NRC will modify its regulations commensurate with the reduced risk associated with permanently shutdown and defueled reactors, while maintaining safety and security at sites transitioning to decommissioning, without needing to grant exemptions, approvals, or license amendments in certain areas (e.g., EP, physical security, certified fuel handler (CFH) training, decommissioning financial assurance, and onsite/offsite liability insurance).

1.3 Objectives

The objectives for the decommissioning rulemaking include the following:

- Continue to provide reasonable assurance of adequate protection of public health and safety and the common defense and security at decommissioning power reactor sites.
- Provide clear and appropriate requirements for decommissioning power reactors.

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- Codify the resolution of those issues that are generically applicable to all decommissioning power reactors and have previously required exemptions or license amendments.
 - Identify, define, and resolve additional areas of concern related to the regulation of decommissioning power reactors.

1.4 Sections in the Final Rule

The following list shows how each section of this draft regulatory analysis document corresponds to the technical areas discussed in the final rule, Section III, "Scope of the Final Rule":

- Section 4.1 corresponds to Section A, "Emergency Preparedness."
- Section 4.2 corresponds to Section B, "Physical Security."
- Section 4.3 corresponds to Section C, "Cybersecurity."
- Section 4.4 corresponds to Section D, "Drug and Alcohol Testing."
- Section 4.5 corresponds to Section E, "Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor."
- Section 4.6 corresponds to Section F, "Decommissioning Funding Assurance."
- Section 4.7 corresponds to Section G, "Offsite and Onsite Financial Protection Requirements and Indemnity Agreements."
- Section 4.8 corresponds to Section H, "Environmental Considerations."
- Section 4.9 corresponds to Section I, "Record Retention Requirements."
- Section 4.10 corresponds to Section J, "Low-Level Radioactive Waste Transportation."
- Section 4.11 corresponds to Section K, "Spent Fuel Management Planning."
- Section 4.12 corresponds to Section L, "Backfit Rule."
- Section 4.13 corresponds to Section M, "Foreign Ownership, Control, or Domination."
- Section 4.14 corresponds to Section N, "Clarification of Scope of License Termination Plan Requirement."

2 DECOMMISSIONING INPUTS

The purpose of this section is to define the inputs that support the definition of the alternatives and the cost-benefit analysis.

2.1 Decommissioning Levels

The NRC is amending its regulations to provide an efficient regulatory framework for decommissioning, using a graded approach for certain technical areas. This graded approach is commensurate with the reductions in radiological risk at four levels of decommissioning:

- (1) permanent cessation of operations and removal of all fuel from the reactor vessel,
- (2) sufficient decay of fuel in the SFP so that it would not reach ignition temperature within 10 hours under adiabatic heatup conditions, (3) transfer of all spent fuel to dry storage, and
- (4) removal of all fuel from the site. These levels are discussed further in the subsections below.

2.1.1 Level 1

Level 1 begins after the NRC docket the licensee's certifications of permanent cessation of operations and permanent removal of the fuel from the reactor vessel pursuant to 10 CFR 50.82, "Termination of license," or 10 CFR 52.110, "Termination of license." In Level 1, a decommissioning reactor is defueled and permanently shut down, but the spent fuel in the SFP is still susceptible to a zirconium fuel cladding fire within 10 hours under adiabatic heatup conditions if the SFP is unexpectedly drained. This configuration encompasses the period from immediately after the core is removed from the reactor to just before the decay heat of the hottest fuel assemblies is low enough that no rapid zirconium oxidation would take place within 10 hours. The NRC staff has determined that a baseline decay time period of 10 months for a boiling-water reactor (BWR) or 16 months for a pressurized-water reactor (PWR) conservatively bounds the anticipated decay time for the operating fleet at the time of this rulemaking.

Therefore, the final rule establishes these two time periods as the default time licensees will remain in Level 1, for reactors that operated using fuels with zirconium cladding at a burnup of less than or equal to 72 gigawatt-days per metric ton of heavy metal (GWd/MTHM), averaged across the assembly. During these time periods, an appropriate level of EP must be maintained to respond to applicable design-basis accidents (DBAs) and to ensure a prompt response to the low-likelihood possibility that a rapid draindown of the SFP could cause a subsequent zirconium fire and release in less than 10 hours. Licensees may submit an analysis to support a shorter decay time period, just as in the regulatory baseline, and they are required to submit this analysis if the burnup exceeds the fuel characteristics specified above.

The applicable sections below discuss in more detail the regulatory change implementing these two decay time periods, for the areas of decommissioning affected by the decay time periods.

2.1.2 Level 2

In Level 2, the reactor is defueled and permanently shut down, and spent fuel in the SFP has decayed and cooled sufficiently so that it cannot heat up to clad ignition temperature within 10 hours under adiabatic conditions. In this configuration, the spent fuel can be stored long-term in the SFP. The NRC anticipates that spent fuel in Level 2 will be stored in the SFP for at least 5 years after being moved there from the reactor vessel. In addition, the site may possess a radioactive inventory of liquid radiological waste, radioactive reactor components, and contaminated structural materials. The radioactive inventory during Level 2 may change, depending on the licensee's proposed shutdown activities and schedule.

2.1.3 Level 3

The NRC anticipates that in Level 3, more than 5 years have elapsed since the reactor permanently ceased operation and was defueled, and all spent nuclear fuel is in dry cask

storage (e.g., in an ISFSI). A licensee decision to transfer all fuel to an ISFSI is based, in part, on such plant-specific factors as the timing and method of plant decommissioning, the preexistence of a licensed ISFSI, and the anticipated start of fuel shipments to a Federal high-level waste repository or a monitored retrievable storage facility. To evaluate the potential effects of alternatives considered in this analysis, the NRC assumed that the spent fuel is stored in an onsite ISFSI for 16 years before being transmitted to either an offsite ISFSI or a permanent geologic repository. This is based on a decommissioning proposal from the World Nuclear Association for transferring all spent fuel to a U.S. Department of Energy long-term storage repository (Ref. 16).

2.1.4 Level 4

In Level 4, all spent nuclear fuel has been removed from the site. The site may possess a radioactive inventory of liquid radiological waste, radioactive reactor components, and contaminated structural materials. The radioactive inventory during this configuration may change, depending on the licensee's proposed decommissioning activities and schedule. In Level 4, there are no credible accident sequences that can result in significant offsite radiological consequences. Therefore, the potential accidents that could occur during the decommissioning of a nuclear power reactor in Level 4 have negligible offsite and onsite consequences.

3 IDENTIFICATION OF AFFECTED ATTRIBUTES

An inventory of affected attributes can be found in section 5 of NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," Revision 5 (draft final), dated January 2020 (Ref. 17). These attributes are as follows:

- Industry Implementation: This attribute accounts for the one-time projected net economic effect on the affected licensees of implementing the rulemaking objectives.
- Industry Operation: This attribute accounts for the projected net economic effect of routine and recurring activities that involve all affected licensees. The economic effect includes procedural and administrative activities to process license amendments and exemptions.
- NRC Implementation: This attribute accounts for the one-time projected net economic effect on the NRC of placing the rulemaking alternative into operation.
- NRC Operation: This attribute accounts for the projected net economic effect on the NRC of routine and recurring activities after the rulemaking action is implemented. The economic effect includes procedural and administrative activities to process license amendments and exemptions.
- Environmental Considerations: This attribute accounts for environmental improvements resulting from the implementation of the rulemaking alternative relative to the regulatory baseline that have not been addressed through a generic or programmatic environmental impact statement or environmental assessment.
- Regulatory Efficiency: This attribute accounts for regulatory and compliance improvements resulting from the implementation of the rulemaking alternative, relative to the regulatory baseline.

4 IDENTIFICATION AND ANALYSIS OF ALTERNATIVES FOR THE DECOMMISSIONING AREAS

The NRC considered the following general approaches to address the regulatory problem identified in section 1.2:

- Alternative 1: Take no action.
- Alternative 2: Amend the decommissioning requirements through rulemaking.

This section considers 14 areas related to decommissioning individually. The discussion of each area covers the above alternatives, the assumptions for the alternatives, and the affected attributes.

4.1 Emergency Preparedness

The EP requirements in 10 CFR 50.47, “Emergency plans,” and Appendix E, “Emergency Planning and Preparedness for Production and Utilization Facilities,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” continue to apply to a nuclear power reactor after permanent cessation of operations and removal of fuel from the reactor vessel. Currently, no explicit regulatory provisions distinguish EP requirements for a power reactor that has permanently ceased operations from those for an operating power reactor. To establish a level of EP commensurate with the risk at a decommissioning site, licensees request exemptions from the regulatory EP requirements early in the decommissioning process, and the NRC thoroughly reviews each request on a case-by-case basis.

The NRC has previously approved exemptions from the emergency planning regulations in 10 CFR 50.47 and Appendix E to 10 CFR Part 50 at permanently shutdown and defueled power reactor sites. The agency granted these exemptions based, in part, on the NRC’s determination that the spent fuel at the decommissioning licensee’s facility had sufficiently decayed to eliminate applicable design-basis events that could result in an offsite radiological release exceeding the limit of 1 rem at the exclusion area boundary established by the U.S. Environmental Protection Agency’s (EPA’s) early phase protective action guides (PAGs).

The NRC also relied on analyses that showed that a beyond-design-basis zirconium fire in the SFP is highly unlikely. This conclusion was based on the amount of time necessary before the spent fuel could reach the zirconium ignition temperature during an SFP draindown event. Based on reasonably conservative adiabatic heatup calculations, a minimum of 10 hours for the time to heat up to zirconium ignition temperature has been used as part of the basis to support the approval of exemptions from portions of the EP regulations. The 10-hour period allows for the licensee to take onsite mitigation measures or, if necessary, for offsite authorities to take appropriate response actions using an all-hazards approach emergency management plan.

Between 1987 and 1999, the NRC issued exemptions from EP requirements for 10 licensees. Since 2014, additional site-specific exemptions have been issued.¹ These exemptions relieved the licensees from the requirements of 10 CFR 50.47 and Appendix E to 10 CFR Part 50 as they pertain to offsite radiological emergency preparedness (REP), including the requirement to

¹ Examples of the exemptions include exemptions for Kewaunee Power Station (Ref. 18); Crystal River Unit 3 Nuclear Generating Plant (Ref. 19); San Onofre Nuclear Generating Station, Units 2 and 3 (Ref. 20); and Vermont Yankee Nuclear Power Station (Ref. 21).

maintain the 10-mile plume exposure pathway and the 50-mile ingestion pathway emergency planning zones (EPZs). Licensees were required to have sufficient trained personnel on shift and to maintain an onsite emergency plan addressing the classification of an emergency, notification of emergencies to licensee personnel and offsite authorities, and coordination with designated offsite government officials following an event declaration so that, if needed, offsite authorities may implement appropriate response actions.

Because no explicit regulatory provisions distinguish EP requirements for a nuclear power reactor that has permanently ceased operations from those for an operating power reactor, the NRC is amending the EP requirements in 10 CFR Part 50, including 10 CFR 50.47; 10 CFR 50.54(q) and (t); and Appendix E to 10 CFR Part 50, and adding alternative requirements in the new section 10 CFR 50.200, "Power reactor decommissioning emergency plans." The objectives of this rulemaking are to: (1) define the level of EP appropriate for a decommissioning nuclear power plant site from the time of permanent cessation of operations until such time as no EP is required, and (2) minimize the need for licensees to submit, and the NRC to review, requests for exemptions from EP regulations to obtain relief from requirements that are no longer necessary.

4.1.1 Alternative EP-1 (No-Action Alternative)

Under the no-action alternative, the EP requirements in 10 CFR 50.47, 10 CFR 50.54(q) and (t), and Appendix E to 10 CFR Part 50 would remain unchanged and would continue to apply to a nuclear power reactor after permanent cessation of operations and removal of fuel from the reactor vessel. Every nuclear power reactor licensee would have to establish and maintain emergency plans and preparedness in accordance with these regulations, which include standards for both onsite and offsite emergency response plans, based on an anticipated prompt response to a wide spectrum of events.

A decommissioning site has far fewer potential accidents that can have significant offsite consequences than an operating reactor, and these potential accidents are dominated by the zirconium fire scenario. The current regulations do not address the fact that there is considerably more time to respond to a postulated zirconium fire incident at a decommissioning site than there is to respond to a postulated accident at an operating reactor.

Because certain EP requirements designed for operating reactors impose a regulatory burden on licensees undergoing decommissioning that is not necessary to protect public health and safety, licensees generally request exemptions from these requirements. The current exemption process is described in NSIR/DPR-ISG-02, "Interim Staff Guidance: Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants," dated May 11, 2015 (Ref. 22). Under this process, exemptions to offsite EP requirements must be supported by a number of analyses, including a site-specific analysis demonstrating that fuel stored in the SFP would not reach the zirconium ignition temperature in less than 10 hours following a beyond-design-basis accident that involves a major loss of water inventory from the SFP. Therefore, each such exemption request requires extensive analysis by the licensee and review by the NRC. The no-action alternative would not relieve the burden imposed on licensees and the NRC by this case-by-case exemption process. In addition, while the NRC could enhance the exemption process, doing so would not lead to the efficiency gains possible through Alternative EP-2. Regulatory Guide (RG) 1.184, "Decommissioning of Nuclear Power Reactors," Revision 1, describes the current decommissioning process and shows that most of the administrative burden incurred by licensees and the NRC is in the first several years of decommissioning (Ref. 23).

The NRC's approval of requests for exemption from certain requirements of 10 CFR 50.47 and Appendix E to 10 CFR Part 50 allows licensees to begin establishing a permanently defueled emergency plan (PDEP) and a permanently defueled emergency action level (EAL) scheme. A licensee could submit the PDEP to the NRC for prior review and approval, in which case the NRC would document its determination on the PDEP in a safety evaluation report. NRC approval of the PDEP would indicate that the NRC maintains reasonable assurance that adequate protective measures can and will be taken in a radiological emergency and would provide an approved emergency plan as a licensing basis against which to compare future changes. Alternatively, the licensee could determine that adopting the PDEP would not reduce the effectiveness of its emergency plan per 10 CFR 50.54(q), because of the change in the plant licensing basis due to the granting of the exemption request; in this case, the licensee could implement the change without prior NRC review and approval. As for the permanently defueled EAL scheme, its adoption is considered to be a scheme change, and per the requirements of Section IV.B.2 of Appendix E to 10 CFR Part 50, the licensee would submit it to the NRC for prior review and approval as a license amendment request pursuant to 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit."

4.1.2 Alternative EP-2 (Rulemaking to Amend Regulations to Provide a Graded Approach to Emergency Preparedness/Emergency Plan Changes between Levels with NRC Approval)

Under this alternative, the NRC would establish a graded approach to EP in new 10 CFR 50.200 that is commensurate with the reductions in radiological risk at the four levels of decommissioning discussed in section 2.1. The levels and areas of EP requirements are discussed below. This alternative differs from Alternative EP-1 because under the latter, EP requirements are reduced only if exemptions are requested by licensees and approved by the NRC.

Level 1: Post-Shutdown Emergency Plan

Licensees would enter Level 1 after the NRC docket their certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1) or 10 CFR 52.110(a). A post-shutdown emergency plan (PSEP) under 10 CFR 50.200(a) would provide a transition period from the EP requirements for an operating reactor to the requirements for a decommissioning site where the spent fuel has decayed for at least 10 months for a BWR or 16 months for a PWR. This transition would reduce the regulatory burden associated with EP requirements that are no longer necessary at a permanently shutdown and defueled power reactor facility. For this regulatory analysis, the NRC estimates that licensees will remain in Level 1 for a period of 10 months (for BWRs) or 16 months (for PWRs) from the date of permanent cessation of operations. As discussed in section 2.1.1, these time periods are based on a burnup of less than or equal to 72 GWd/MTHM; a licensee that exceeded this burnup before decommissioning would have to calculate decay time using NRC guidance to determine the time period and seek NRC approval of that decay period. This calculation is the same as that being performed under the regulatory baseline by licensees seeking to transition from EP requirements for an operating reactor to a PDEP, and it would apply to any such licensee with a higher burnup under the regulatory baseline. Therefore, there is no incremental cost due to this requirement in the final rule. Furthermore, by providing the limiting burnup value, the NRC could avert costs for any licensee that decides not to perform the calculation but instead to use the 10- or 16-month time period in the final rule, because its burnup is within the limit. This benefit is considered qualitatively in this regulatory analysis.

The following discussion addresses requirements that the NRC is amending or creating to support a transition from Level 1 to a Level 2 PDEP while still providing for adequate protection of public health and safety during the transition period.

PSEP Staffing and Emergency Response Organization

The final rule allows a licensee transitioning to Level 1 under 10 CFR 50.200(a) to revisit staffing levels and the staffing analysis performed under Section IV.A.9 of Appendix E to 10 CFR Part 50 for the emergency response organization (ERO), in order to align staffing with the reduced spectrum of credible accidents for a permanently shutdown and defueled power reactor facility. The new requirement acknowledges that there are fewer credible accidents requiring a response from the ERO at a facility that is permanently shutdown and defueled than at an operating reactor, and that the principal public safety concern involves the radiological risks associated with the storage of spent fuel onsite in the SFP. The reactor, reactor coolant system, and reactor support systems are no longer in operation and have no function related to the storage of spent fuel, so postulated accidents involving their failure or malfunction are no longer applicable. Therefore, certain ERO positions and emergency functions as detailed in table B-1 of NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Revision 2, issued December 2019 (Ref. 24), may not be applicable or necessary in Level 1 under a PSEP. Commensurate with the reduced spectrum of credible accidents, the NRC is changing the guidance on ERO staffing levels for Level 1. The NRC is issuing a guidance document, RG 1.235, "Emergency Planning for Decommissioning Nuclear Power Reactors," as part of this rulemaking (Ref. 25).

PSEP Emergency Action Levels

Section IV.C of Appendix E to 10 CFR Part 50 requires licensees to develop a set of EALs based not only on onsite and offsite radiation monitoring information but also on readings from a number of sensors that indicate a potential emergency, such as the pressure in containment and the response of the emergency core cooling system. The final rule amendment to add 10 CFR 50.54(q)(9)(ii) allows licensees transitioning to Level 1, notwithstanding whether they implement the requirements of 10 CFR 50.200(a), to revise individual EALs consistent with the profile of a permanently shutdown and defueled power reactor facility. Although there may be no credible event that could result in significant radiological release beyond the site boundary when a facility enters Level 1, the purpose of Level 1 is to ensure that adequate EP is in place to ensure a prompt response even if a highly unlikely event should occur. RG 1.235 provides guidance for a licensee for a permanently shutdown and defueled power reactor facility desiring to make individual EAL changes.

PSEP Evacuation Time Estimate Studies

Section IV.3 of Appendix E to 10 CFR Part 50 requires licensees to use evacuation time estimates (ETEs) in the formulation of protective action recommendations (PARs) and to provide the ETEs to State and local governmental authorities for use in developing offsite protective action strategies. Licensees must update ETEs periodically in accordance with 10 CFR 50.47(b)(10) and Sections IV.4, IV.5, and IV.6 of Appendix E to 10 CFR Part 50. In a 2011 final rule, "Enhancements to Emergency Preparedness Regulations" (EP Final Rule) (Ref. 26), the NRC amended its regulations on ETEs to require licensees to periodically assess changes to the EPZ population. As a result, licensees are required to update their ETE analysis after every decennial census and at any time during the decennial period when the EPZ

permanent resident population increases so as to increase the longest ETE value for specific zones by 25 percent or 30 minutes, whichever is less.

The NRC concludes that updates to the ETE during Level 1 would provide limited benefit for the enhancement of protective action strategies or offsite evacuation planning. Even if the criteria for updating the ETE analysis were met within the Level 1 timeframe, updating an ETE report could take several months of analysis. After the ETE is updated, the regulations in Section IV.6 of Appendix E to 10 CFR Part 50 require another 180 days before the updated ETE can be used to inform PARs and offsite protective action strategies. The time needed to develop and implement a revised protective action strategy could exceed the time that the facility would spend in Level 1, and would also be counter to the purpose of Level 1 as a transition period during the decommissioning process. Additionally, based on the NRC's review of submitted ETEs, population changes within a period comparable to the Level 1 timeframe are unlikely to change ETEs enough to affect the formulation of protective action strategies. Because formal offsite REP planning and preplanned PARs for evacuations in response to a radiological emergency would not be required in Level 2 (see discussion below), updates to the ETE during Level 1 would provide almost no benefit. For these reasons, the NRC is amending 10 CFR Part 50, Appendix E, Section IV.4, to clarify that the ETE requirements of paragraphs 4, 5, and 6 of 10 CFR Part 50, Appendix E, Section IV, would no longer be applicable to licensees after the NRC docket their certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel, notwithstanding whether they implement the requirements of 10 CFR 50.200(a). Existing ETE analyses would remain effective within the emergency plan.

PSEP Annual Dissemination of Public Information

Section IV.D.2 of Appendix E to 10 CFR Part 50 currently requires licensees to annually disseminate basic emergency planning information to the public within the plume exposure pathway EPZ. Several commenters stated that this requirement should no longer apply to decommissioning sites. Section II.G of NUREG-0654/FEMA-REP-1, Revision 2 contains criteria for the contents of the annual dissemination of public information, including educational information on radiation, points of contact, protective measures, and information for populations with special needs. Most of this information is unlikely to change from year to year, and EPZ residents will have had adequate opportunity to become aware of it during the period of plant operation. Therefore, starting in Level 2, and consistent with the removal of requirements for formal offsite REP for decommissioning sites (including the removal of EPZ requirements), the NRC is not requiring annual dissemination of public information. However, in Level 1, the change in the plant's operating status and the ensuing changes to the EP program necessitate a final dissemination of information to the public, to explain the decommissioning process and the resultant changes to the onsite and offsite EP that are likely to occur over the next several years. Although the NRC is not issuing regulatory changes related to disseminations of public information in Level 1, it is issuing RG 1.235 in conjunction with this final rule to provide guidance on one method acceptable to the NRC for the final dissemination of information for licensees with PSEPs.

PSEP Drill and Exercises

Section IV.F of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(14) include requirements for periodic drills and exercises for licensees. Given the very low probability of DBAs or other events that could result in radiological releases exceeding the limits in the EPA PAGs, as well as the time available to initiate mitigation measures consistent with plant conditions, the

previously routine progression to a General Emergency in power reactor site exercise scenarios is not applicable to a decommissioning site. Therefore, the licensee would not be expected to demonstrate response to as wide a spectrum of events as it was during its operating phase. Beginning in Level 1, exercise scenarios could be reduced commensurate with the permanent cessation of power reactor operations and removal of fuel from the reactor vessel to reflect a smaller suite of potential accident scenarios.

Section IV.F.2.c of Appendix E to 10 CFR Part 50 also requires that offsite REP plans for each site be exercised biennially, with full or partial participation² by each offsite authority having a role under the radiological emergency plan. Depending on when the licensee starts the decommissioning process, an offsite exercise could potentially be required during Level 1. As the risk of an accident resulting in a radiological release offsite is significantly reduced in Level 1 and because regulatory standards for offsite REP programs would not apply in Level 2, there would be limited benefit to performing exercises simulating a release with offsite consequences during Level 1. Therefore, the scenario need not be based on a radiological release with significant offsite consequences. Under Alternative EP-2, the final rule and RG 1.235 clarify the timing and scope of offsite exercises in relation to the licensee's exercise cycle and the timeline for decommissioning.

PSEP Emergency Response Data System

Section VI of Appendix E to 10 CFR Part 50 outlines a set of system, testing, and implementation requirements for the Emergency Response Data System (ERDS). The ERDS transmits near-real-time electronic data directly between the licensee's onsite computer system and the NRC Operations Center. Nuclear power reactors that are shut down permanently or indefinitely are currently not required to provide hardware to interface with the NRC receiving system under 10 CFR Part 50, Appendix E. The NRC is not making any changes to the ERDS requirements.

Hostile Action Requirements

In the 2011 EP Final Rule, the NRC amended its regulations to include enhancements to EP in response to a hostile action event. In Appendix E to 10 CFR Part 50, Section IV.B.1 includes providing EALs for hostile actions, Section IV.E.8.d includes alternative facilities for the staging of ERO personnel, Section IV.I provides for protective actions for onsite personnel, and Sections IV.F.2.c.4 and IV.F.2.i include hostile action scenarios in drills and exercises. These EP requirements related to hostile actions are separate and distinct from the physical protection regulations in 10 CFR Part 73, "Physical Protection of Plants and Materials." As discussed below, hostile action requirements would not apply to decommissioning sites that have progressed to Level 2. The NRC has determined that, given the condition of the facility in Level 1, it is prudent to maintain provisions for hostile actions within onsite and offsite radiological emergency plans during Level 1. Consequently, the NRC maintains EP requirements related to hostile actions during Level 1 in the final rule.

Level 2: Permanently Defueled Emergency Plan

For plants that have permanently shut down and defueled, the EP approach for Level 2 is based primarily on the following conditions: (1) a postulated radiological release would not exceed the

² The terms "full participation" and "partial participation" are defined in 10 CFR Part 50, Appendix E, footnotes 4 and 5, respectively.

EPA PAGs at the exclusion area boundary for DBAs applicable to a permanently shutdown and defueled reactor, and (2) sufficient time would exist to take prompt mitigative actions in response to a postulated zirconium fire accident scenario in the SFP and, if warranted, for offsite officials to take appropriate response actions to protect public health and safety using an all-hazards emergency management plan.

The NRC's analysis of spent fuel decay times provided information on fuel heatup time to 900 degrees Celsius as a function of cooling time for both PWR and BWR fuel assemblies, taking into account sensitivities to the mass of the racks and the fuel configuration in the SFP. Based on this analysis, the NRC concludes that after a cooling period of 10 months for a BWR or 16 months for a PWR, the spent fuel cannot reasonably heat up to clad ignition temperature within 10 hours. The NRC is therefore allowing licensees under 10 CFR 50.200(b) to transition to a PDEP (Level 2) after a specified time. Also, the final rule allows licensees to submit an analysis for NRC approval demonstrating that a different (e.g., shorter) spent fuel decay period would suffice to ensure that spent fuel would not heat up to 900 degrees Celsius in less than 10 hours under adiabatic conditions. To transition to a PDEP (Level 2) in less than 10 months (for a BWR) or 16 months (for a PWR), a licensee would need to submit this analysis under 10 CFR 50.90 and obtain the NRC's approval for it. The analysis is the same as that performed under the regulatory baseline by licensees seeking to transition from EP requirements for an operating reactor to a PDEP. Therefore, there is no incremental cost due to this requirement. Furthermore, by providing the limiting burnup value, the NRC could avert costs for any licensee that decides not to perform the calculation, but instead to use the 10- or 16-month time period in the final rule language, because its burnup is within the limit. This benefit is considered qualitatively in this regulatory analysis. RG 1.235 provides guidance on one method acceptable to the NRC for conducting the spent fuel heatup analysis.

PDEP Offsite Radiological Emergency Response Plans

Under 10 CFR 50.200(b) of the final rule, NRC planning standards no longer apply to offsite radiological emergency response plans in Level 2, and these plans are not necessary for licensees of permanently shutdown and defueled nuclear power reactors with a PDEP.

For transition to a PDEP, site conditions would need to provide for a period of at least 10 hours after an event begins to initiate mitigation measures or to implement appropriate response actions off site. The NRC concludes that such time is ample to take appropriate action without the extensive preplanning and other elements of the EP framework required for operating reactors. Therefore, regulatory standards for offsite radiological emergency plans would no longer be necessary for adequate protection of public health and safety. Licensees with PDEPs would still maintain various onsite capabilities to support offsite response organizations (OROs) in EP and response, including radiological training; regular coordination with OROs; radiological assessment capabilities; memoranda of understanding for firefighting, law enforcement, and ambulance/medical services; and the ability to make PARs upon request. Licensees with PDEPs would not expect or require any action from State or local government organizations in response to an event at a decommissioning site other than onsite firefighting, law enforcement, and ambulance/medical services. This clarification to the offsite radiological emergency response plans does not represent a material change in how licensees meet the EP requirements under Alternative EP-1 after the NRC grants an exemption request.

PDEP Staffing and Emergency Response Organization

For licensees under 10 CFR 50.200(b) (i.e., licensees with PDEPs), the final rule includes staffing requirements similar to the current requirements in 10 CFR 50.47(b)(1), 10 CFR 50.47(b)(2), and paragraph IV.A of Appendix E to 10 CFR Part 50, except for changes reflecting the low staffing levels required to operate the facility and the removal of formal offsite radiological emergency response requirements. For example, licensees with PDEPs do not have to comply with the requirement under 10 CFR Part 50, Appendix E, Section IV.A.3, to augment the ERO with staff from licensee headquarters. Decommissioning sites typically have a level of emergency response that does not require response by headquarters personnel. Licensees do not have to identify State or local officials responsible for protective actions, as currently required under 10 CFR Part 50, Appendix E, Section IV.A.8, because offsite emergency measures are limited to onsite support provided by local police, fire departments, and ambulance/medical services, as appropriate. The final rule requires licensees with PDEPs to include plant staff emergency assignments in their emergency plans.

In addition, the staffing analysis required under 10 CFR Part 50, Appendix E, Section IV.A.9, no longer applies to licensees with PDEPs. In the 2011 EP Final Rule, the NRC concluded that the staffing analysis requirement was not necessary for nonpower reactor licensees because of the low staffing levels required to operate the facilities. For the same reason, licensees with PDEPs are no longer required to perform this analysis under the final rule.

As licensees transition to a PDEP, staffing levels may be reduced but must remain commensurate with the need to safely store spent fuel at the facility in a manner that protects public health and safety. New guidance is being developed as part of Alternative EP-2 to provide one method acceptable to the NRC for ERO staffing during Level 2.

PDEP Emergency Classification Levels and Emergency Action Levels

Section IV.C.1 of Appendix E to 10 CFR Part 50 requires that EALs be based, in part, on onsite and offsite radiation monitoring data. The final rule requires licensees with PDEPs to establish a standard emergency classification level (ECL) and EAL scheme, whose bases include facility system and effluent parameters. The final EAL and ECL requirements for licensees with PDEPs are analogous to those of 10 CFR Part 50, Appendix E, Sections IV.B and IV.C, except for the current requirements to base EALs on offsite monitoring data and the requirement from 10 CFR Part 50, Appendix E, Section IV.B.1, to include hostile-action-based EALs. For licensees with PDEPs, 10 CFR 50.200(c) in the final rule specifies that only the ECLs of Notification of Unusual Event and Alert would apply (and not the ECLs of Site Area Emergency and General Emergency, which apply to operating reactors). The final requirements are accompanied by new guidance as part of Alternative EP-2.

PDEP Emergency Assessment, Classification, and Declaration

Section IV.C.2 of Appendix E to 10 CFR Part 50 currently requires licensees to maintain the capability to assess, classify, and declare an emergency condition within 15 minutes. For a decommissioning power reactor, there is very low likelihood of a credible accident resulting in radiological releases requiring offsite protective measures, and the event progression is much slower than that for an operating reactor. For these reasons, under Alternative EP-2, the NRC would not require licensees with PDEPs (in Level 2) to assess, classify, and declare an emergency condition within 15 minutes. Instead, in 10 CFR 50.200(c)(1)(iii)(B), the NRC would require licensees with PDEPs to document and maintain the capability to assess, classify, and

declare an emergency condition within 60 minutes after indications appear that an EAL has been exceeded; furthermore, licensees would have to declare the emergency condition as soon as possible after identifying the appropriate ECL. The NRC estimates in this analysis that this change in the timing requirement, from 15 minutes to within 60 minutes, will result in an inconsequential difference in cost burden from that of Alternative EP-1 in the case that the licensee submits and the NRC grants an exemption request.

PDEP Notification Requirement to State and Local Governmental Agencies

Section IV.D.3 of Appendix E to 10 CFR Part 50 currently requires licensees to have the capability to notify OROs of an emergency declaration within 15 minutes. Under Alternative E-2, the NRC is requiring licensees in Level 2 to promptly notify OROs, as soon as possible and no later than 60 minutes after declaring an emergency. Given the very low probability of DBAs or other credible events that could lead to offsite releases exceeding the limits in the EPA PAGs, and given the time available to initiate mitigation measures consistent with plant conditions or, if necessary, to implement protective actions, the NRC concludes that 60 minutes is sufficient time for ORO notification in Level 2.

The NRC estimates that this change in the notification time requirement, from 15 minutes to as soon as possible and within 60 minutes, will result in an inconsequential difference in cost burden from that of Alternative EP-1 in the case that the licensee submits and the NRC grants an exemption request.

PDEP Public Alert and Notification Systems

Section IV.D.3 of Appendix E to 10 CFR Part 50 currently requires licensees to demonstrate that appropriate governmental authorities have the capability to make a public alerting and notification decision promptly on being informed of an emergency condition. Given the very low probability of DBAs or other credible events that could lead to offsite releases exceeding the limits in the EPA PAGs, and because of the time available for event mitigation, the NRC has concluded that the public alert and notification system are not required for licensees in Level 2. Correspondingly, exercises of this system, as required under Section IV.F.2 of Appendix E to 10 CFR Part 50, are no longer required for licensees with PDEPs (in Level 2).

Under Alternative EP-2, the NRC is not including in new 10 CFR 50.200(c) the alert and notification system requirement. However, licensees in Level 2 are still required to maintain the capability to notify responsible State and local governmental agencies within 60 minutes after declaring an emergency; research has shown that this leaves sufficient time to inform the public and implement protective actions, if necessary. The NRC estimates that this change in the maintenance and exercise of the public alert and notification system will result in an inconsequential difference in cost burden from that of Alternative EP-1 in the case that the licensee submits and the NRC grants an exemption request.

PDEP Emergency Planning Zones

EPZs are areas for which planning is needed to ensure that prompt and effective actions can be taken to protect the public in the event of an incident. The current requirements of 10 CFR Part 50 state that the EPZs associated with each nuclear power plant must be defined for both the shorter term plume exposure pathway and the longer term ingestion exposure pathway. Given the very low probability of DBAs or other credible events that could lead to offsite releases exceeding the limits in the EPA PAGs, and given the time available to initiate

mitigation measures consistent with plant conditions, the NRC concludes that in Level 2, the potential offsite consequences do not warrant maintaining the plume exposure pathway and ingestion exposure pathway EPZs. For even the worst case severe accident, sufficient time would be available for OROs to implement appropriate response actions.

Under Alternative EP-2, 10 CFR 50.47(b) does not apply to offsite radiological emergency response plans if the licensee's emergency plan is not required to meet these planning standards or if the plume exposure pathway EPZ does not exceed the site area boundary.

PDEP Offsite Radiological Protective Action Recommendations

Licensees must develop a range of protective actions for the plume exposure pathway EPZ for emergency workers and the public, with consideration to evacuation, sheltering, and the use of potassium iodide per the current requirements in 10 CFR 50.47(b). Also, licensees must develop and put in place guidelines for the choice of protective actions during an emergency and develop protective actions for the ingestion exposure pathway EPZ.

Under Alternative EP-2, licensees with PDEPs (in Level 2) are required to continue developing protective actions for emergency workers and the public, but, consistent with the removal of regulatory standards for offsite REP in Level 2, they are not required to reference specific offsite protective actions or preplanned activities for the public in the EPZs. 10 CFR 50.200(b)(10) in the final rule requires a range of protective actions for emergency workers, such as those who may have to provide firefighting, law enforcement, and ambulance/medical services at the decommissioning site, as well as for members of the public present within the owner-controlled area, during a radiological emergency. Licensees in Level 2 do not need preplanned offsite protective actions to ensure a prompt response to a radiological emergency on site, given the time available for OROs to implement appropriate response actions. Although, with a permanently shutdown and defueled reactor, there is a very low probability of events that could result in doses to the public beyond the owner-controlled area exceeding the limits in the EPA PAGs, 10 CFR 50.200(c)(1)(ii)(A) requires licensees in Level 2 to determine the magnitude of and continually assess the impact of any radiological release. If a release occurs, the licensee staff must communicate that information to offsite authorities within 60 minutes so that they can take appropriate response actions.

The NRC estimates that this change to how the licensee maintains the range of protective actions for the plume exposure pathway EPZ for emergency workers and the public will result in an inconsequential difference in cost burden from that of Alternative EP-1 in the case that the licensee submits and the NRC grants an exemption request.

PDEP Evacuation Time Estimate Studies

Currently, licensees are required to develop and update ETEs in accordance with 10 CFR 50.47(b) and Section IV.3 of Appendix E to 10 CFR Part 50. Section IV.3 requires licensees to use ETEs in the formulation of PARs and to provide ETEs to State and local governmental authorities for use in developing offsite protective action strategies. Under Alternative EP-2 and consistent with the determination for EPZs and PARs described above, the NRC will not require licensees with PDEPs (in Level 2) to maintain ETEs.

PDEP Emergency Facilities and Equipment

Section IV.E of Appendix E to 10 CFR Part 50 requires licensees to maintain and describe adequate provisions for emergency facilities and equipment, including equipment at the site for personnel monitoring, equipment for radiological assessment, facilities and supplies for decontaminating onsite individuals, first aid facilities and medical supplies, arrangements for qualified medical service providers and the transportation of contaminated injured individuals, and arrangements for the treatment of individuals injured in support of licensed activities. Decommissioning licensees have not received exemptions or license amendments for these requirements to date, and the NRC has determined that licensees with PSEPs (in Level 1) and PDEPs (in Level 2) still need to maintain these capabilities. As a result, the NRC chose not to generate alternative requirements, different from those of Alternative EP-1, for how the licensee maintains and describes adequate provisions for emergency facilities and equipment.

PDEP Hostile Action Requirements

In relation to a licensee's capability to implement EP, 10 CFR Part 50, Appendix E, Section IV.A.7, defines "hostile action" as an act directed toward a nuclear power plant or its personnel that includes the use of violent force to destroy equipment, take hostages, or intimidate the licensee to achieve an end. However, in the preamble for the 2011 EP Final Rule, the NRC excluded nonpower reactors from the definition of "hostile action," because a nonpower reactor as defined in 10 CFR 50.2, "Definitions," is not a nuclear power plant, and a regulatory basis had not been developed to support the inclusion of nonpower reactors in the definition of "hostile action." A facility with a PDEP (in Level 2) is similar to a nonpower reactor, in that it has a small operating staff and presents a very low likelihood of a credible accident resulting in radiological releases requiring response actions off site. Therefore, power reactor facilities transitioning to a PDEP do not fall within the scope of "hostile action," and enhancements to EP in response to hostile actions, such as alternative facilities for staging ERO personnel, protection of onsite personnel, and challenging drills and exercises involving hostile actions, are not warranted. However, these facilities should maintain certain elements for security-based events, including EALs. In terms of physical security at these facilities, the objective is to protect the spent fuel against sabotage. Thus, licensees need to maintain a level of security commensurate with the consequences of a sabotage event, which is evaluated on a site-specific basis. The severity of the consequences of a sabotage event declines over time because the aging of the fuel reduces the underlying concern of an offsite radiological release.

Under Alternative EP-2, power reactor licensees transitioning to a PDEP (Level 2) are required by 10 CFR 50.200(c)(1)(i)(A)(5) to identify ORO resources that would respond to a security event, and to describe in their PDEPs the assistance they expect from those resources. The NRC estimates in this regulatory analysis that the treatment of hostile action requirements does not represent a change in burden from Alternative EP-1 after the NRC grants an exemption request.

PDEP Drills and Exercise

10 CFR 50.200(b)(14) of the final rule requires licensees with PDEPs to conduct periodic exercises to evaluate major portions of emergency response capabilities, conduct periodic drills to develop and maintain key skills, and correct deficiencies identified through exercises and drills. Details about these exercises and drills are provided in 10 CFR 50.200(c)(1)(vi). The final rule requirements differ from the existing requirements under 10 CFR Part 50, Appendix E, Section IV.F, to account for changes in principal functional areas, offsite radiological emergency

response requirements, offsite PAR requirements, and the spectrum of accidents possible at PDEP facilities. The regulatory analysis assumes that this does not represent a change in burden from Alternative EP-1 after the NRC grants an exemption request.

PDEP Offsite Response Organization Participation in Drills and Exercises

Section IV.F of Appendix E to 10 CFR Part 50 and 10 CFR 50.47(b)(14) include requirements for periodic EP drills and exercises for licensees. Paragraph IV.F.2.c of Appendix E to 10 CFR Part 50 requires offsite REP plans for each site to be exercised biennially with full participation by offsite authorities having a role under the radiological response plan. Under the final rule, for licensees with PDEPs, the requirements related to ORO participation in these drills and exercises no longer apply, because no action is required from State or local government organizations in response to an event other than onsite firefighting, law enforcement, and ambulance/medical services. However, 10 CFR 50.200(c)(1)(vi)(B)(3) requires licensees with PDEPs to enable any State or local government to participate in the licensees' drills upon request. This regulatory analysis assumes that relaxing the requirements for ORO participation in radiological drills and exercises from mandatory participation to voluntary participation does not represent a change in burden from Alternative EP-1 after the NRC grants an exemption request.

Level 3: All Spent Fuel Transferred to an Independent Spent Fuel Storage Installation

A licensee with all of its spent fuel in dry cask storage that terminates its license under 10 CFR Part 50 or 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," must first obtain a specific license under 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste," before transitioning to the EP requirements already provided in 10 CFR 72.32(a). A licensee maintaining its 10 CFR Part 50 or 10 CFR Part 52 license, and thus its 10 CFR Part 72 general license authorized under 10 CFR 72.210, "General license issued," may opt to change its EP program to align it with the requirements of 10 CFR 72.32, "Emergency Plan," once all spent fuel is transferred to dry cask storage. In addition, a licensee with a 10 CFR Part 72 general license must continue to comply with all applicable 10 CFR Part 50 and 10 CFR Part 52 requirements until its 10 CFR Part 50 or 10 CFR Part 52 license is terminated. The final rule requires that licensees with an ISFSI-only emergency plan (IOEP) must follow and maintain the effectiveness of an emergency plan that meets the requirements in 10 CFR 72.32(a), 10 CFR 50.200(b)-(c), 10 CFR 50.200(a), or the combination of 10 CFR 50.47(b) and Appendix E to Part 50.

Level 4: All Spent Fuel Removed from Site

Once all spent fuel has been permanently removed from a site, the licensee can terminate its EP program, because the potential accidents that could occur have negligible offsite and onsite radiological consequences.

Additional Amendments for Emergency Preparedness

Change to Emergency Plans

Licensees are currently required by 10 CFR 50.54(q)(2) to follow and maintain the effectiveness of an emergency plan that meets the standards in 10 CFR 50.47(b) and the requirements in Appendix E to 10 CFR Part 50. In addition, 10 CFR 50.54(q) contains the conditions under

which the licensee may make changes to its emergency plan without prior application to and approval by the NRC, provided that the changes do not reduce the effectiveness of the plan and that the plan, as changed, continues to meet the standards in 10 CFR 50.47(b) and the requirements in Appendix E to 10 CFR Part 50.

The final rule adds new requirements, similar to those of 10 CFR 50.54(q)(2)–(3), to establish the standards that emergency plans for decommissioning power reactors must meet and the process for making changes to them. The final rule establishes processes for (1) transitions between EP decommissioning levels (i.e., PSEP, PDEP, IOEP), and (2) changes to emergency plans within an EP decommissioning level. The NRC does not anticipate any EP-related changes to 10 CFR 50.59, “Changes, tests and experiments,” as a result of this rulemaking alternative.

Program Element Review under 10 CFR 50.54(t)

Under 10 CFR 50.54(t), licensees must conduct reviews of EP program elements either: (1) at intervals not to exceed 12 months, or (2) as necessary, based on an assessment by the licensee against performance indicators, and as soon as reasonably practicable after a change occurs in personnel, procedures, equipment, or facilities that could adversely affect EP. If a licensee chooses the second option, it must still review all program elements at least once every 24 months. The final rule amends 10 CFR 50.54(t) in such a way that, after the NRC has docketed licensees’ certifications under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a), licensees will be able to conduct program element reviews under 10 CFR 50.54(t) at intervals not to exceed 24 months (rather than 12 months) without conducting an assessment against performance indicators. As a result, the NRC expects that licensees will conduct a program element review shortly after implementing a PDEP.

Development of Regulatory Guides

Under Alternative EP-2, the NRC has developed RG 1.235 for decommissioning facilities as discussed previously.

4.1.3 Assumptions

The regulatory analysis makes the following assumptions:

- Under Alternative EP-1, all nuclear power plant licensees would file exemption requests and amendment requests for the pertinent requirements in 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50, to obtain the benefits described in Alternative EP-2 above.
- Under Alternative EP-2, licensees would not submit site-specific analyses, but instead would wait the predetermined time, as specified by rulemaking, before transitioning from Level 1 to Level 2.
- For Alternative EP-2, the guidance will reflect the notification requirements.
- For Alternative EP-2, staffing and ERO requirements do not represent a material change in burden from Alternative EP-1 after the NRC grants an exemption request.

4.1.4 Affected Attributes

Industry Implementation: Under Alternative EP-2, licensees will submit fewer requests for exemptions from EP requirements and fewer requests for amendments than they typically do, which implies a one-time benefit (i.e., averted cost) for the industry for plants that enter decommissioning after issuance of the rule.

NRC Implementation: Under Alternative EP-2, licensees will submit fewer requests for exemptions from EP requirements and fewer requests for amendments. This will result in a benefit (i.e., averted cost) for the NRC, because it will have fewer such requests to review.

4.2 Physical Security

Whether they hold a license under 10 CFR Part 50 or 10 CFR Part 52, nuclear power reactor licensees are subject to various security requirements in 10 CFR Part 73. Such requirements include those in Appendix B, "General Criteria for Security Personnel," to 10 CFR Part 73; Appendix C, "Safeguards Contingency Plans," to 10 CFR Part 73; 10 CFR 73.54, "Protection of digital computer and communication systems and networks"; and 10 CFR 73.55, "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage." If the power reactor site has an associated ISFSI under the general license granted by 10 CFR 72.210, then the licensee must protect the ISFSI in accordance with 10 CFR 72.212, "Conditions of general license issued under 10 CFR 72.210."

Under the existing requirements in 10 CFR 73.55, each nuclear power reactor licensed under 10 CFR Part 50 or 10 CFR Part 52 must establish and implement a physical protection program that will ensure that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety. To meet this general performance objective, the physical protection program must protect against the design-basis threat (DBT) of radiological sabotage, as stated in 10 CFR 73.1, and prevent significant core damage and spent fuel sabotage.

A licensee implements these performance objectives by maintaining at all times the capabilities to detect, assess, interdict, and neutralize threats up to the DBT for radiological sabotage. The regulations in 10 CFR 73.55(b)(3) also require the physical protection program to provide defense in depth by integrating systems, technologies, programs, equipment, supporting processes, and implementing procedures to ensure the program's continued effectiveness.

During the transition from operation to decommissioning, the reactor is permanently shut down and the spent fuel is permanently moved from the reactor vessel to an SFP. This typically means that the number and location of potential adversary targets decreases, as do the potential consequences of radiological sabotage. The licensee is currently responsible for conducting a site-specific analysis, including target sets, to identify measures needed to implement the licensee's physical protection program. Such an analysis can be conducted to identify and analyze new site-specific conditions to account for changes in the site configuration, including the reduction in target sets, at a decommissioning facility. At this step in the decommissioning process, licensees historically have submitted to the NRC requests for exemptions from the NRC security requirements under 10 CFR 73.5, "Specific exemptions"; requests for license amendments under 10 CFR 50.90; and security plan changes under 10 CFR 50.54(p). (In accordance with 10 CFR 50.54(p)(2), a licensee may make security plan changes that do not decrease the safeguards effectiveness of the security plan without prior

NRC approval. Licensees must provide a report of the security plan change to the NRC within 2 months of the change.)

Currently, there are no regulatory provisions distinguishing physical security requirements for a power reactor that has permanently ceased operation from those for an operating power reactor. As a result, decommissioning licensees and the NRC have expended considerable resources to process security-related licensing actions, such as exemption and license amendment requests. Decommissioning licensees have sought and received NRC approval of exemptions and amendments to reduce physical security requirements that are no longer needed or no longer relevant because the site configuration has changed, and because of the reduced consequences of radiological sabotage at a decommissioning plant.

Licensees and the NRC also spend resources on reviewing security plan changes to make sure that they either do not decrease safeguards effectiveness or receive NRC review and approval before implementation in accordance with 10 CFR 50.54(p). The lack of a regulatory definition for “a decrease in safeguards effectiveness” complicates these activities; therefore, the NRC is amending the current regulations on security plan changes to provide clarity for licensees and staff.

4.2.1 Alternative PS-1 (No-Action Alternative)

Under the no-action alternative, the current physical security regulatory structure would remain in place for power reactor licensees during both operation and decommissioning. Each nuclear power reactor licensed under 10 CFR Part 50 or 10 CFR Part 52 would remain subject to the current requirements in 10 CFR 73.55 to maintain a Commission-approved physical security plan, training and qualification plan, safeguards contingency plan, and cybersecurity plan (CSP). Under this alternative, the NRC would continue to process requests from licensees undergoing decommissioning for exemptions from certain requirements and license amendments.

4.2.2 Alternative PS-2 (Rulemaking to Streamline the Security Plan Change Process)

Under this alternative, the NRC would streamline the decommissioning process by allowing licensees to determine that changes to a broader range of security requirements would not decrease the effectiveness of the applicable security plan, taking into account changes resulting from the reactor’s decommissioning status, including the reduced number of target sets and the related reduced consequences of radiological sabotage. Licensees would not have to request either exemptions or amendments to make these changes, and thus these changes would reduce the number of exemptions and amendments that decommissioning licensees commonly request, and that the NRC has historically approved. This alternative also relies on changes to plant operations to support a stepdown in the physical security requirements currently imposed on operating reactors through regulations and orders. Under this alternative, the NRC would continue to review security plan change reports submitted by licensees and to oversee security programs at decommissioning power reactors through a security inspection program that verifies licensees’ compliance with applicable regulatory requirements.

The final rule will change the regulations in the following areas of physical security:

- **Security plans.** The NRC is revising 10 CFR 50.54(p) to include definitions of the terms “change” and “decrease in safeguards effectiveness.” The application of these definitions is limited to the revised 10 CFR 50.54(p) and will apply to operating, decommissioning, and decommissioned reactor licensees. The term “change” is being

defined in a new provision, 10 CFR 50.54(p)(1)(i), to mean an action that results in a modification of, addition to, or removal from the licensee's security plan. The term "decrease in safeguards effectiveness" is being defined in a new provision, 10 CFR 50.54(p)(1)(ii), to mean a change or series of changes to an element or component of the security plans referenced in 10 CFR 50.54, "Conditions of licenses," that reduces or eliminates the licensee's ability to meet the performance objectives and capabilities of the applicable physical protection program or system required by 10 CFR Part 73.

For changes to licensees' security plans that would not decrease the safeguards effectiveness of the plans, this final rule requires both decommissioning and operating reactor licensees to include in the currently required report of the plan change a summary of the supporting analysis for the licensee's determination that the change does not decrease safeguards effectiveness. The summary must be sufficient to demonstrate that the change does not decrease the safeguards effectiveness of the security plan.

- **Dry cask storage.** Power reactor licensees that operate an ISFSI may hold either a general or specific license for the ISFSI. Under 10 CFR 72.212(b)(9), general-license ISFSIs are subject to the same physical security requirements in 10 CFR 73.55 as power reactors, with some exceptions. By contrast, licensees that hold a specific license under 10 CFR Part 72 are subject to the physical security requirements of 10 CFR 73.51, "Requirements for the physical protection for spent nuclear fuel and high-level radioactive waste," that do not encompass all of the 10 CFR 73.55 requirements.

During the decommissioning process, power reactor licensees with a general license ISFSI will transition to a phase when all the spent fuel has been removed from the SFP and placed in a dry cask storage system (DCSS). At this point, the security measures needed to protect the facility from radiological sabotage decrease significantly. Once the reactor ceases to operate, certain requirements in 10 CFR 73.55 (e.g., protection against significant core damage) are no longer necessary, because there is no fuel in the reactor core. Holders of an ISFSI general license must submit requests for license amendments and regulatory exemptions to obtain relief from the more stringent requirements. The NRC has historically exempted decommissioning licensees that have placed all fuel in a DCSS from certain requirements in 10 CFR 73.55 that allow the licensees to commit to following the ISFSI-specific physical security requirements in 10 CFR 73.51, which reflect a physical protection approach that is commensurate with the reduced risk of such a facility as compared to an operating power reactor or a decommissioned facility with fuel in the SFP.

The NRC is amending its regulations so that once all spent nuclear fuel has been placed in dry cask storage, licensees may elect to follow 10 CFR 72.212(b)(9)(vii) and protect a general license ISFSI in accordance with the physical security requirements in 10 CFR 73.51. A licensee may use the process set forth in the revised and renumbered 10 CFR 50.54(p)(3) to make this change and submit its revised physical security plan to the NRC. This security plan must continue to address the applicable security-related orders associated with an ISFSI that are conditions of the license. The NRC is also making conforming changes to 10 CFR 72.13, "Applicability," to reflect the requirements that would apply to a licensee that elects to follow 10 CFR 72.212(b)(9)(vii).

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- **Significant core damage.** Under 10 CFR 73.55(b)(3), a nuclear power reactor licensee's physical protection program must be designed, in part, to prevent significant core damage. However, once a licensee has permanently ceased operation and moved all fuel from the core to the SFP, core damage is no longer possible. Accordingly, licensees no longer need to protect against significant core damage once all fuel is in the SFP or in a DCSS. Training of security personnel for this condition is also no longer warranted. Therefore, the NRC is clarifying that a decommissioning licensee no longer needs to meet the requirement in 10 CFR 73.55(b)(3) to protect against significant core damage once the reactor has permanently ceased operating and all fuel has been removed from the reactor vessel. However, the requirement to protect against spent fuel sabotage will remain in place as long as spent fuel remains in the SFP.
 - **Vital areas.** Under 10 CFR 73.55(e)(9), licensees are required to protect the reactor control room as a vital area (VA). A VA is defined in 10 CFR 73.2, "Definitions," as any area which contains vital equipment; under 10 CFR 73.2, vital equipment means any equipment, system, device, or material whose failure, destruction, or release could directly or indirectly endanger public health and safety through exposure to radiation. The role of the reactor control room at an operating plant is described in General Design Criterion 19, "Control Room," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50. General Design Criterion 19 specifies that the control room must be a protected space from which actions can be taken to operate the nuclear power plant safely and without interruption under normal or accident conditions.

Once there is no fuel in a reactor core and the reactor has permanently ceased operations, the licensee may determine that there is no need for a reactor control room if all of the vital equipment has been removed from it and if the area does not serve as the VA boundary for other VAs. Therefore, the NRC is revising 10 CFR 73.55(e)(9)(v) to provide that a decommissioning licensee no longer needs to designate the reactor control room as a VA if the licensee has submitted and the NRC has docketed the certifications required under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a), and the licensee has documented that all vital equipment has been removed from the control room and the control room does not serve as the vital area boundary for other vital areas.

- **Communications.** Under 10 CFR 73.55(j)(4)(ii), the NRC requires that a system for continuous communication capabilities with the control room must terminate in the central and secondary alarm stations to ensure effective command and control during both normal and emergency conditions. One purpose of this requirement is to ensure that communications are maintained between security operations and reactor operators who are normally located in the control room. A nuclear power reactor that has permanently ceased operations and no longer has fuel in the reactor vessel may no longer have reactor operators or a control room. Therefore, the NRC is amending 10 CFR 73.55(j) to require that continuous and redundant communications be maintained between the central alarm station and the CFH, as defined in 10 CFR 50.2, or the senior on-shift licensee representative once the reactor has ceased operations and the licensee no longer has licensed senior operators in the control room. The intention of this change is to allow licensees flexibility in maintaining communications with one or both of these individuals.
- **Suspension of security measures.** The NRC is amending 10 CFR 73.55(p) to permit a senior licensed operator, CFH, or any individual in a superior position to a senior licensed operator or CFH to approve the temporary suspension of security measures

during certain emergency conditions or during severe weather at decommissioning nuclear power reactors whose 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) certifications have been submitted. Currently, 10 CFR 73.55(p)(1)(i) states the following:

[T]he licensee may suspend any security measures under this section in an emergency when this action is immediately needed to protect the public health and safety.... This suspension of security measures must be approved as a minimum by a licensed senior operator before taking this action.

Similarly, 10 CFR 73.55(p)(1)(ii) states the following:

[The licensee may suspend security measures during] severe weather when the suspension of affected security measures is immediately needed to protect the personal health and safety of security force personnel.... This suspension of security measures must be approved, as a minimum, by a licensed senior operator, with input from the security supervisor or manager, before taking this action.

The licensee for a nuclear power reactor that has permanently ceased operations and no longer has fuel in the reactor vessel may no longer employ or have on site a licensed senior operator. Under the current provisions, it is not clear whether a decommissioning licensee could suspend security measures to protect the public, or to protect security personnel during severe weather, without first requesting an exemption. The NRC is modifying the regulatory language to clarify that a senior licensed operator, CFH, or any individual in a superior position to these individuals can make this decision. When all spent fuel has been placed in dry cask storage, these same decisions can be made by an individual designated by the facility licensee or an organizationally senior individual.

4.2.3 Assumptions

The regulatory analysis makes the following assumptions for the cost-benefit analysis of physical security:

- Under Alternative PS-1, all nuclear power plant licensees would file exemption and amendment requests to reduce their physical security requirements in ways that are commensurate with the benefits they would obtain through the recommended rulemaking.
- Docketing of the certifications submitted under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) meets the requirements for stepping down the physical security requirements.

4.2.4 Affected Attributes

Industry Implementation: Under Alternative PS-2, licensees will not need to submit requests for exemptions and amendments to reduce their physical security requirements. This will result in a one-time benefit (i.e., averted cost) for the industry.

NRC Implementation: Under Alternative PS-2, licensees will not need to submit requests for exemptions and amendments to reduce their physical security requirements. This will result in a benefit (i.e., averted cost) for the NRC, because it will not have to review these requests.

4.3 Cybersecurity

As stated in 10 CFR 73.54, applicants and licensees must provide high assurance that their digital computer and communication systems and networks associated with safety, important-to-safety, security, and EP functions are adequately protected against cyberattacks, up to and including the DBT described in 10 CFR 73.1. Each holder of a nuclear power reactor operating license (OL) under 10 CFR Part 50 has an NRC-approved CSP. Further, combined license (COL) applicants are required to submit their CSP for review and approval as part of their COL application. In each 10 CFR Part 50 license, the approved CSP is referenced as a license condition and continues to apply until the license is terminated or the license condition is removed by license amendment. However, current COL holders do not have an equivalent cybersecurity license condition.

The cybersecurity requirements in 10 CFR 73.54 apply to licensees currently licensed to operate a nuclear power plant. Once the NRC has docketed a licensee's 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) certifications, that licensee is no longer authorized to operate a nuclear power plant. Therefore, the requirements in 10 CFR 73.54 no longer apply to such a licensee. However, for each 10 CFR Part 50 licensee, the aforementioned CSP license condition remains in effect during decommissioning. This means that for Part 50 licensees the NRC's cybersecurity requirements remain in effect during spent fuel cooldown. Because current COL holders have no equivalent license condition, they are not required to maintain their CSPs when they begin decommissioning, leading to an inconsistency in how OL holders and COL holders are regulated regarding CSPs.

4.3.1 Alternative CS-1 (No-Action Alternative)

Under the no-action alternative, the NRC would not change the current cybersecurity requirements set forth in 10 CFR 73.54. These requirements apply to 10 CFR Part 50 licensees and applicants, and to applicants for and holders of COLs in accordance with 10 CFR 52.79(a)(36)(iii). Once a licensee has filed the certifications required by either 10 CFR 50.82(a)(1) or 10 CFR 52.110(a), and the NRC has docketed those certifications, the licensee is no longer authorized to operate a nuclear power reactor. Therefore, by its terms, 10 CFR 73.54 does not apply to the licensee.

However, although the cybersecurity rule no longer applies to a licensee that has filed the certifications required by 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) and those certifications have been docketed by the NRC, OL holders still must retain their CSPs in accordance with their license condition. As such, an OL holder must abide by its CSP until the licensee submits a license amendment request to remove the CSP license condition from its license. If a license amendment request is not submitted and approved, in whole or in part, the existing CSP will remain in force even after the submittal and docketing of the 10 CFR 50.82(a)(1). Under the no-action alternative, the NRC expects that licensees will continue to submit license amendment requests to have the CSP rescinded once the spent fuel has sufficiently decayed. Also, under the no-action alternative, COL holders, because they do not have such a CSP license condition, will not be required to maintain their CSP once decommissioning begins.

4.3.2 Alternative CS-2 (Rulemaking to Align Cybersecurity Requirements During Decommissioning)

Under this alternative, the NRC will add two subsections to 10 CFR 73.54 to clarify the cybersecurity requirements applicable to a nuclear power reactor during each stage of the

decommissioning process. The new subsection 10 CFR 73.54(i) states that for a decommissioning licensee, the requirements of 10 CFR 73.54 will remain in effect until (1) the NRC has docketed the licensee's 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) certifications, and (2) at least 10 months (for a BWR) or 16 months (for a PWR) have elapsed since the date of permanent cessation of operations, or an NRC-approved alternative to the 10- or 16-month spent fuel decay period, submitted under 10 CFR 50.54(q)(8)(ii)(A)–(B), has elapsed. As discussed in section 2.1.1, these time periods are based on a burnup of less than or equal to 72 GWd/MTHM; a licensee that exceeded this burnup before decommissioning would have to calculate decay time using NRC guidance to determine the time period and seek NRC approval of that decay period. This calculation is the same as that being performed under the regulatory baseline by licensees seeking to remove all cybersecurity requirements and applies to any such licensee with a higher burnup under the regulatory baseline. Therefore, there is no incremental cost due to this requirement in the final rule. Furthermore, by providing the limiting burnup value, the NRC could avert costs for any licensee that decides not to perform the calculation, but instead to use the 10- or 16-month time period in the final rule language, because its burnup is within the limit. This benefit is considered qualitatively in this regulatory analysis.

The new subsection 10 CFR 73.54(j) states that after both requirements of 10 CFR 73.54(i) have been met, the license condition requiring implementation and maintenance of a CSP will be deemed removed from the license of each applicable licensee subject to 10 CFR 73.54. The NRC is also removing the first paragraph of 10 CFR 73.54 and revising the language of 10 CFR 73.54(a). This is a conforming change to clarify that the applicability of 10 CFR 73.54 is not limited to “operating” reactors (i.e., that 10 CFR 73.54 is still applicable after the NRC has docketed a licensee's 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) certifications) and to remove language that is no longer needed concerning the initial submission of CSPs by existing licensees. This regulatory change will require existing COL holders to maintain their CSPs during spent fuel cooldown, which is a new requirement. Furthermore, the NRC is making a conforming change to 10 CFR 73.55(c)(6), under which a licensee will no longer be required to maintain a CSP after the fuel in the SFP has sufficiently decayed but will continue to have to meet 10 CFR 73.55(c).

4.3.3 Assumptions

The regulatory analysis assumes that under the regulatory baseline, all future sites would submit license amendment requests to remove cybersecurity requirements during decommissioning. It also assumes that the only COL holder with a currently operating reactor, Southern Nuclear Operating Co. for Vogtle Units 3 and 4, would have terminated its CSP at the start of decommissioning (as opposed to after spent fuel cooldown), under the regulatory baseline.

4.3.4 Affected Attributes

Industry Implementation: Under Alternative CS-2, licensees will not need to submit amendment requests to remove their CSPs once the spent fuel has decayed sufficiently as described above.

Industry Operation: Under Alternative CS-2, COL holders remain subject to cybersecurity protection requirements until the fuel in the SFP has cooled sufficiently (i.e., 10 months for BWRs and 16 months for PWRs). Thus, they will incur additional costs due to labor hours expended to implement the cybersecurity requirements for 10 or 16 months. (As discussed previously, this affects only one COL holder at one site.) However, by relieving OL holders of the need to request license amendments to eliminate the CSP once the spent fuel cooldown

period is over, the final rule will avert additional costs. Under the regulatory baseline, these licensees would have been required to maintain their CSPs until the NRC had approved their license amendment requests. If this approval had not arrived until after the spent fuel cooldown period was complete, the licensees would have incurred additional, unnecessary costs to maintain their CSPs beyond that period.

4.4 Drug and Alcohol Testing

The regulation at 10 CFR 26.3(a) lists those licensees that must comply with designated subparts of 10 CFR Part 26, “Fitness for Duty Programs,” including “[l]icensees who are authorized to operate a nuclear power reactor under 10 CFR 50.57, and holders of a COL under 10 CFR Part 52 after the Commission has made the finding under 10 CFR 52.103(g).” In particular, 10 CFR Part 26 does not apply to a decommissioning 10 CFR Part 50 reactor licensee—that is, a holder of a power reactor license issued under 10 CFR Part 50 that is no longer authorized to operate a nuclear power reactor because the NRC has docketed the certifications required under 10 CFR 50.82(a)(1). However, 10 CFR Part 26 does apply to holders of COLs issued under 10 CFR Part 52 throughout decommissioning. Therefore, 10 CFR Part 52 licensees are required to maintain a fitness-for-duty (FFD) program under 10 CFR Part 26 during decommissioning, but 10 CFR Part 50 licensees are not. The NRC is correcting this inconsistency by establishing that 10 CFR Part 52 licensees do not need to comply with 10 CFR Part 26 once the NRC has docketed their 10 CFR 52.110(a) certifications.

Requirements to implement an FFD program also exist under 10 CFR 73.55. Under 10 CFR 73.55(b)(9), nuclear power reactor licensees must establish, maintain, and implement an insider mitigation program (IMP) to monitor the initial and continuing trustworthiness and reliability of individuals granted unescorted access authorization (UAA) or unescorted access (UA) to a protected area (PA) or VA of a reactor such that these individuals do not pose a threat to the facility. Under 10 CFR 73.55(b)(9)(ii)(B), the IMP is required to contain elements from the FFD program described in 10 CFR Part 26. However, 10 CFR 73.55(b)(9)(ii)(B) does not identify which FFD program elements must be included in the IMP. 10 CFR 73.55(b)(9)(ii)(B) requires that an IMP include only elements of an FFD program and does not require compliance with 10 CFR Part 26.

The NRC recognizes that the IMP requirements, including the appropriate elements of the 10 CFR Part 26 FFD program, apply equally to all personnel granted UAA or UA to the PA or VA. This construct makes sense at operating power reactors, which contain many target sets of potential interest to an adversary in both the PA and VA, but the risk is significantly less at decommissioning power reactors. At a decommissioning power reactor, the primary focus of the licensee’s security mission is to protect the SFP and its safety systems against the DBT, as most (if not all) of the other target sets are removed because the reactor is no longer operational. Therefore, the NRC is clarifying the IMP requirements in 10 CFR 73.55(b)(9)(ii)(B) by establishing the appropriate set of FFD program elements in 10 CFR Part 26, to provide reasonable assurance that individuals granted UAA or UA to the PA or VA are trustworthy and reliable as demonstrated, in part, by the avoidance of substance abuse. The primary effect of these changes (and the primary driver of the averted costs under these changes) is that random drug and alcohol testing will no longer be required for the part of the workforce granted PA-only UA to decommissioning power reactor sites.

The NRC also notes that 10 CFR Part 73, Appendix B, Section I.B.1.b.(4), contains requirements addressing drug or alcohol addiction issues for security personnel. Section I.B.2.a of the same appendix requires that security personnel “demonstrate mental alertness and the

capability to exercise good judgement.” Although not specifically used as the basis for this rulemaking, continued drug and alcohol testing will support the licensee’s continued adherence to these provisions.

4.4.1 Alternative DA-1 (No-Action Alternative)

The no-action alternative will not address the inconsistency in the scope of 10 CFR Part 26 and its application to 10 CFR Part 50 and 10 CFR Part 52 licensees during decommissioning. Therefore, 10 CFR Part 26 will continue to apply to 10 CFR Part 52 licensees but not to 10 CFR Part 50 licensees during decommissioning. This alternative also would not clarify the 10 CFR Part 26 FFD program elements that are incorporated into a licensee’s IMP as required by 10 CFR 73.55(b)(9)(ii)(B). Therefore, licensees would continue to determine which FFD program elements in 10 CFR Part 26 to include in their IMPs. The NRC is aware that the licensees of recently decommissioning power reactor sites generally continue to implement in their IMPs all elements of the 10 CFR Part 26 FFD program that they implemented during operations, except for Subpart I, “Managing Fatigue,” and Subpart K, “FFD Program for Construction.”

4.4.2 Alternative DA-2 (Rulemaking to Require Fitness-for-Duty Program Elements That Support Power Reactor IMPs)

Under Alternative DA-2, the NRC will amend 10 CFR 26.3, “Scope,” to correct the inconsistency in the applicability of 10 CFR Part 26 to 10 CFR Part 50 and 10 CFR Part 52 licensees during decommissioning, so that similarly situated nuclear power reactor licensees are treated the same during decommissioning.

The final rule clarifies the FFD program elements in 10 CFR Part 26 that are incorporated in a licensee’s IMP consistent with 10 CFR 73.55(b)(9)(ii)(B). These clarifications apply to 10 CFR Part 50 and 10 CFR Part 52 licensed facilities. The final rule requires individuals who have UA to the VA at a decommissioning site, perform the functions of a CFH (as defined in 10 CFR 50.2) prior to all spent nuclear fuel at a site being placed in dry cask storage, perform security-related functions (i.e., security personnel described in 10 CFR 26.4(a)(5)), or administer the FFD program (i.e., FFD program personnel described in 10 CFR 26.4(g)) to be subject to a full 10 CFR Part 26 FFD program, except for Subparts I and K. Individuals with UA to the VA have access to the SFP or perform work around the SFP and, thus, may have knowledge of value to an adversary. CFHs maintain UA to the VA and are essential to the safe movement of spent nuclear fuel. Individuals who have security-related responsibilities maintain UA to the VA and generally carry weapons on site, which would pose a significant challenge to site security if they were to perform as an active violent insider during an attack. FFD program personnel who administer the FFD program perform functions such as making authorization decisions under 10 CFR Part 26 for individuals to be considered for UA to the VA or PA, or collecting specimens for alcohol and drug testing, which are essential to the integrity of the FFD program. The changes under Alternative DA-2 require individuals who have UA to PA, but do not perform certified fuel handling or security-related functions or administer the drug testing program, to still be subject to pre-access, for-cause, and follow-up testing, but not subject to random testing. This approach reflects the reduced potential for insiders to affect radiological sabotage at decommissioning sites and the reduced hazard presented by the spent fuel. These changes ensure that FFD program elements that are necessary to maintain reasonable assurance that individuals at decommissioning reactor sites remain trustworthy and reliable and are implemented consistently throughout the industry.

4.4.3 Assumptions

The regulatory analysis assumes that in the status quo, at decommissioning, licensees will continue to meet the IMP requirements in 10 CFR 73.55(b)(9)(ii)(B) by implementing a full FFD program under 10 CFR Part 26, except for Subparts I and K.

For Alternative DA-2, the NRC based the workforce size estimates at decommissioning sites on the annual FFD program performance drug and alcohol testing data submitted to the NRC by the licensees of the following nine decommissioning power reactor facilities: Crystal River, Duane Arnold, Indian Point, Kewaunee, Oyster Creek, Pilgrim, San Onofre, Three Mile Island, and Zion.

For Alternative DA-2, the regulatory analysis assumes that 40 percent of the individuals working at a decommissioned nuclear power plant will have UA to the VA.

For Alternative DA-2, the NRC based the estimated number of years from start of decommissioning to transfer of all spent fuel to dry cask storage in an ISFSI on the completed spent fuel transfer campaigns at the following eight decommissioning sites: Crystal River, Duane Arnold, Fort Calhoun, Kewaunee, Oyster Creek, Pilgrim, San Onofre, and Vermont Yankee.

4.4.4 Affected Attributes

Industry Implementation: To implement Alternative DA-2, licensees will incur a one-time cost from participating in the NRC's update to RG 5.77, "Insider Mitigation Program," Revision 1, issued September 2022 (Ref. 27).

Industry Operation: Under Alternative DA-2, the NRC will rework the IMP requirements to allow for an approach commensurate with the hazard and potential event consequences at a decommissioning facility. As a result, individuals with PA-only UA to a decommissioning site will no longer be subject to random drug and alcohol testing under 10 CFR 26.31(c)(5). This will reduce industry costs for drug and alcohol testing programs during decommissioning.

NRC Implementation: The NRC will incur a one-time cost to revise RG 5.77 after the final rule is issued.

4.5 Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor

The current regulations for operating reactors include specific requirements on staffing levels for licensed operators for each shift, as well as control room staffing requirements and commensurate training requirements for licensed operators. The regulations do not address training requirements for a facility undergoing decommissioning. Licensees have been requesting amendments to their technical specifications to eliminate the need to maintain licensed operators on the staff during decommissioning and to discontinue the associated licensed operator training programs. Instead, licensees have proposed, and the NRC has approved, a CFH, a non-licensed operator (NLO) who has been qualified in accordance with a Commission-approved fuel handler training program, and an additional NLO as the necessary staff for each shift.

A CFH at a permanently shutdown and defueled nuclear power reactor undergoing decommissioning is an individual who has the requisite knowledge and experience to evaluate plant conditions and make judgments about what actions are necessary to protect public health and safety. Because the CFH is defined as an NLO, the NRC has evaluated the CFH training program in accordance with 10 CFR 50.120, "Training and qualification of nuclear power plant personnel," which includes a requirement in 10 CFR 50.120(b)(2) that the training program must be derived from a systems approach to training, as defined in 10 CFR 55.4, "Definitions," and must provide for the training and qualification of certain categories of nuclear power plant personnel, including the NLO category. The NRC notes that, although the definition of a CFH in 10 CFR 50.2 indicates that a fuel handler training program requires Commission approval, the regulations do not further specify what constitutes an acceptable program, beyond the requirements in 10 CFR 50.120, which apply to all NLOs. Because a training program for an NLO subject to 10 CFR 50.120 does not require Commission approval, unless that NLO is a CFH, the NRC has determined in several license amendment reviews that an acceptable fuel handler training program suitable to qualify a CFH should ensure that the trained individual (1) has the requisite knowledge and experience in the safe conduct of decommissioning activities, (2) has the requisite knowledge and experience in the safe handling and storage of spent fuel, and (3) is capable of evaluating plant conditions and exercising prudent judgment for emergency action decisions.

Hence, the NRC is revising the definition of a CFH in 10 CFR 50.2 to establish these three criteria for an acceptable fuel handler training program. This will eliminate the need for licensees to seek Commission approval of their training programs. Use of the criteria would be optional; licensees could still seek Commission approval for their training programs, but they would not be required to do so. The NRC can inspect the implementation of training programs suitable to qualify NLOs and CFHs using existing inspection procedures (IPs), such as IP 41501, "Part 52, Review of Training and Qualification Programs," dated June 4, 2019 (Ref. 28).

The current regulations do not address the acceptability of discontinuing the licensed operator, licensed senior operator, and shift technical advisor (STA) positions for a decommissioning reactor. Decommissioning licensees have been removing the STA position and replacing their licensed operator and senior operator positions with a CFH and an NLO in their technical specifications through license amendments. In the final rule, the NRC is revising a footnote in 10 CFR 50.54(m) to state that licensed senior operators, licensed operators, and STAs are not required upon the NRC's docketing of the licensee's certifications required under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a).

A related issue exists with 10 CFR 50.120(b)(2), which states that the training programs required by 10 CFR 50.120 must provide for the training and qualification of categories of nuclear power plant personnel specified in 10 CFR 50.120(b)(2). Thus, if a decommissioning licensee decides that one or more existing training programs is unnecessary, the licensee needs to obtain relief from the requirements in 10 CFR 50.120(b)(2) by applying for an exemption to eliminate or modify the programs. No licensee has sought such an exemption. The NRC recognizes that the categories of nuclear power plant personnel listed in 10 CFR 50.120(b)(2) are based on the categories of personnel needed for an operating reactor and are likely not necessary for a decommissioning plant. The final rule will clarify that training programs derived from a systems approach to training are not required for the categories of nuclear power plant personnel that are no longer necessary at decommissioning plants, such as STAs.

4.5.1 Alternative CFH/STA-1 (No-Action Alternative)

Under this alternative, the NRC will retain the current wording of CFH-related regulations, which state, in part, that “[t]he training program must be periodically evaluated and revised as appropriate to reflect...changes to the facility, procedures and regulations.” The no-action alternative will not result in any significant additional cost or benefit; the NRC will continue to review, on a case-by-case basis, the training requirements proposed in licensees’ requests for approval. Additionally, the NRC will make no changes to the regulations on the STA and licensed operator positions or training programs for categories of nuclear power plant personnel that are no longer necessary at decommissioning plants.

4.5.2 Alternative CFH/STA-2 (Rulemaking on Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor)

Under this alternative, the final rule clarifies the requirements for the training of CFHs at decommissioning power reactors. The NRC is adding to 10 CFR 50.2 an alternative definition of “certified fuel handler” that eliminates the need for licensees to seek Commission approval for fuel handler training programs.

Specifically, the NRC is codifying current licensing practices by amending 10 CFR 50.2 to add an alternative definition that gives three broad-scope objectives as the responsibilities for which a CFH must be trained: (1) safe conduct of decommissioning activities, (2) safe handling and storage of spent fuel, and (3) appropriate response to plant emergencies. In addition, the CFH must qualify in accordance with a fuel handler training program that meets the same requirements as all training programs for NLOs under 10 CFR 50.120. Should a licensee not exercise the alternative definition, it would need to submit a request for approval of a fuel handler training program.

Furthermore, the NRC is revising a footnote to the table “Minimum Requirements per Shift for On-Site Staffing of Nuclear Power Units by Operators and Senior Operators Licensed under 10 CFR Part 55” in 10 CFR 50.54(m)(2)(i) to state that licensed senior operators, licensed operators, and STAs are not required once the NRC has docketed the license holder’s certifications required under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a). Consistent with this change, the final rule also amends 10 CFR 50.120(b)(2) so that training programs derived from a systems approach to training are not required for the categories of nuclear power plant personnel that are no longer necessary at decommissioning plants, such as STAs. Additionally, the NRC is updating RG 1.184 to Revision 2 to provide guidance for the staffing requirements at a decommissioning power reactor site (Ref. 29).

4.5.3 Assumptions

The regulatory analysis makes the following assumptions for the cost-benefit analysis of CFH definition; elimination of licensed senior operators, licensed operators, and STAs; and elimination of training programs derived from a systems approach to training for the categories of nuclear power plant personnel that are no longer necessary at decommissioning plants:

- The development of voluntary industry initiatives would require the same amount of time as the NRC would take to develop a new RG.
- The NRC would take half as long to review the industry initiatives as the industry would take to develop them.

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- All licenses would choose to use the definition of a CFH provided by the rulemaking alternative when they establish their fuel handler training programs.
 - Future licensees might request exemptions from 10 CFR 50.120(b)(2) to remove their training programs derived from a systems approach to training for the categories of nuclear power plant personnel that are no longer necessary at their decommissioning plants.

4.5.4 Affected Attributes

Industry Implementation: Under Alternative CFH/STA-2, licensees will still need to submit license amendment requests to replace licensed operators with shift staffing consisting of CFHs and NLOs, to manage spent fuel and conduct decommissioning activities. However, Alternative CFH/STA-2 eliminates the need for licensees to seek Commission approval for fuel handler training programs suitable to qualify a CFH. The elimination of this approval process will result in a one-time benefit (i.e., averted cost) for the industry. Alternative CFH/STA-2 also eliminates the need for licensees to seek exemption from the 10 CFR 50.120(b)(2) requirement to maintain training programs for personnel not necessary at a decommissioning plant. However, the averted costs of eliminating these exemption requests were not estimated quantitatively because there is no history of such exemption requests being submitted.

NRC Implementation: Under Alternative CFH/STA-2, the NRC will no longer have to review fuel handler training programs for their suitability to qualify CFHs. However, the NRC will continue to review license amendment requests for changes to the section of licensees' technical specifications titled "Administrative Controls" for the removal of licensed senior operators, licensed operators, and STAs.

4.6 Decommissioning Funding Assurance

The NRC requires nuclear power plant licensees to provide reasonable assurance that funds will be available for plant radiological decommissioning. As part of this assurance, licensees must provide minimum decommissioning financial assurance in accordance with the formula in 10 CFR 50.75(c). This formula of minimum amounts was established in 1988 as a means of ensuring that the bulk of funds needed for radiological decommissioning would be available. The requirement in 10 CFR 50.75(c) also defines a process for adjusting the formula to current-year dollars. The NRC uses the formula and adjustment factors to assess the adequacy of licensees' decommissioning financial assurance every 2 years. RG 1.159, "Assuring the Availability of Funds for Decommissioning Production or Utilization Facilities," Revision 2 provides guidance to licensees on the requirements for decommissioning financial assurance (Ref. 30). RG 1.159 will be updated to Revision 3 (Ref. 31) to reflect the changes in this final rule.

The term "legitimate" in 10 CFR 50.82(a)(8)(i)(A) and 52.110(h)(1)(i) does not add any substance to the regulations and is potentially confusing, and therefore the final rule removes this term. The purpose of these regulations is to ensure that expenses to be paid with funds from a licensee's decommissioning trust fund (DTF) fall within the NRC definition of "decommission." Whether an expense falls within the definition of decommission will continue to be determined on a case-by-case basis by the licensee when considering whether to make a withdrawal from the DTF. Since the term "legitimate" is nonsubstantive, its removal does not change any of the existing requirements regarding the use of DTFs.

Each power reactor licensee is currently required to file a report with the NRC on the status of its decommissioning financial assurance, for each reactor that it owns, by March 31st of every odd-numbered year or annually for plants that are within five years of their projected end of operations, on multiple aspects of decommissioning funding. The NRC is changing the reporting frequency in 10 CFR 50.75(f)(1) to coordinate the reporting frequency with the ISFSI decommissioning funding assurance reporting frequency in 10 CFR 72.30. This change converts the biennial decommissioning funding status report required for 10 CFR Part 50 and 10 CFR Part 52 nuclear power reactor licensees to a triennial decommissioning funding status report as is currently required for 10 CFR Part 72 ISFSI licensees. This revision does not change the annual reporting frequency for a reactor licensee that is within 5 years of its projected end of operation, whether that projection is based on the license's expiration date or on a premature shutdown, and will not change the annual reporting frequency for a reactor that has permanently ceased operations. In addition, the change in reporting frequency does not relieve the licensee from calculating annual adjustments as required under 10 CFR 50.75(a)(2) and will not affect the table of minimum amounts in 10 CFR 50.75(c) or its escalation factors. Therefore, a licensee is required to continue to monitor its decommissioning funding on an annual basis, but instead of reporting at least once every 2 years to the NRC, it would report at least once every 3 years.

The final rule amends 10 CFR 50.82(a)(8)(v) and 52.110(h)(5) for use by general license ISFSIs at reactor sites to specify that their report on the status of funding for decommissioning and for the management of spent fuel ends when those licensees have completed a final radiation survey and demonstrated that residual radioactivity has been reduced to a level that permits termination of its license with the exception of the ISFSI.

The NRC is also aligning the decommissioning financial assurance reporting requirements when decommissioning has been completed but for the decommissioning of the ISFSI. Specifically, the NRC is amending 10 CFR 50.82(a)(8)(vii) and 52.110(h)(7) to align the timing of the requirement regarding the reporting on funding for the management of spent fuel with the ISFSI decommissioning funding plan updates required by 10 CFR 72.30(c), such that both reporting requirements have a periodicity of not to exceed 3 years. The NRC is also revising 10 CFR 50.75(h) to be consistent with the requirements of 10 CFR 50.4. Specifically, notifications will be sent directly to the Document Control Desk, and not to the Director, Office of Nuclear Reactor Regulation, or Director, Office of Nuclear Material Safety and Safeguards, as applicable. This change provides one consistent location for licensees to docket all notifications to the NRC. The NRC is deleting 10 CFR 50.75(f)(2). The language of existing 10 CFR 50.75(f)(1) fully encompasses the language of paragraph (f)(2), and, therefore, paragraph (f)(2) is unnecessary and potentially confusing.

The requirement in 10 CFR 50.75 that the licensee provide reasonable assurance that sufficient funds will be available for radiological decommissioning is a continuing obligation. However, economic factors can cause the amount of a licensee's financial assurance to fall below the amount required (either by the NRC minimum formula in 10 CFR 50.75(c), or by a licensee's site-specific decommissioning cost estimate), thereby creating a shortfall.³ The current regulations do not explicitly discuss what to do when a licensee faces a funding shortfall, regardless of its cause. The NRC is amending its regulations in 10 CFR 50.75(f)(1) to clarify that, although the regulations establish a continuing obligation to provide reasonable assurance of decommissioning funding, when a licensee identifies a shortfall in the report required by 10

³ Shortfall is defined as the difference between the amount of financial assurance provided by the licensee and the amount of financial assurance required.

CFR 50.75(f)(1), the next report for licensees that are not “electric utilities” as defined in 10 CFR 50.2, or the report two reports later for licensees that are electric utilities, may not have a shortfall. The NRC is revising 10 CFR 50.82(a)(9)(ii)(F) and 52.110(i)(2)(vi) to require licensees to identify the specific sources of funds for “remaining decommissioning costs,” including sources of funds for license termination, spent fuel management, and ISFSI decommissioning, as applicable.

The NRC is revising 10 CFR 72.30 so that the ISFSI financial assurance submittals subsequent to the initial decommissioning funding plan will no longer require NRC approval. The NRC found little benefit in approving subsequent decommissioning funding plans for ISFSIs because the financial assurance mechanisms employed are very similar to those used for nuclear power reactors. The revisions to 10 CFR 72.30(b) restructure the current requirement to clarify the ISFSI decommissioning funding plan reporting requirements for general license and specific license ISFSIs. The redesignated 10 CFR 72.30(b)(1) clarifies that a specific license ISFSI holder must submit a decommissioning funding plan as part of its application to receive a specific license. The redesignated 10 CFR 72.30(b)(2) clarifies that a general license ISFSI holder must submit a decommissioning funding plan prior to the initial storage of spent fuel in accordance with 10 CFR 72.212(a)(3). The 10 CFR 72.30(b) requirement on content of the decommissioning funding plans for both general license and specific license ISFSIs is being retained and is being redesignated as 10 CFR 72.30(b)(3). Both types of funding plans must be reviewed and approved by the NRC. Section 72.30(c) is also being revised to clarify that an updated decommissioning funding plan is required at the time of specific license renewal for an ISFSI but not for general license ISFSI renewals. These changes make the processes under 10 CFR 72.30(c) more efficient and less burdensome to the licensee and the NRC, while still maintaining reasonable assurance of adequate funding for the decommissioning of ISFSIs.

Finally, the NRC is deleting a duplicative requirement for site-specific decommissioning cost estimates in 10 CFR 50.82(a)(8)(iii) and 52.110(h)(3), clarifying and making conforming changes regarding Part 52 requirements by revising 10 CFR 52.110 and 10 CFR 50.75(b)(1), and making some consistency changes to 10 CFR 50.75, all of which would not have an impact on the costs and benefits of this final rule.

4.6.1 Alternative DTF-1 (No-Action Alternative)

Under the no-action alternative, the regulations for establishing and using the DTF would remain unchanged. The reporting frequencies would remain as they currently stand, and the many clarifying and conforming changes would not be made to the regulations.

4.6.2 Alternative DTF-2 (Rulemaking to Amend Regulations to Reduce Reporting Costs and Reduce Ambiguity in Decommissioning Trust Fund Regulations)

Under this alternative, the NRC will change the current decommissioning funding assurance regulations as follows to reduce reporting costs and address ambiguity:

- The NRC will modify the reporting requirements in 10 CFR 50.75(f)(1) to be consistent with the reporting frequency for decommissioning funding assurance for ISFSIs in 10 CFR 72.30(c). Licensees will report the status of decommissioning funding triennially (every 3 years), instead of biennially (every 2 years). Furthermore, the NRC will modify the reporting requirements when decommissioning has been completed but for the decommissioning of the ISFSI, again to triennial (instead of annual) frequency.

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- The NRC will amend the regulation at 10 CFR 50.75(b) to further clarify that licensees shall maintain decommissioning funding assurance. Licensees will have to correct shortfalls promptly and provide evidence of having done so to the NRC within the next two reporting cycles under 10 CFR 50.75(f). Conforming changes will be made to 10 CFR 50.82 as part of this rulemaking.
 - The NRC will amend 10 CFR 50.75(h)(1)(B)(iv) to be consistent with 10 CFR 50.4, “Written communications,” with respect to written notice of intent to make a disbursement or payment from the DTF. This change will require that all notice materials be sent to the Document Control Desk instead of the director of the Office of Nuclear Reactor Regulation, as licensees are now directed.
 - The NRC will eliminate 10 CFR 50.75(f)(2), because it duplicates the language of 10 CFR 50.75(f)(1).
 - The NRC will amend the regulations at 10 CFR 50.82(a)(8)(i)(A) and 10 CFR 52.110(h)(1)(i) to remove the term “legitimate.” This term does not add any substance to the regulations and is potentially confusing.
 - The NRC will revise 10 CFR 52.110 to make the same changes as in 10 CFR 50.82, for consistency. In addition, the NRC will add paragraphs (h)(5)–(h)(7) to give site-specific decommissioning cost estimate reporting requirements that are identical to those of 10 CFR 50.82(a)(8)(v)–(vii). A report on irradiated fuel should be submitted only if irradiated fuel is on site.
 - The NRC will revise 10 CFR 72.30 so that the resubmittals subsequent to the initial decommissioning funding plan for ISFSIs will no longer require NRC approval. This change will make the processes under 10 CFR 72.30(c) more efficient and less burdensome to the licensee, while still maintaining reasonable assurance of adequate funding for the decommissioning of an ISFSI.

4.6.3 Assumptions

The regulatory analysis makes no assumptions beyond that licensees are in compliance with existing regulations that are being modified by the final rule.

4.6.4 Affected Attributes

Industry Operation: Under Alternative DTF-2, the decommissioning financial assurance reporting frequencies will be extended from every 2 years to every 3 years until within 5 years of decommissioning and during decommissioning, when the frequency remains at annual, and from every year to every 3 years once decommissioning has been completed but for the decommissioning of the ISFSI. This lower frequency of reporting will result in averted costs for licensees. In addition, licensees that report a shortfall pursuant to 10 CFR 50.75(f) will have to correct the shortfall in a timely manner.

NRC Operation: Under Alternative DTF-2, the NRC will continue to evaluate decommissioning financial assurance reports as they are submitted. Therefore, the lower frequency of reporting will result in a lower frequency of evaluation and thus in averted costs for the NRC.

Regulatory Efficiency: Under Alternative DTF-2, the NRC will appropriately restructure certain reporting requirements for general license ISFSIs and specific license ISFSIs, align other reporting requirements, remove duplicative regulations, and clarify terminology. These changes will enhance the regulatory structure and contribute to licensee and NRC process efficiencies.

4.7 Offsite and Onsite Financial Protection Requirements and Indemnity Agreements

To implement the requirements of the Price-Anderson Act (PAA), codified in section 170 of the Atomic Energy Act of 1954, as amended (AEA), the NRC requires nuclear power plant licensees to comply with regulations for offsite financial protection and indemnity agreements. All nuclear reactors are required to have and maintain offsite financial protection as set forth in 10 CFR 140.11, "Amounts of financial protection for certain reactors." As set forth in 10 CFR 140.11(a)(4), the amounts of insurance required for each large operating reactor (i.e., with a rated capacity of 100,000 electrical kilowatts or more) are (1) primary financial protection in the amount of \$500 million, and (2) secondary financial protection consisting of funds from a nuclear industry retrospective rating plan. The Commission executes and issues agreements of indemnity for large operating reactors pursuant to 10 CFR 140.20, "Indemnity agreements and liens." The general form of indemnity agreement to be entered into by the Commission with large operating reactors is provided at 10 CFR 140.92, "Appendix B—Form of indemnity agreement with licensees furnishing insurance policies as proof of financial protection," and 10 CFR 140.93, "Appendix C—Form of indemnity agreement with licensees furnishing proof of financial protection in the form of licensee's resources."

Apart from the PAA requirements, the NRC also requires nuclear power reactor licensees to maintain onsite property insurance. Specifically, 10 CFR 50.54(w) requires licensees to obtain property insurance for each reactor site in the amount of \$1.06 billion, or the maximum amount of coverage generally available from private sources, whichever is less, to stabilize and decontaminate the reactor and the reactor site in the event of an incident. Neither the PAA nor the NRC's implementing regulations for large operating reactors explicitly address decommissioning. Likewise, the NRC's onsite insurance requirements do not address the status of facilities during the decommissioning period or the reduction in risk presented by permanently shutdown reactors.

In SECY-93-127, "Financial Protection Required of Licensees of Large Nuclear Power Plants during Decommissioning," dated May 10, 1993 (Ref. 32), the NRC staff concluded, "In the interim, exemptions could be granted for reductions in the amount of primary financial protection required to a level which would not prejudice the outcome of rulemaking. The staff believes that a level of \$100 million would be adequate." In SRM-SECY-93-127, dated July 13, 1993 (Ref. 33), the Commission authorized the staff to approve, through specific exemptions from the requirements of 10 CFR 140.11(a)(4), termination of participation in the retrospective rating plan and reduction in primary financial protection from \$450 million (the amount required by the regulations at that time) to \$100 million, after a spent fuel cooling period adequate to support air cooling of the fuel in a completely drained pool. Similarly, under the status quo, and pursuant to 10 CFR 50.54(w), licensees must have and maintain a minimum coverage limit for each reactor site in the lesser amount of either \$1.06 billion, or whatever amount of insurance is generally available from private sources. In SECY-96-256, "Changes to Financial Protection Requirements for Permanently Shutdown Nuclear Power Reactors, 10 CFR 50.54(w)(1) and 10 CFR 140.11," dated December 17, 1996 (Ref. 34), the NRC staff recommended changes to the power reactor insurance regulations that would allow licensees to lower onsite insurance levels to \$50 million upon demonstration that the fuel stored in the SFP could be air-cooled if the

SFP were drained of water. In SRM-SECY-96-256, dated January 28, 1997 (Ref. 35), the Commission supported this recommendation. The NRC has issued several exemptions from the requirements of 10 CFR 50.54(w), on the basis that the reduced onsite insurance coverage value of \$50 million satisfies the underlying purpose of the rule in funding stabilization of site conditions and cleanup costs associated with decontamination following the hypothetical rupture of a large onsite liquid radioactive waste tank. With the spent fuel adequately cooled by air in a drained SFP, the potential for a significant release from the spent fuel is considered negligible.

4.7.1 Alternative FP-1 (No-Action Alternative)

Under the no-action alternative, licensees will continue to abide by the regulations in 10 CFR 140.11(a)(4), which require each reactor that is licensed to operate and has a rated capacity for electrical generation exceeding 100,000 electrical kilowatts to have \$500 million in primary financial protection to remedy a potential offsite release of nuclear material and to participate in the industry retrospective rating plan. Under 10 CFR 50.54(w), licensees will also continue to maintain a minimum coverage limit for each reactor site in the lesser amount of either \$1.06 billion, or whatever amount of insurance is generally available from private sources. Pursuant to 10 CFR 140.8, "Specific exemptions," the Commission may grant exemptions from this regulation that it determines are authorized by law and otherwise are in the public interest.

4.7.2 Alternative FP-2 (Rulemaking to Codify Current Exemption Process)

This rule change will allow licensees of large operating reactors that have permanently shut down to reduce both offsite and onsite financial protection without needing to submit requests for regulatory exemptions from financial protection requirements. The objectives of this change are: (1) to provide a process that maintains adequate financial protection during decommissioning, and (2) to minimize the need for licensees to request exemptions from financial protection requirements that are no longer needed.

This alternative amends the offsite and onsite financial protection requirements based on the reduced risk of radiological release from the anticipated reactor configurations. It incorporates reductions in financial protection based on two levels (Levels 1 and 2), described below and summarized in table 2. The amounts of financial protection required in each level are consistent with exemptions previously granted for decommissioned reactors. The amounts are based on the estimated cost of recovery from limiting hypothetical events for specific reactor configurations.

Table 2 Two-Step Graded Approach

Level	Reactor Site Description	Offsite Requirement	Onsite Requirement
1	Operating, or permanently ceased operations and permanently defueled	\$500 million; participation in industry retrospective rating plan	\$1.06 billion
2	Sufficiently decayed fuel	\$100 million; withdrawal from rating plan	\$50 million

Description of Level 1: Operating, or Permanently Ceased Operations and Permanently Defueled

Licensees in Level 1 include licensees of operating reactors and licensees of decommissioning reactors that have docketed certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82 or 10 CFR 52.110. In this level, a decommissioning reactor is defueled and permanently shut down, but the spent fuel in the SFP is still susceptible to a zirconium fuel cladding fire if the SFP is unexpectedly drained, although this is a very unlikely event. This configuration encompasses the period from immediately after the core is removed from the reactor, until just before the decay heat of the hottest fuel assemblies is low enough to prevent any rapid zirconium oxidation within 10 hours under adiabatic conditions. Licensees in Level 1 must maintain the full amounts of offsite and onsite insurance specified in 10 CFR 140.11(a)(4) and 10 CFR 50.54(w), respectively.

Description of Level 2: Sufficiently Decayed Fuel

In Level 2, the reactor is defueled and permanently shut down, and spent fuel in the SFP has decayed and cooled sufficiently so that it cannot heat up to clad ignition temperature within 10 hours under adiabatic conditions. In this configuration, the spent fuel can be stored long term in the SFP. In addition, the site may possess a radioactive inventory of liquid radiological waste, radioactive reactor components, and contaminated structural materials. This inventory may change during Level 2, depending on the licensee's proposed shutdown activities and schedule. The transition to Level 2 financial protection amounts could occur after a timeframe based on a site-specific analysis demonstrating that the fuel cannot heat up to clad ignition temperature within 10 hours under adiabatic conditions. In Level 2, the offsite requirements are reduced from \$500 million in primary financial protection and participation in the industry retrospective rating plan to \$100 million and withdrawal from the industry retrospective rating plan. The Commission has determined that the \$100 million is sufficient to cover offsite liability claims such as those incurred as a result of the accident at Three Mile Island, Unit 2.

In Level 2, onsite financial protection requirements are reduced from \$1.06 billion to \$50 million. This amount reflects the potential for a radiological incident resulting from the mobile sources of radioactivity at a permanently shutdown reactor site. A scenario involving the rupture of a large liquid radioactive waste storage tank (approximately 450,000 gallons) containing slightly radioactive water was selected as conceivable and a bounding scenario. To estimate cleanup costs in the limiting event, the NRC staff considered the costs associated with removing soil contamination and potential contamination of the groundwater table. That postulated event was estimated to require an onsite waste cleanup cost of approximately \$50 million, with negligible radiological consequences off site. In economic terms, these costs would surpass the cleanup costs associated with a fuel-handling incident, which has been taken into account in determining the upper-bound level of onsite insurance coverage required in Level 2.

Furthermore, the NRC is amending its regulations at 10 CFR 140.81, "Scope and purpose," to clarify the applicability of the requirements for an extraordinary nuclear occurrence (ENO) to reactors in decommissioning. Under sections 11 and 170 of the AEA, and NRC regulations at Subpart E, "Extraordinary Nuclear Occurrences," of 10 CFR Part 140, "Financial Protection Requirements and Indemnity Agreements," the Commission is authorized to make a determination as to whether an event at a utilization or production facility causing a discharge or dispersal of source, special nuclear, or byproduct material that has resulted or will result in substantial damages to offsite members of the public or property, is an ENO. An event will qualify as an ENO if the Commission determines that the criteria in 10 CFR 140.84,

“Criterion I—Substantial discharge of radioactive material or substantial radiation levels offsite,” and 10 CFR 140.85, “Criterion II—Substantial damages to persons offsite or property offsite,” have been met. The NRC recognizes that the consequences of an accident at a decommissioning reactor in Level 1 can be similar to those of an accident at an operating reactor. As presented in NUREG-1738, in the window beginning immediately after the reactor has been defueled and the fuel has been placed in the SFP, the offsite consequences of a zirconium fire may be comparable to those from a postulated severe accident at an operating reactor. The existing potential consequences from a zirconium fire, until the fuel in the SFP has sufficiently decayed, provide the basis for the modification of the NRC’s regulations to include plants in decommissioning within the scope of 10 CFR 140.81.

The NRC also is amending 10 CFR 50.54(w) to include a prompt notification to the Commission of any material change in proof of onsite property insurance filed with the Commission under 10 CFR Part 50. Specifically, the transition to Level 2 will prompt the licensee to notify the NRC under 10 CFR 50.54(w)(6) of a reduction in onsite property insurance from \$1.06 billion to \$50 million. The addition of 10 CFR 50.54(w)(6) would be a conforming change, for consistency with the offsite financial protection requirements under 10 CFR 140.15(e).

4.7.3 Assumptions

The regulatory analysis makes the following assumptions:

- Under Alternative FP-1, all nuclear reactor licensees will submit exemption requests for onsite and offsite financial protection, which will be consistent with the reduced requirements for offsite and onsite financial protection described for Levels 1 and 2.
- Under Alternative FP-2, no decommissioning licensees will submit site-specific analyses demonstrating that the spent fuel in an SFP cannot heat up to clad ignition temperature under adiabatic conditions, since they will opt for a decay period of 10 or 16 months.
- Under Alternative FP-2, nuclear power reactor sites that have decommissioned will reduce their onsite and offsite financial protection to the minimum requirements of Level 2 once they meet the description of this level.
- Under Alternative FP-2, the decommissioning financial protection and indemnity regulations will no longer apply after the site has passed its confirmatory survey and the NRC has terminated the plant license.

4.7.4 Affected Attributes

Industry Implementation: Under Alternative FP-2, licensees will not need to apply for exemptions from offsite and onsite financial protection regulations. This results in a one-time benefit (i.e., averted cost) for each licensee. Licensees are required to submit a prompt notification to the Commission of any material change in proof of onsite or offsite property insurance filed with the Commission under 10 CFR 50.54(w)(6) or the current 10 CFR 140.15(e).

NRC Implementation: Under Alternative FP-2, licensees will no longer need to request exemptions to reduce financial protection. This eliminates the need for staff reviews of these exemption requests, which constitutes a benefit (i.e., averted cost) for the NRC.

4.8 Environmental Considerations

In certain circumstances, licensees may be unable to satisfy the requirement to conclude in the PSDAR that the environmental impacts associated with site-specific decommissioning activities will be bounded by previous environmental impact statements. NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," Supplement 1, "Regarding the Decommissioning of Nuclear Power Reactors," issued November 2002 (Ref. 36), identified two resource areas that were not generically resolved and thus would require site-specific analyses, as well as four other resource areas that might require site-specific analyses. Therefore, a licensee that could not conclude in the PSDAR that the environmental impacts will be bounded would have to either change its planned decommissioning activities so that their impacts would be bounded, or submit a license amendment request or an exemption request to satisfy 10 CFR 50.82(a)(4)(i) or 10 CFR 52.110(d)(1).

4.8.1 Alternative ENV-1 (No-Action Alternative)

The no-action alternative will retain the current decommissioning regulations requiring licensees to conclude in the PSDAR that the environmental impacts associated with site-specific decommissioning activities will be bounded by previous environmental impact statements.

4.8.2 Alternative ENV-2 (Rulemaking to Revise PSDAR Requirements)

Under this alternative, the NRC will change the PSDAR requirements in 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) to require that licensees discuss whether the environmental impacts associated with site-specific decommissioning activities will be bounded by previous environmental reviews and the licensee's reasons for reaching that conclusion, and describe any decommissioning activities whose environmental impacts will not be so bounded and will be evaluated prior to the performance of the activities. Licensees are no longer required to make the definitive conclusion that impacts will be bounded. Instead, they have the flexibility to address any unbounded environmental impacts closer to, but before, the decommissioning activities being undertaken that could cause these impacts. If a licensee is considering a decommissioning activity that would otherwise be prohibited by 10 CFR 50.82(a)(6)(ii) or 10 CFR 52.110(f)(2), then before undertaking the activity, the licensee could request a license amendment or a regulatory exemption, decide not to perform the proposed activity, or modify the proposed activity so that the significant environmental impact does not occur. If the licensee chooses to request a license amendment or an exemption, then the request will trigger NRC responsibilities under the applicable environmental statutes.

The NRC also is changing the regulations at 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) to allow licensees to use any appropriate federally issued environmental review documents. This would include environmental review documents prepared in compliance with the National Environmental Policy Act of 1969, as amended (NEPA), the Endangered Species Act of 1973, as amended (ESA), the National Historic Preservation Act of 1966, as amended (NHPA), or other environmental statutes, instead of only environmental impact statements. This change allows licensees to use a wider range of documents that address various resources. Also, the NRC is changing the regulations at 10 CFR 50.82(a)(6)(ii) and 10 CFR 52.110(f)(2) to clarify that licensees shall not perform any decommissioning activities that result in significant environmental impacts not bounded by appropriate federally issued environmental review documents.

4.8.3 Assumptions

The regulatory analysis makes the following assumptions:

- Under Alternative ENV-2, licensees will no longer make the effort that they would have made, under the status quo, to conclude in the PSDAR that the environmental impacts associated with site-specific decommissioning activities will be bounded by previous environmental impact statements. The NRC assumes that licensees reach this conclusion by working for approximately 3 hours per page.

4.8.4 Affected Attributes

Industry Implementation: Alternative ENV-2 will result in averted costs for the industry, in the form of the time needed for licensees to conclude in the PSDAR that the environmental impacts associated with site-specific decommissioning activities will be bounded by previous environmental impact statements.

Environmental: Under Alternative ENV-2, the NRC will amend its regulations to state that licensees must discuss in the PSDAR whether the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate federally issued environmental review documents and the licensee's reasons for reaching that conclusion, and describe any decommissioning activities whose environmental impacts will not be so bounded and will be evaluated prior to the performance of the activities. This change clarifies the requirement that ensures that licensees do not perform decommissioning activities that would have significant impacts not previously reviewed. This regulatory change will have no impact on the NRC, and licensees could continue to resolve any unbounded impacts before performing the associated decommissioning activity by requesting a license amendment or an exemption, by not performing the activity, or by modifying the activity to avoid causing the unbounded significant environmental impacts. The change more closely aligns the licensee's environmental analysis to the occurrence of the impacts. It reduces the burden on decommissioning licensees at the time of PSDAR submittal because they will no longer need to develop a statement concluding that environmental impacts will be bounded.

4.9 Record Retention Requirements

The following regulations contain certain existing requirements for recordkeeping and record retention at operating nuclear power plants and ISFSIs:

- Criterion XVII, "Quality Assurance Records," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires licensees to retain certain records consistent with regulatory requirements for a duration established by the licensees.
- The regulations at 10 CFR 50.59(d)(3) and 10 CFR 52.63(b)(2) require licensees to maintain certain records until termination of a license issued under 10 CFR Part 50 or 10 CFR Part 52. Also, Section X.A.3 of the standard design certifications rules (i.e., Appendices A through G of 10 CFR Part 52) require licensees to maintain certain records throughout the period of application and for the term of the license (including any period of renewal).

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- The regulation at 10 CFR 50.71(c) requires licensees to maintain certain records consistent with various elements of the NRC regulations, facility technical specifications, and other licensing basis documents.
 - The regulation at 10 CFR 72.72(d) requires licensees to duplicate certain records of spent fuel and high-level radioactive waste and store them in a separate location sufficiently remote from the original records so that a single event would not destroy both sets.

Licensees that are transitioning to decommissioning frequently request exemptions from certain parts of these recordkeeping regulations that require the retention of records until termination of the license. Licensees that have previously been granted these exemptions used the justification that, when the associated structures, systems, and components (SSCs) are removed from the licensing basis documents, the SSCs will no longer serve any NRC-regulated function. Therefore, there will be no need to retain the records.

In addition, several licensees requesting exemption from the requirements of 10 CFR 72.72(d) used the justification that they will store the ISFSI spent fuel records using the same procedures and processes used for the facility spent fuel (and other) records, which are typically stored in accordance with the NRC-approved quality assurance program.

4.9.1 Alternative R-1 (No-Action Alternative)

The no-action alternative will retain the status quo and all provisions of the current recordkeeping and record retention regulations in 10 CFR 50.71(c); 10 CFR Part 50, Appendix B, Criterion XVII; 10 CFR 50.59(d)(3); 10 CFR 52.63(b)(2); Section X.A.3 of 10 CFR Part 52, Appendices A through G; and 10 CFR 72.72(d). Under this alternative, decommissioning licensees will still need to apply for exemptions under 10 CFR 50.12 and 10 CFR 72.7, "Specific exemptions," to remove the record retention requirements for SSCs that no longer serve any NRC-regulated function. The NRC will continue to review and approve these exemptions on a case-by-case basis.

4.9.2 Alternative R-2 (Rulemaking to Decrease Record Retention Requirements during Decommissioning)

Through this rulemaking effort, the NRC will change the regulations to minimize the need for regulatory exemptions related to recordkeeping and record retention during decommissioning. Once the NRC receives notifications of permanent cessation of operation and permanent removal of fuel from the reactor vessel, under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a), it will allow decommissioning licensees to no longer retain records associated with SSCs that no longer serve any NRC-regulated function.

4.9.3 Assumptions

The regulatory analysis assumes that under the no-action alternative, a licensee will request exemptions from certain parts of the recordkeeping regulations at the time when it certifies under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) that it has (1) permanently ceased operation and (2) permanently removed fuel from the reactor vessel.

4.9.4 Affected Attributes

Industry Implementation: Under Alternative R-2, licensees will submit fewer requests for exemptions from recordkeeping requirements than they typically do, resulting in a one-time benefit (i.e., averted cost) for the industry for licensees that enter decommissioning after issuance of the rule.

NRC Implementation: Under Alternative R-2, licensees will submit fewer requests for exemptions from recordkeeping requirements than they typically do. This will result in a benefit (i.e., averted cost) for the NRC, because it will not need to review these requests.

4.10 Low-Level Waste Transportation

Section III.E of Appendix G, “Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests,” to 10 CFR Part 20, “Standards for Protection Against Radiation,” contains requirements for investigating rail shipments of low-level radioactive waste (LLW) if the shipper has not been notified of receipt within 20 days of transfer. In addition, section III.E requires licensees to report such missing shipments to the NRC. Decommissioning licensees frequently request exemptions from certain parts of these requirements related to the 20-day receipt notification window. Licensees that have previously been granted these exemptions typically extended the investigation notification window to 90 days, using the justification that operating experience indicates that while the 20-day window is adequate for shipments by truck, rail shipments may take more than 20 days to reach their destination because of delays in the route that are outside the licensee’s control (e.g., rail cars waiting in switchyards to be included in a train to the disposal facility).

The NRC is reducing the need for licensees to seek these exemptions by extending the receipt notification window from 20 days to 90 days after the transfer of LLW by rail from an operating or decommissioning facility, as required by 10 CFR Part 20.

4.10.1 Alternative TR-1 (No-Action Alternative)

The no-action alternative will retain the status quo and all provisions of the current investigation requirements for LLW transportation in 10 CFR Part 20, Appendix G, Section III.E. Under this alternative, both operating and decommissioning licensees will still need to apply for exemptions under 10 CFR 20.2301, “Applications for exemptions,” to extend the receipt notification window for rail transfer of LLW. The NRC will continue to review and approve these exemptions on a case-by-case basis.

4.10.2 Alternative TR-2 (Rulemaking to Change Low-Level Waste Transportation Requirements)

Under Alternative TR-2, the NRC will change its regulations to minimize the need for regulatory exemptions related to the investigation requirements in 10 CFR Part 20 for LLW transportation, during both operation and decommissioning, at all nuclear facilities. Specifically, the NRC will extend the receipt notification window to 90 days after the transfer of LLW from a nuclear facility by rail. The revised regulation will continue to meet the underlying purpose of 10 CFR Part 20, Appendix G, Section III.E, which requires licensees to investigate, trace, and report radioactive shipments that have failed to reach their destination for unknown reasons.

4.10.3 Assumptions

The regulatory analysis assumes that under the no-action alternative, a licensee will request exemptions from certain parts of the transportation investigation requirements at the time when it certifies under 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) that it has: (1) permanently ceased operation and (2) permanently removed fuel from the reactor vessel.

4.10.4 Affected Attributes

Industry Implementation: Under Alternative TR-2, licensees will submit fewer requests for exemptions from transportation investigation requirements than they typically do, resulting in a one-time benefit (i.e., averted cost) for the industry after issuance of the rule.

NRC Implementation: Under Alternative TR-2, licensees will submit fewer requests for exemptions from transportation investigation requirements than they typically do. This will result in a benefit (i.e., averted cost) for the NRC, because it will not have to review these requests.

4.11 Spent Fuel Management Planning

The regulation at 10 CFR 72.218(a) states that the spent fuel management program under 10 CFR 50.54(bb) (i.e., the irradiated fuel management program (IFMP)) must include a plan for removing from the reactor site the spent fuel stored under the 10 CFR Part 72 general license. The IFMP must show how the spent fuel will be managed before the licensee starts to decommission systems and components needed for moving, unloading, and shipping this spent fuel. The regulation at 10 CFR 72.218(b) states that an application for termination of a reactor operating license submitted under 10 CFR 50.82 or 10 CFR 52.110 must also describe how the spent fuel stored under the 10 CFR Part 72 general license will be removed from the site.

Although 10 CFR 72.218, "Termination of licenses," states what information must be included in the 10 CFR 50.54(bb) IFMP and in the 10 CFR 50.82 or 10 CFR 52.110 application for license termination, the regulations in 10 CFR 50.54(bb), 10 CFR 50.82, and 10 CFR 52.110 do not reflect these provisions. This causes regulatory uncertainty. The NRC is revising the regulations in 10 CFR 50.54(bb), 10 CFR 50.82, 10 CFR 52.110, and 10 CFR 72.218 to align the requirements, provide regulatory clarity, and enhance regulatory transparency and openness about decommissioning and spent fuel management planning.

4.11.1 **Alternative SFM-1 (No-Action Alternative)**

Under the no-action alternative, the NRC will retain the provisions of the current decommissioning regulations and guidance documents on spent fuel management and handling capabilities during decommissioning, and it will not change or clarify the requirements in 10 CFR 50.82, 10 CFR 50.54(bb), 10 CFR 52.110, or 10 CFR 72.218.

4.11.2 **Alternative SFM-2 (Rulemaking to Clarify and Update Spent Fuel Management Planning)**

Under this alternative, the NRC will clarify and align the regulations in 10 CFR 50.82, 10 CFR 50.54(bb), 10 CFR 52.110, and 10 CFR 72.218 that require licensees to plan how they will manage spent fuel at the site before they decommission the SSCs that support moving, unloading, and shipping of spent fuel. Specifically, the NRC will merge the existing IFMP provisions in 10 CFR 50.54(bb) and 10 CFR 72.218 into the PSDAR provisions in 10 CFR 50.82 and 10 CFR 52.110, and will delete 10 CFR 50.54(bb). The NRC is moving the provision

currently in 10 CFR 72.218(a) to 10 CFR 50.82(a)(4) and 10 CFR 52.110(d) to state that a licensee may not start to decommission SSCs needed for moving, unloading, and shipping spent fuel that is stored in an ISFSI licensed under the general license provisions in 10 CFR 72.210 until the NRC has received the licensee's PSDAR submittal. The NRC is also deleting the current 10 CFR 50.54(bb) requirement for information on the funding for management of irradiated fuel, because the existing regulations at 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) already require the site-specific decommissioning cost estimate submitted with the PSDAR to include the projected cost of managing irradiated fuel. By merging the IFMP provisions into the PSDAR provisions, the NRC will also eliminate the outdated IFMP approval provision that currently exists in 10 CFR 50.54(bb), which relies on a regulatory infrastructure for "any proceeding for continued licensing under Part 50 or Part 72" that no longer exists. The information on spent fuel management planning will not be subject to NRC approval, because the NRC does not approve the PSDAR. However, the public notice, comment period, and meeting already required for PSDARs will be expanded to include the spent fuel management information in IFMPs, providing opportunities for stakeholder engagement on this information that do not exist under the current regulations.

4.11.3 Assumptions

The regulatory analysis assumes that under Alternative SFM-2, no new regulatory guidance will be developed; only RG 1.185, "Standard Format and Content for Post-shutdown Decommissioning Activities Report" (Ref. 37), is being updated to Revision 2 (Ref. 38) as part of the final rule package to account for spent fuel management requirements.

4.11.4 Affected Attributes

Industry Implementation: Under Alternative SFM-2, licensees will commit minor resources to include additional details about spent fuel management in the PSDAR.

Industry Operation: Under Alternative SFM-2, licensees will spend less time interacting with the NRC to clarify information on the management of spent fuel during decommissioning thanks to enhanced clarity in guidance and regulations.

NRC Operation: Under Alternative SFM-2, the NRC will spend less time interacting with licensees to clarify information on the management of spent fuel during decommissioning thanks to enhanced clarity in guidance and regulations.

4.12 Backfit Rule

Backfitting occurs when the NRC imposes new or changed regulatory requirements or staff interpretations of the regulations or requirements on nuclear power reactor licensees, certain nuclear power reactor applicants, or select nuclear materials licensees. To ensure that proposed regulatory changes are adequately defined and justified, the NRC imposes the changes only after a formal and systematic assessment of them. The backfitting process is intended to prevent the NRC, after issuing a license or other approval, from arbitrarily changing the terms and conditions of the approval and other requirements that existed when the approval was issued.

For nuclear power reactor licensees, this process is set forth in 10 CFR 50.109, "Backfitting," and in the issue finality provisions in 10 CFR Part 52 (hereinafter collectively referred to as the "Backfit Rule"). The language of the Backfit Rule, specifically, the definition of "backfitting" in

10 CFR 50.109(a)(1), clearly applies to a licensee designing, constructing, or operating a nuclear power facility:

[T]he modification of or addition to systems, structures, components, or design of a facility; or the design approval or manufacturing license for a facility; or the procedures or organization required to design, construct or operate a facility; any of which may result from a new or amended provision in the Commission's regulations or the imposition of a regulatory staff position interpreting the Commission's regulations that is either new or different from a previously applicable staff position.

The application of the Backfit Rule to decommissioning plants is not as clear. In SECY-98-253, "Applicability of Plant-Specific Backfit Requirements to Plants Undergoing Decommissioning," dated November 4, 1998 (Ref. 39), the staff presented the Commission with a list of reasons for this uncertainty:

- The Backfit Rule has no endpoint at which the rule no longer applies, "thereby implying that backfit protection continues into decommissioning and up to the point of license termination."
- The term "operate" could reasonably be interpreted as including activities to decommission the reactor.
- The Backfit Rule was developed when the decommissioning of plants was not an active area of regulatory concern.
- The Backfit Rule's definition of "backfitting" uses terms associated with the design, construction, and operation of a facility, rather than its decommissioning, although the staff noted in SECY-98-253 that "prior to the 1996 decommissioning rule, the Commission regarded decommissioning as a phase of the plant's life cycle which is different from the operational phase."
- Two of the factors used in evaluating a backfit—costs of construction delay or facility downtime, and changes in plant or operational complexity—are targeted to power operation and "conceptually inappropriate in evaluating the impacts of a backfit on a decommissioning plant."
- The preambles for the final Backfit Rules of 1970 (Ref. 40), 1985 (Ref. 41), and 1988 (Ref. 42) did not discuss any aspect of decommissioning, focusing instead on construction and operation.
- Proposed changes to decommissioning requirements usually focused on relaxing requirements or on whether a requirement applicable to an operating reactor continued to be applicable to a decommissioning plant. Thus, "the notion of a 'substantial increase' in protection to public health and safety from a backfit does not appear to be particularly useful [in decommissioning]."
- The 1996 decommissioning final rule (Ref. 3) did not directly respond to questions from the public on the applicability of the Backfit Rule to a decommissioning plant.

In SECY-98-235, the staff requested Commission approval to amend, among other regulations, 10 CFR 50.109, so that the Backfit Rule would clearly apply to decommissioning licensees. In this paper, the NRC staff also proposed that until the rulemaking was completed, the staff would apply the Backfit Rule to plants undergoing decommissioning “to the extent practical.” In SRM-SECY-98-0253, dated February 12, 1999 (Ref. 43), the Commission approved development of a Backfit Rule for plants undergoing decommissioning. The Commission directed the NRC staff to continue to apply the then-current Backfit Rule to plants undergoing decommissioning until issuance of the final rule. The NRC ultimately did not conduct that rulemaking. In this final rule, the NRC captures in its regulations the Commission’s long-standing policy that the Backfit Rule applies to NRC actions that affect nuclear power reactor licensees in decommissioning.

4.12.1 Alternative B-1 (No-Action Alternative)

Under the no-action alternative, the NRC will continue to apply the Backfit Rule to NRC actions that affect decommissioning licensees “to the extent practical.” This means that for decommissioning licensees, the NRC will not use the provisions of the Backfit Rule that concern reactors being designed, constructed, or operated, because those provisions do not apply reactors whose design, construction, and operation phases have ended. These provisions are, in part or in whole, the following sections of 10 CFR 50.109:

- 10 CFR 50.109(c)(5) - installation and continuing costs associated with the backfit, including the cost of facility downtime or the cost of construction delay.
- 10 CFR 50.109(c)(6) - the potential safety impact of changes in plant or operational complexity, including the relationship to proposed and existing regulatory requirements.
- Other references to reactor design, construction, or operation in 10 CFR 50.109.

Under this approach, the NRC will have to refrain from applying certain provisions of the Backfit Rule to NRC actions that affect decommissioning licensees if it determines that the provisions cannot be practically applied to these actions. The NRC will make this determination on a case-by-case basis, given the specific circumstances at each licensee’s site. Because of its case-by-case nature and the resulting uncertainty in applicability, this approach could undermine the Backfit Rule’s predictability and stability policies.

4.12.2 Alternative B-2 (Rulemaking to Clarify Application of Backfit Rule to Decommissioning Licensees)

The NRC will amend 10 CFR 50.109 so that power reactor licensees whose 10 CFR 50.82(a)(1) or 10 CFR 52.110(a) certifications have been docketed by the NRC are subject to similar backfitting provisions as they were during their operating phase. A new backfitting provision for decommissioning licensees will eliminate any confusion arising from the use of the words “operate a facility” in 10 CFR 50.109(a)(1) as compared to other uses of the term “operate” in 10 CFR. The current 10 CFR 50.109(a) will be limited to licensees of operating reactors, and the new provision at 10 CFR 50.109(b) will be limited to decommissioning licensees. The preamble will be revised to remove discussion of the phrase “operate a facility.” It will explain instead that the reasons for applying the Backfit Rule to decommissioning sites are the same as those for applying it to operating reactors, and that 10 CFR 50.109(b)(1) and (2) list the types of entities that are within the scope of the Backfit Rule and the criteria for determining when they are within the rule’s scope, respectively.

4.12.3 Affected Attributes

None.

4.13 Foreign Ownership, Control, or Domination

The NRC's regulations in 10 CFR Part 50 and 10 CFR Part 52 provide for the issuance of a 10 CFR Part 50 license for a utilization or production facility and a 10 CFR Part 52 license for a utilization facility, respectively. The NRC is amending its regulations to address the circumstances when a facility licensed under 10 CFR Part 50 or 10 CFR Part 52 no longer meets the definition of a utilization facility or a production facility, yet the NRC still maintains its regulatory authority over the licensee. The AEA has certain requirements specific to utilization and production facilities. By clarifying when a facility licensed under 10 CFR Part 50 or 10 CFR Part 52 is no longer a utilization or production facility, the NRC can then specify whether these AEA requirements still apply to the licensee for that facility.

The NRC has identified that 10 CFR 50.38, "Ineligibility of certain applicants," should not apply to a facility that is no longer a utilization or production facility. Specifically, the AEA prohibits the issuance of a license for a utilization or production facility to an entity that the Commission knows or has reason to believe is foreign owned, controlled, or dominated. However, the Commission regulations that implement this prohibition in 10 CFR 50.38 are silent as to whether the prohibition would apply to the acquisition of a 10 CFR Part 50 or 10 CFR Part 52 license for a facility that is no longer a utilization or production facility.

4.13.1 Alternative F-1 (No-Action Alternative)

Under the no-action alternative, the NRC will retain its current regulations on utilization and production facilities, including the provisions that prohibit transferring a license for a utilization or production facility to an entity that the Commission knows or has reason to believe is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.

4.13.2 Alternative F-2 (Rulemaking to Specify Requirements Related to Foreign Ownership, Control, or Domination)

Under this alternative, the NRC will add to its regulations language to establish the criteria for when a facility licensed under 10 CFR Part 50 or 10 CFR Part 52 no longer meets the statutory or regulatory definition of a utilization facility (i.e., is no longer capable of making use of special nuclear material) or a production facility (i.e., is no longer capable of producing special nuclear material, separating the isotopes of plutonium, or processing irradiated materials containing special nuclear material). The first criterion is that the facility must not be legally capable of operating. The second criterion is that the facility must have been physically modified to render it incapable of making use of special nuclear material (in the case of a utilization facility) or of producing special nuclear material, separating the isotopes of plutonium, or processing irradiated materials containing special nuclear material (in the case of a production facility), without significant alterations to restore its capability to do so. When a utilization facility has been physically modified to be incapable of making use of special nuclear material, it is no longer designed or used to sustain nuclear fission in a self-supporting chain reaction.

The regulations at 10 CFR 50.82(a)(2) and 10 CFR 52.110(b) already provide for the first criterion for power reactor licensees: they state, respectively, that a 10 CFR Part 50 or 10 CFR Part 52 license no longer authorizes operation of the reactor or emplacement or

retention of fuel in the reactor vessel once the NRC has docketed the certifications for permanent cessation of operations and permanent removal of fuel from the reactor vessel, or when a final legally effective order to permanently cease operations has come into effect. The NRC is amending these regulations to add the second criterion: that a facility licensed under 10 CFR Part 50 or 10 CFR Part 52 is no longer a utilization facility once the licensee has modified it to be incapable of making use of special nuclear material without significant facility alterations.

Because the NRC's regulations do not state when a nonpower production or utilization facility (NPUF) licensee is no longer authorized to operate (other than at license termination), the NRC is amending 10 CFR 50.82(b) to add the criteria for when an NPUF is no longer authorized to operate. The NRC is renumbering the current paragraph (b)(6) in 10 CFR 50.82 as paragraph (b)(8) and adding new paragraphs (b)(6) and (b)(7). Paragraph (b)(6) will provide that an NPUF or fuel reprocessing plant is not legally capable of operating when the NRC has removed the licensee's authority to operate the facility through a license amendment. Licensees typically request a possession-only license amendment first and then submit a decommissioning plan (through a second license amendment request). This rule will offer licensees the option to request only one licensing action—the decommissioning plan license amendment—that will also address the licensee's operating authority, rendering a possession-only license amendment unnecessary. The NRC is adding the new paragraph at 10 CFR 50.82(b)(7), and amending 10 CFR 50.82(a)(2) and 10 CFR 52.110(b), to affirm that the agency's statutory authority over the existing 10 CFR Part 50 or 10 CFR Part 52 license continues after the licensee has performed decommissioning activities as a result of which the licensed facility no longer meets the definition of a utilization or production facility.

The NRC is also amending 10 CFR 50.38 so that its prohibition on transferring a license to an entity that the Commission knows or has reason to believe is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government is not applicable if the license is a 10 CFR Part 50 or 10 CFR Part 52 license for a facility that no longer meets the definition of a utilization or production facility.

4.13.3 Assumptions

The regulatory analysis assumes that under Alternative F-1, one-third of all licensees for future nuclear power reactor sites that decommission will request exemptions from 10 CFR 50.38. This assumption is based on historical data on past decommissioning sites for which licensees did request exemptions from 10 CFR 50.38 (Ref. 44).

4.13.4 Affected Attributes

Industry Implementation: Under Alternative F-2, licensees will no longer need to request exemptions from 10 CFR 50.38, resulting in a one-time benefit (i.e., averted cost) for the industry for licensees that enter decommissioning after issuance of the rule. Also, under Alternative F-2, the rule will offer an NPUF the option to request only one licensing action—the decommissioning plan license amendment—that will also address the licensee's operating authority, rendering a possession-only license amendment unnecessary. This will result in a one-time cost benefit because the licensee will not have to prepare this amendment request.

NRC Implementation: Alternative F-2 will result in a benefit (i.e., averted cost) for the NRC because it will not need to review these requests for exemptions and amendments.

4.14 Clarification of Scope of License Termination Plan Requirement

The Commission's Policy Statement on Deferred Plants (Ref. 45) addresses holders of construction permits that defer or terminate plant construction. Certain COL holders have cited the Policy Statement for authority to request NRC approval to withdraw their COLs. The Policy Statement provides that a permit holder can request withdrawal of its permit and does not cite the license termination provisions in 10 CFR Part 50, such as the requirement in 10 CFR 50.82 to submit a license termination plan. The Policy Statement was issued before the promulgation of 10 CFR Part 52 and has not been updated since, but there is nothing to prevent COL holders from following the applicable parts of the Policy Statement while continuing to comply with the Commission's regulations and the terms and conditions of the COL. The requirement for a license termination plan in 10 CFR 52.110(i) does refer to "[a]ll power reactor licensees," but the regulatory history and context indicates that 10 CFR 52.110 as a whole applies only to plants that have started operation.

4.14.1 Alternative T-1 (No-Action Alternative)

Under the no-action alternative, the NRC will retain the provisions of the current decommissioning regulations in 10 CFR 50.82(a)(9) and 10 CFR 52.110(i) requiring a license termination plan.

4.14.2 Alternative T-2 (Rulemaking to Clarify License Termination Plan)

Under this alternative, the NRC will amend its regulations to clarify that the requirement for a license termination plan in 10 CFR 50.82(a)(9) and 10 CFR 52.110(i) applies only to power reactor licensees that have commenced operation. This clarification addresses apparent confusion among COL holders that seek to surrender their licenses before beginning operation. Specifically, the NRC is amending 10 CFR 52.110(i) so that it explicitly applies only to "power reactor licensees that have loaded fuel into the reactor." As stated in the "Final Procedures for Conducting Hearings on Conformance with the Acceptance Criteria in Combined Licenses" (Ref. 46), the NRC has historically understood operation as beginning with the loading of fuel into the reactor. Therefore, 10 CFR 52.110(i) will apply to 10 CFR Part 52 power reactor licensees that have, at a minimum, begun to load fuel into the reactor. Similarly, 10 CFR 50.82(a)(9) will apply to 10 CFR Part 50 power reactor licensees that have, at a minimum, begun to load fuel into the reactor.

4.14.3 Assumptions

The clarification under Alternative T-2 is administrative and does not represent a significant change in costs or benefits for the industry, the NRC, State or local governments, or the general public.

5 EVALUATION OF COSTS AND BENEFITS FOR AREAS OF DECOMMISSIONING CONSIDERED FOR RULEMAKING

This section examines the costs and benefits expected to result from the alternatives in each decommissioning area relative to the regulatory baseline (i.e., the no-action alternative). All costs and benefits are monetized, when possible. The total costs and benefits are then summed to determine whether they result in a positive net benefit. Costs and benefits that are not monetized because of a lack of data are qualitatively described.

5.1 Analytical Methodology

This section describes the process used to evaluate the costs and benefits associated with each alternative, consistent with the guidance in NUREG/BR-0058, Revision 5 (draft final). The benefits include desirable changes in affected attributes (e.g., monetary savings, reduced burden on licensees, streamlined process), while the costs include any undesirable changes in affected attributes (e.g., monetary costs).

This regulatory analysis evaluates eight attributes on a quantitative basis: industry implementation, industry operation, NRC implementation, NRC operation, other government, general public, environmental considerations, and regulatory efficiency. Quantitative analysis requires a baseline characterization of the affected universe, including characterization of factors such as the number of affected entities, the areas of decommissioning, and the administrative processes and procedures that licensees or applicants would implement, or no longer implement, because of the alternatives under consideration. Costs to complete and process exemptions and amendments for decommissioning preceding the issuance of the final rule in 2024 are sunk costs, as are all costs associated with rulemaking and RG development and publication, and are not considered in this regulatory analysis.

5.1.1 Regulatory Baseline

This regulatory analysis measures the incremental impacts of the recommended rulemaking, relative to a baseline that reflects anticipated behavior in the event the NRC undertakes no additional regulatory actions (the no-action alternatives). As part of the regulatory baseline used in this analysis, the staff assumes full licensee compliance with existing NRC regulations.

5.1.2 Discount Rates

In accordance with guidance from the Office of Management and Budget (OMB) Circular No. A-4, "Regulatory Analysis," dated September 17, 2003 (Ref. 47), and NUREG/BR-0058, Revision 5 (draft final), net-present-worth calculations are used to determine how much society would need to invest today to ensure that the designated dollar amount is available in a given year in the future. The use of present-worth values allows costs and benefits to be valued to a reference year for comparison, regardless of when they are actually incurred. Based on OMB Circular No. A-4 and consistent with NRC past practice and guidance, present-worth calculations use 3 percent and 7 percent real discount rates.⁴ 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, reflecting the discounting concept of the *social rate of time preference*. A 7 percent discount rate approximates the marginal pretax real rate of return on an average investment in the private sector; this 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 discounting concept of the *opportunity cost of capital*,⁵ which reflects the time value of resources directed to meet regulatory requirements.

⁴ The rates in appendix C to OMB Circular No. A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (Ref. 48), do not apply to regulatory analysis or cost-benefit analysis of public investment. These rates are used for lease-purchase and cost-effectiveness analysis, as specified in the circular.

⁵ Opportunity cost is the value of the next best alternative to a particular activity or resource. Opportunity cost does not need to be assessed in monetary terms; it can be assessed in terms of anything that is of value.

5.1.3 Labor Rates

For the purposes of regulatory analysis, labor rates are developed, consistent with the guidance in NUREG/CR-4627, “Generic Cost Estimates,” issued February 1992 (Ref. 49); NUREG/BR-0058, Revision 5 (draft final); and general cost-benefit methodology. The NRC labor rate for fiscal year 2022 is \$143 per hour, calculated using the approach set forth in NUREG/CR-3568, “A Handbook for Value-Impact Assessment” (Ref. 50).

This regulatory analysis uses multiple weighted hourly labor rates for the industry, listed in Appendix B. The NRC derived these labor rates according to data from the Bureau of Labor Statistics (BLS) (Ref. 51 and 52). Specifically, the NRC used the 2022 occupational employment and wages data, which provide labor categories and the mean hourly wage rate by job type. The industry labor rates used in the analysis reflect total compensation, which includes health and retirement benefits (using a burden factor of 2.4). The NRC used the BLS data tables to select appropriate hourly labor rates for performing the estimated procedural, licensing, and utility-related work necessary during and after implementation of the alternatives. The labor rates include wages paid to the individuals performing the work plus the associated fringe benefit components of labor costs (i.e., the time for plant management over and above those directly expensed), which are considered expenses. The NRC verified that these labor rates are consistent with wage rates submitted by the industry in recent cost estimates for severe accident mitigation alternatives. Appendix A to this regulatory analysis provides a breakdown of the labor categories that may be required to implement rulemaking. The NRC also performed an uncertainty analysis which is discussed in section 6.8.

5.1.4 Affected Entities

The following describes the nuclear power reactors that will be affected by the decommissioning rule:

- Operating reactor sites: The NRC models 55 operating U.S. light-water nuclear power reactors sites in this analysis, as well as multiple decommissioning sites.⁶ Note that in 2013, three of these sites had permanently shut down without significant advance notice or preplanning: Crystal River Unit 3 Nuclear Generating Plant, Kewaunee Power Station, and San Onofre Nuclear Generating Station. Entergy Nuclear Operations, Inc., shut down Vermont Yankee Nuclear Power Station on December 29, 2014. The Omaha Public Power District board of directors shut down Fort Calhoun Station on October 24, 2016 (Ref. 54). Oyster Creek Nuclear Generating Station shut down in September 2018; Pilgrim Nuclear Power Station shut down in May 2019; Three Mile Island Nuclear Station, Unit 1, shut down in September 2019; Indian Point Nuclear Generating Units 2 and 3 shut down in May 2020 and May 2021, respectively; Duane Arnold Energy Center shut down in August 2020; Palisades Nuclear Plant shut down in April 2022 (but the licensee is now working to resume operations); and Diablo Canyon Power Plant, Units 1 and 2, were planned to shut down in 2024 and 2025, respectively (but the licensee submitted a license renewal application in November 2023).
- NPUFs: The final rule will affect all NPUFs through the changes made to the application of the definition of a utilization or production facility. The NRC will amend regulations so

⁶ This is based on information from Appendix F, “Commercial Nuclear Power Reactor Operating Licenses—Expiration by Year, 2024–2055,” to NUREG-1350, Volume 34, “2022–2023 Information Digest,” issued February 2023 (Ref. 53).

that the first criterion for a facility not to meet the statutory definition of a utilization or production facility (i.e., that the licensee is no longer authorized to operate), which currently applies only to power reactor licensees, will also apply to NPUFs and fuel reprocessing plants. Furthermore, for all utilization or production facilities, the NRC will add the second criterion that the licensee has modified the facility to be incapable of making use of special nuclear material without significant facility alterations. The NRC is amending 10 CFR 50.38 so that its prohibition on transferring a license to an entity that the Commission knows or has reason to believe is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government is not applicable to 10 CFR Part 50 or 10 CFR Part 52 licenses for facilities that no longer meet the definition of a utilization or production facility.

No potential new reactors are included in this analysis, because of their current application status (not enough information is known, or known for certain, about such reactors to include in the analysis).

5.1.5 Sign Conventions

This analysis uses positive signs for all favorable consequences and negative signs for all adverse consequences of each alternative. For example, additional costs above the regulatory baseline are shown as negative values, and benefits and averted costs are shown as positive values. Negative values are shown using parentheses (e.g., negative \$500 is displayed as (\$500)).

5.1.6 Base Year

The rulemaking is expected to be issued and effective in 2024. The monetized benefits and costs in this analysis are expressed in 2022 dollars. Non-rulemaking implementation costs are assumed to be incurred in 2024. Ongoing and annual costs of operation under each alternative are assumed to begin in 2024 unless otherwise stated, and to continue until no additional costs or benefits are incurred. These monetized future costs and benefits are then discounted back into 2022 dollars.

5.1.7 Time Period of Analysis

To define the period of analysis covered by this regulatory analysis (i.e., the period over which costs and benefits would be incurred), the NRC used the remaining license term for each operating licensee and COL holder, plus the time spent in decommissioning and the time to transfer spent fuel offsite. The remaining license terms were obtained from Appendix F to NUREG-1350, Volume 34. The license terms consist of an operating period and can be followed by a 60-year period for SAFSTOR or a 12-year period for DECON decommissioning. The NRC assumes that each operating site will apply for and receive two 20-year license renewals beyond the original 40-year license term (in many cases, the first renewal has already occurred). At the end of the operating period, the NRC assumes that each site will enter the decommissioning phase and will in turn incur decommissioning costs.

5.1.8 Cost Estimation

In order to estimate the costs associated with each alternative, the NRC used a work breakdown structure to deconstruct each alternative into requirements that would need to be met. These requirements include avoidance of exemptions and amendments, additional

processes that licensees would be required to complete (e.g., additional materials and drug testing), and other additional penalties (e.g., spent fuel management fees). The NRC also used licensee input on reduced staffing during decommissioning and extrapolation techniques (i.e., utilization of cost factors) to estimate the costs and benefits of each alternative.

The NRC gathered data from several sources (e.g., the BLS, internal databases, publications, and periodicals) and obtained expert opinions on labor costs. The data were used to estimate costs for activities such as preparing and submitting requests for exemptions and license amendments, reviewing and processing these requests, managing spent fuel and tracking spent fuel management, and completing materials tests. NRC working group members provided expert opinions on the levels of effort (labor hours and staffing) needed to complete decommissioning activities, based on NRC experience with oversight of operating and decommissioning power reactors; these opinions form the basis for the many assumptions used to derive the cost estimates. In addition, the NRC used historical cost data to estimate the future cost of some requirements (e.g., drug and alcohol testing) using cost factors. For instance, to calculate the estimated averted costs of requests for exemptions and amendments and the preparation of the final rule, the NRC needed to extrapolate the labor hours necessary for the work based on past data. For steps in the regulatory alternatives with no or incomplete data, the staff based its cost estimates on similar steps for which data are available.

To incorporate uncertainty into the model, the staff employed a Monte Carlo simulation, which is an approach to uncertainty analysis in which input variables are expressed as distributions. The simulation was run 10,000 times, and values used in simulations were chosen randomly from the distributions of the input variables provided in Appendix B to this document. The result was a distribution of values for the output variable of interest. Using Monte Carlo simulation, it is also possible to determine which input variables have the greatest effect on the value of the output variable. Section 6.8 of this analysis describes the Monte Carlo simulation methods and presents the results of the uncertainty analysis.

6 PRESENTATION OF RESULTS FOR AREAS OF DECOMMISSIONING CONSIDERED FOR RULEMAKING

This section presents the quantitative and qualitative results of the analysis, by attribute, relative to the regulatory baseline (the no-action alternative). As described earlier, costs and benefits are quantified where possible and can have either a positive or a negative sign, depending on whether they have favorable or adverse effects relative to the regulatory baseline. Discussions are provided for those attributes for which costs and benefits could not be quantified. Although this ex-ante cost-benefit analysis⁷ provides useful information for deciding whether to select an alternative, it is important to note that the analysis is based on estimates of future costs and benefits. Whether or not the estimates hold in the future, the process of conducting regulatory analyses has value in that it helps decision-makers think in depth about specific alternatives and their associated results.

6.1 Industry Implementation

The NRC estimates that amending some of the previously mentioned requirements in 10 CFR Part 50 (e.g., requirements on EP and physical security) will allow licensees to avert one-time costs because they will need to submit fewer requests for exemptions and license

⁷ An ex-ante cost-benefit analysis is prepared before a policy, program, or alternative is in place and can assist in the decision about whether resources should be allocated to that policy, program, or alternative.

amendments. However, the final rule will also introduce new requirements for licensees, which will result in additional costs. The next two sections discuss both the averted and the additional costs in each area of decommissioning.

6.1.1 Averted Industry Implementation Costs

To be exempt from, or to change its manner of compliance with, NRC requirements (e.g., for maintaining offsite EP) during decommissioning, a licensee must submit an exemption request or a license amendment request to the NRC for review and approval. Such submittals can be expensive for licensees. This analysis evaluates the rulemaking alternative, which will eliminate the need for decommissioning-related exemption and license amendment requests, in multiple areas of decommissioning:

- Alternative EP-2 will reduce the need for exemptions from EP requirements and amendments to make changes to emergency plans. This will result in a one-time benefit (i.e., averted cost) for the industry, as licensees will need to prepare fewer exemption and amendment requests.
- Alternative PS-2 will reduce the need for exemptions from the physical security requirements to suspend security measures for the control room and ISFSI. This will result in a one-time benefit (i.e., averted cost) for the industry, as licensees will need to prepare fewer exemption requests.
- Under Alternative CS-2, licensees will not need to request amendments to remove their CSPs once the spent fuel has sufficiently decayed, resulting in a one-time benefit (i.e., averted cost) for the industry.
- Under Alternative CFH/STA-2, licensees will not need to submit their fuel handler training programs for Commission approval as suitable to qualify CFHs. This will result in a one-time benefit (i.e., averted cost) to the industry.
- Alternative FP-2 will reduce the need for exemptions for offsite and onsite financial protection requirements because these requirements will be lowered based on the level of decommissioning. This will result in a one-time benefit (i.e., averted cost) for the industry, as licensees will need to prepare fewer exemption requests.
- Alternative ENV-2 will result in averted costs for the industry, in the form of the time needed for licensees to conclude in the PSDAR that the environmental impacts associated with site-specific decommissioning activities will be bounded by previous environmental impact statements.
- Alternative R-2 will reduce the need for exemptions from recordkeeping and record retention requirements. This will result in a one-time benefit (i.e., averted cost) for the industry, as licensees will need to prepare fewer exemption requests.
- Alternative TR-2 will reduce the need for exemptions from requirements on LLW transportation investigations, during both operating and decommissioning, at nuclear facilities covered by 10 CFR Part 20. This will result in a one-time benefit (i.e., averted cost) for the industry, as licensees will need to prepare fewer exemption requests.

- Alternative F-2 will eliminate the need for exemptions from 10 CFR 50.38, resulting in a one-time benefit (i.e., averted cost) for the industry for licensees that enter decommissioning after issuance of the rule. The final rule offers NPUF licensees the option to request only one licensing action—the decommissioning plan license amendment—that will also address the licensee’s operating authority, rendering a possession-only license amendment unnecessary. This will result in a one-time benefit to NPUF licensees since they will not have to prepare requests for these amendments.

Table 3 presents the averted implementation costs for each affected area under the final rulemaking, relative to the no-action alternative (status quo). Note that licensees that have already entered decommissioning will not receive the full benefits of avoiding the exemption and amendment process during decommissioning, because it is likely that they will already have submitted exemption or amendment requests to the NRC for processing before the final rule becomes effective in 2024.

Table 3 Averted Industry Implementation Costs

Areas of Decommissioning	Alternatives	Averted Industry Implementation Costs		
		Undiscounted	7% NPV	3% NPV
Emergency Preparedness	EP-2	\$18,595,000	\$ 1,771,000	\$ 6,452,000
Physical Security	PS-2	\$ 3,136,000	\$ 299,000	\$ 1,088,000
Cybersecurity	CS-2	\$ 584,000	\$ 37,000	\$ 159,000
Certified Fuel Handler Training	CFH/STA-2	\$ 764,000	\$ 73,000	\$ 265,000
Offsite and Onsite Financial Protection	FP-2	\$ 1,606,000	\$ 125,000	\$ 510,000
Environmental Considerations	ENV-2	\$ 264,000	\$ 21,000	\$ 84,000
Record Retention Requirements	R-2	\$ 706,000	\$ 55,000	\$ 224,000
Low-Level Waste Transportation	TR-2	\$ 531,000	\$ 41,000	\$ 169,000
Foreign Ownership, Control, or Domination	F-2	\$ 191,000	\$ 15,000	\$ 61,000

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars.

*** NPV = net present value.

6.1.2 Additional Industry Implementation Costs

Under the final rulemaking, additional one-time costs to licensees will result for the following alternatives:

- For Alternative DA-2, licensees will incur an additional one-time cost to participate in the update to RG 5.77, Revision 1.
- For Alternative FP-2, licensees will incur a one-time cost to submit a prompt notification to the Commission of any material change in proof of onsite property insurance filed with the Commission under 10 CFR Part 50.
- Under Alternative SFM-2, licensees will commit additional resources to include the spent fuel management summary in the PSDAR.

Table 4 presents the additional implementation costs for each affected area under the final rulemaking, relative to the no-action alternative (status quo).

Table 4 Additional Industry Implementation Costs

Areas of Decommissioning	Alternatives	Additional Industry Implementation Costs		
		Undiscounted	7% NPV	3% NPV
Drug and Alcohol Testing	DA-2	\$ (27,000)	\$ (22,000)	\$ (25,000)
Offsite and Onsite Financial Protection	FP-2	\$ (6,000)	\$ (435)	\$ (2,000)
Spent Fuel Management Planning	SFM-2	\$ (10,000)	\$ (1,000)	\$ (3,000)

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars.

6.2 Industry Operation

This attribute accounts for the projected economic effect on affected licensees of routine and recurring activities under each alternative. The NRC estimates that by amending some of the previously mentioned requirements (e.g., for EP and physical security), it will enable licensees to avert costs on a recurring basis (annually) during the decommissioning phase. However, as a result of these changes to the regulations, licensees will also be incurring costs annually during the decommissioning phase. The averted and additional recurring costs, annual or otherwise, are considered operation costs. The next two sections discuss the operation costs for each area of decommissioning.

6.2.1 Averted and Additional Industry Recurring Costs

Under the rulemaking, recurring incremental costs and averted costs will result for the following alternatives:

- Alternative DA-2 will reduce the cost of the licensee’s drug and alcohol testing program during decommissioning, by reducing the number of individuals subject to random drug testing (only individuals with UA to the VA or perform certain functions will be subject to random drug testing).
- Under Alternative DTF-2, licensees will expend fewer resources to process decommissioning funding assurance reports because the reporting frequencies will be extended from every 2 years to every 3 years until within 5 years of decommissioning and during decommissioning, and from every year to every 3 years once decommissioning has been completed but for the decommissioning of the ISFSI.
- Alternative SFM-2 will reduce licensee time interacting with the NRC to clarify information on the management of spent fuel during decommissioning because it will clarify how licensees provide that information to the NRC.
- Alternative CS-2 will impose additional costs on COL holders because they will expend labor hours to implement cybersecurity requirements for a longer period (10 months for BWRs and 16 months for PWRs) after the last reactor permanently defuels. (This will affect only one current COL holder with operating reactors.) Alternative CS-2 will also result in averted costs for OL holders, because they will be able to remove license

conditions related to CSPs once spent fuel cooling is complete, without needing to wait for license amendment approval.

Table 5 presents the averted and additional incremental industry operation costs for each affected area under the final rulemaking, relative to the no-action alternative (status quo).

Table 5 Averted and Additional Industry Operation Costs

Areas of Decommissioning	Alternatives	Averted Industry Operation Costs		
		Undiscounted	7% NPV	3% NPV
Drugs and Alcohol Testing	DA-2	\$ 7,879,000	\$ 557,000	\$ 2,393,000
Decommissioning Funding Assurance	DTF-2	\$ 1,007,000	\$ 115,000	\$ 298,000
Spent Fuel Management Planning	SFM-2	\$ 49,000	\$ 4,000	\$ 15,000
Cybersecurity	CS-2	\$ (400,000)	\$ (2,000)	\$ (36,000)

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars

6.3 NRC Implementation

The NRC believes that by amending the previously mentioned requirements, it will enable licensees to avert the costs of applying for exemptions and amendments. In turn, the NRC will avert the cost of processing these exemption and amendment requests. However, to achieve these savings, the NRC will incur costs to develop the final rule and the associated RGs. The following sections discuss the averted and incurred NRC implementation costs for rulemaking and guidance development.

6.3.1 Averted NRC Implementation Costs

When the NRC processes an exemption or license amendment request, it expends resources to perform the review, resolve technical issues, document the evaluation, and respond to the licensee. As a result of this rulemaking, licensees will submit fewer exemption and license amendment requests, and therefore the NRC will spend less time processing these submittals. This will lead to a one-time benefit for the NRC in the form of averted costs. The analysis does not include exemption and license amendment requests that were (or are expected to have been) submitted and processed before issuance of the final rule. **Table 6** displays the NRC's averted implementation costs for processing exemption and license amendment requests.

Table 6 Averted NRC Implementation Costs

Areas of Decommissioning	Alternatives	Averted NRC Implementation Costs		
		Undiscounted	7% NPV	3% NPV
Emergency Preparedness	EP-2	\$ 9,830,000	\$ 936,000	\$ 3,411,000
Physical Security	PS-2	\$ 2,071,000	\$ 197,000	\$ 719,000
Cybersecurity	CS-2	\$ 302,000	\$ 19,000	\$ 83,000
Certified Fuel Handler Training	CFH/STA-2	\$ 1,295,000	\$ 123,000	\$ 449,000
Offsite and Onsite Financial Protection	FP-2	\$ 897,000	\$ 70,000	\$ 285,000
Record Retention Requirements	R-2	\$ 372,000	\$ 29,000	\$ 118,000

Areas of Decommissioning	Alternatives	Averted NRC Implementation Costs		
		Undiscounted	7% NPV	3% NPV
Low-Level Waste Transportation	TR-2	\$ 279,000	\$ 22,000	\$ 89,000
Foreign Ownership, Control, or Domination	F-2	\$ 101,000	\$ 8,000	\$ 32,000

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars.

6.3.2 Additional NRC Implementation Costs

The decommissioning final rule imposes some implementation costs on the NRC. All of the rulemaking costs are sunk at this stage; the only remaining costs are associated with the development of RG 5.77 for the FFD drug and alcohol testing program. The regulatory analysis does not include estimates for the cost of performing ongoing licensing activities during decommissioning. **Table 7** shows the remaining NRC implementation costs associated with the FFD changes in the final rule.

Table 7 Additional NRC Implementation Costs

Areas of Decommissioning	Alternatives	Additional NRC Implementation Costs		
		Undiscounted	7% NPV	3% NPV
Drug and Alcohol Testing	DA-2	\$(29,000)	\$(23,000)	\$(26,000)

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars

6.4 NRC Operation

This attribute accounts for the projected economic effect of routine and recurring NRC activities under each alternative. The NRC estimates that by improving the regulations governing decommissioning, it will avert costs on a recurring basis. (In particular, the resources expended by the NRC to provide oversight constitute annually recurring costs.) Under the final rulemaking, the NRC will avert recurring costs in the following areas of decommissioning:

- Under Alternative DTF-2, the NRC will avert costs for reviewing decommissioning funding assurance reports because the reporting frequencies will be extended from every 2 years to every 3 years until within 5 years of decommissioning and during decommissioning, and from every year to every 3 years once decommissioning has been completed but for the decommissioning of the ISFSI.
- Alternative SFM-2 will reduce the NRC's time interacting with licensees to clarify information on the management of spent fuel during decommissioning because it will clarify how licensees provide that information to the NRC.

Table 8 Averted NRC Operation Costs

Areas of Decommissioning	Alternatives	Averted NRC Operation Costs		
		Undiscounted	7% NPV	3% NPV
Decommissioning Funding Assurance	DTF-2	\$ 853,000	\$ 97,000	\$ 252,000
Spent Fuel Management Planning	SFM-2	\$ 26,000	\$ 2,000	\$ 8,000

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars

6.5 Regulatory Efficiency

The final rulemaking alternatives will increase regulatory efficiency, relative to the regulatory baseline, by aligning cybersecurity and FFD requirements between 10 CFR Part 50 and 10 CFR Part 52 licensees; reducing the need for exemption and license amendment requests for EP, physical security, cybersecurity, and financial protection; reducing the need for requests for NRC approval of CFH training and retraining programs; clarifying reporting requirements in regard to spent fuel management; and making several other general clarifications and improvements. In the area of Decommissioning Funding Assurance, the NRC is appropriately restructuring certain reporting requirements for general license ISFSIs and specific license ISFSIs, aligning other reporting requirements, removing duplicative regulations, and clarifying terminology. These changes will enhance the regulatory structure and contribute to licensee and NRC process efficiencies. Finally, for all areas of decommissioning, the final rulemaking alternatives will clarify what actions licensees can take during decommissioning, enabling the NRC to better maintain and administer regulatory activities throughout the decommissioning process.

6.6 Environmental Considerations

Under Alternative ENV-2, guidance related to PSDARs will be revised to recommend that licensees describe how they will comply with all Federal, State, and local regulations in effect during decommissioning (such as regulations on nonradiological effluent releases, waste management, and environmental monitoring) in support of the PSDAR’s discussion of environmental impacts. The environmental analyses that bound the environmental impacts associated with site-specific decommissioning activities generally assume compliance with State and Federal regulations. Therefore, in determining whether the impacts of a given decommissioning activity are bounded by previous analyses, the licensee should state whether it will continue to comply with applicable State and Federal regulations, which will strengthen the basis for its determination of whether environmental impacts are bounded.

Additionally, Alternative ENV-2 modifies the rule language in 10 CFR 50.82(a)(4)(i) and 10 CFR 52.110(d)(1) to clarify that licensees are no longer required to conclude in the PSDAR that the environmental impacts of planned decommissioning activities will be bounded by appropriate previously issued environmental impact statements. Rather, they must discuss whether the environmental impacts of the planned decommissioning activities will be bounded by appropriate federally issued environmental review documents and the licensee’s reasons for reaching that conclusion, and describe any decommissioning activities whose environmental impacts will not be so bounded and will be evaluated prior to the performance of the activities. If unbounded impacts are identified, then, consistent with 10 CFR 50.82(a)(6)(ii) and

10 CFR 52.110(f)(2), the licensee can address those impacts before the associated activity occurs, instead of at the PSDAR stage.

6.7 Disaggregation

The NRC completed a screening review in accordance with the guidance in Section 4.3.2, “Criteria for the Treatment of Individual Requirements,” of NUREG/BR-0058, for the areas of decommissioning for which there is an alternative that includes rulemaking:

- Emergency Preparedness
- Physical Security
- Cybersecurity
- Drug and Alcohol Testing
- Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor
- Decommissioning Funding Assurance
- Offsite and Onsite Financial Protection Requirements and Indemnity Agreements
- Environmental Considerations
- Record Retention Requirements
- Low-Level Waste Transportation Time
- Spent Fuel Management Requirements
- Backfit Rule
- Foreign Ownership, Control, or Domination (FOCD)
- Clarification of Scope of License Termination Plan Requirement

In the screening review, the NRC evaluated each requirement in each area of decommissioning and found that the requirements considered separately do not mask the inclusion of other unnecessary requirements. As can be seen in the executive summary and in section 8, the final rule is either cost-beneficial or cost-neutral in each individual area. Table 1 and Table 12 serve as the quantitative conclusion of the disaggregation analysis.

6.8 Uncertainty Analysis

To determine the robustness of the estimates of costs and net benefits presented in this document, the NRC examined how the estimates could change based on uncertainties in the staff’s analytical assumptions and input data. To do so, the NRC performed a Monte Carlo simulation for each area of decommissioning, using the @Risk software package by Lumivero Corporation.⁸

Monte Carlo simulations involve introducing uncertainty into the analysis by replacing the point estimates of the variables used to estimate costs and benefits with probability distributions. By defining input variables as probability distributions as opposed to point estimates, one can model the effect of uncertainty on the results of the analysis (i.e., the benefits and costs). The staff determined the distributions for the input variables based on data collected through the Agencywide Documents Access and Management System and the staff’s professional judgment.

⁸ Formerly Palisades Corporation. Information about this software is available online at www.lumivero.com.

The probability distributions used are characterized by summary statistics, including the minimum and maximum values of the program evaluation and review technique (PERT)⁹ distribution and uniform distribution. The NRC used collected input to set the minimum and maximum values of the PERT and uniform distributions, then selected the output variables for the Monte Carlo simulation, which are the estimated monetary costs and benefits. The Monte Carlo simulation was run for 10,000 iterations (recalculations of results with random input variable values chosen) and produced a monetary range of costs and benefits for each alternative in each area of decommissioning under consideration in rulemaking. Additionally, @Risk was used to generate a tornado chart using the Monte Carlo simulation. The tornado chart ranks the input factors (cost drivers) by their effect on total cost. The figures below present the results of the uncertainty analysis for each area of decommissioning.

6.8.1 Emergency Preparedness

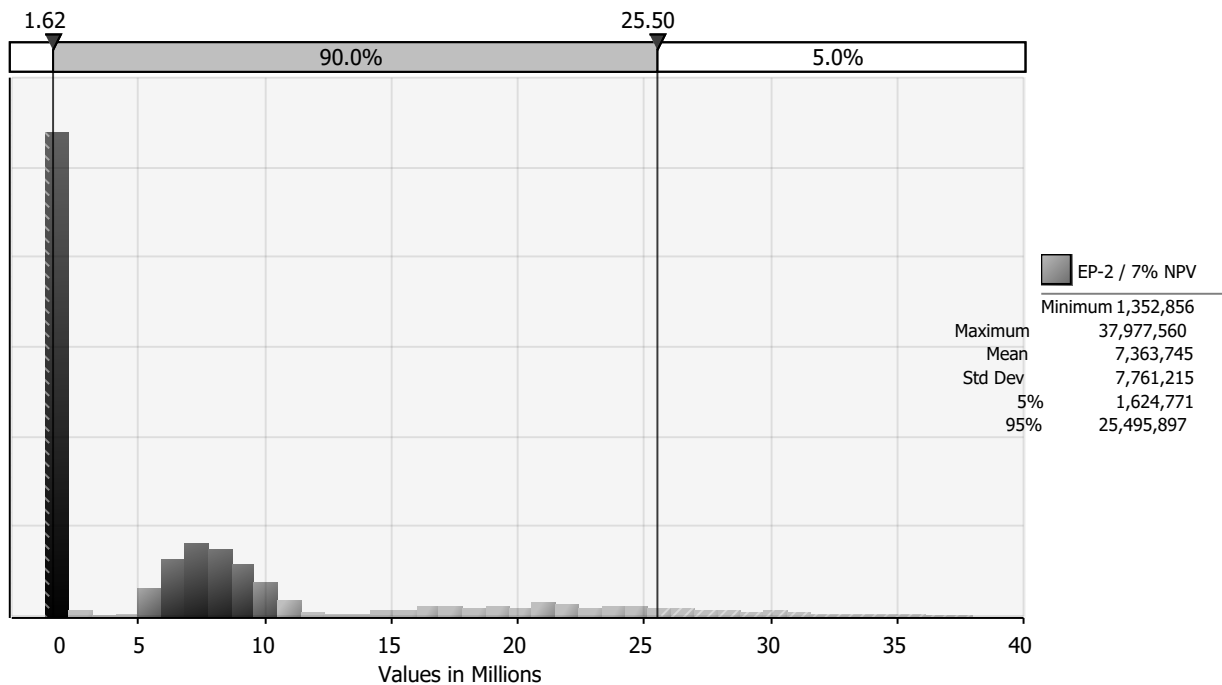


Figure 1 Variation of industry cost due to uncertainty in the Emergency Preparedness cost drivers (Alternative EP-2)

⁹ 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 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.

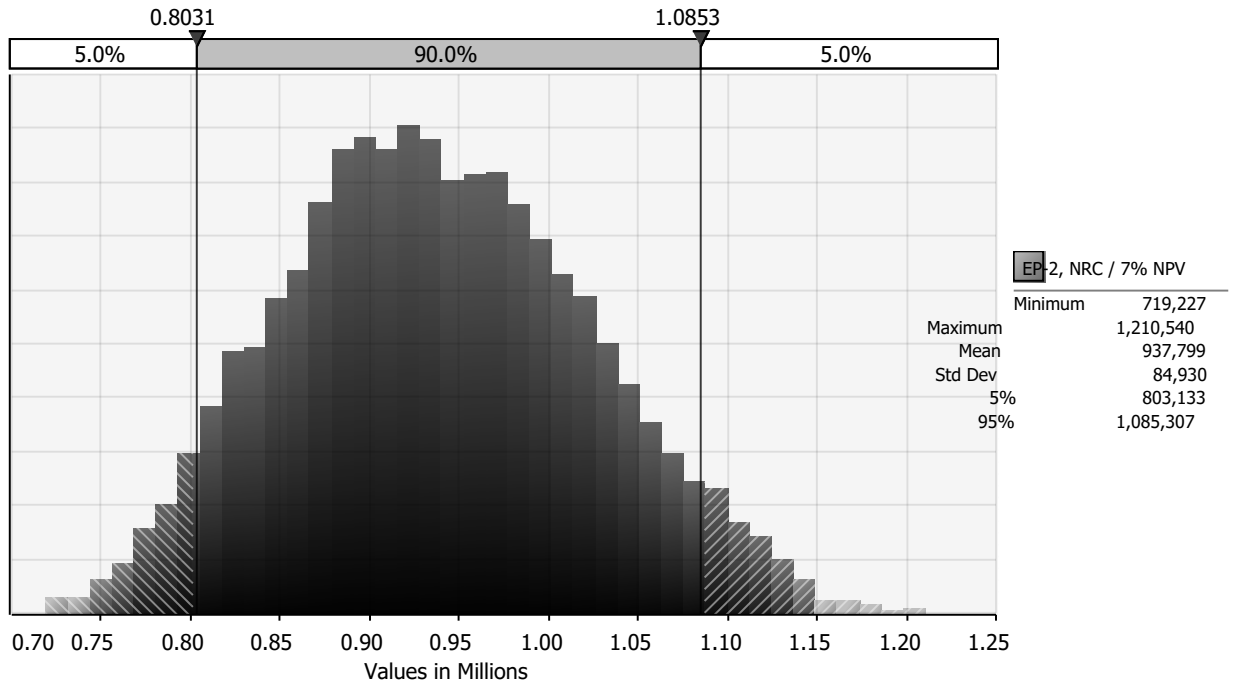


Figure 2 Variation of NRC cost due to uncertainty in the Emergency Preparedness cost drivers (Alternative EP-2)

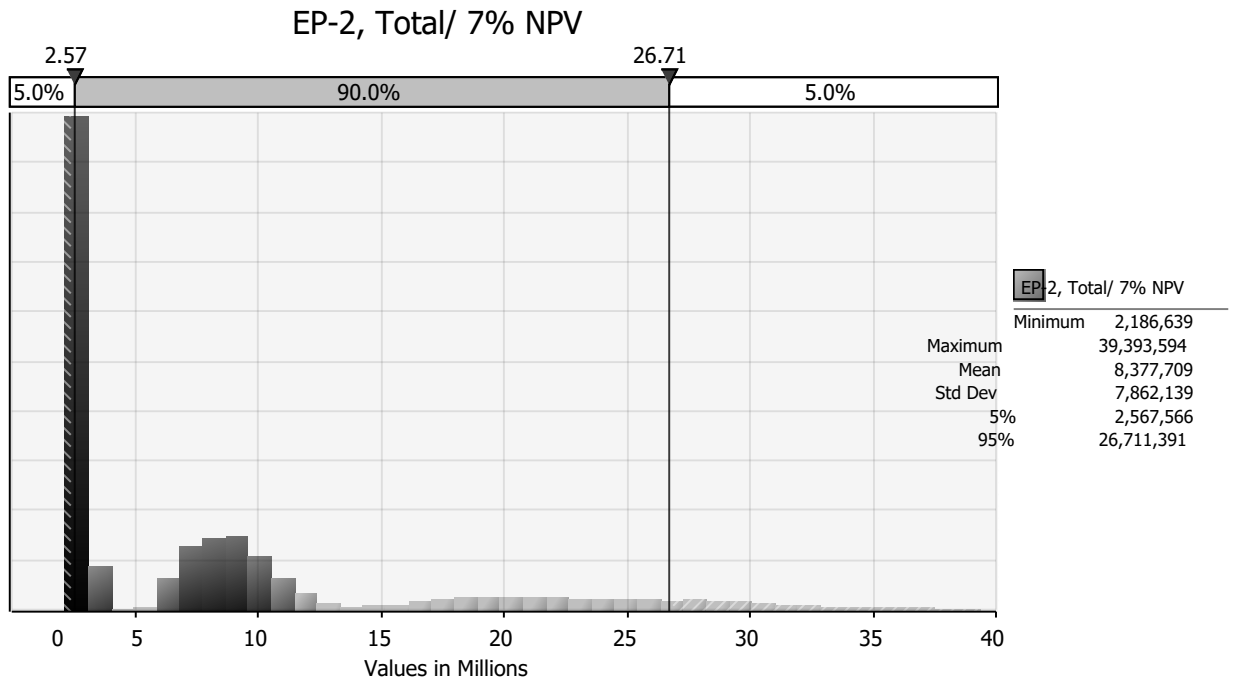


Figure 3 Variation of total cost due to uncertainty in the Emergency Preparedness cost drivers (Alternative EP-2)

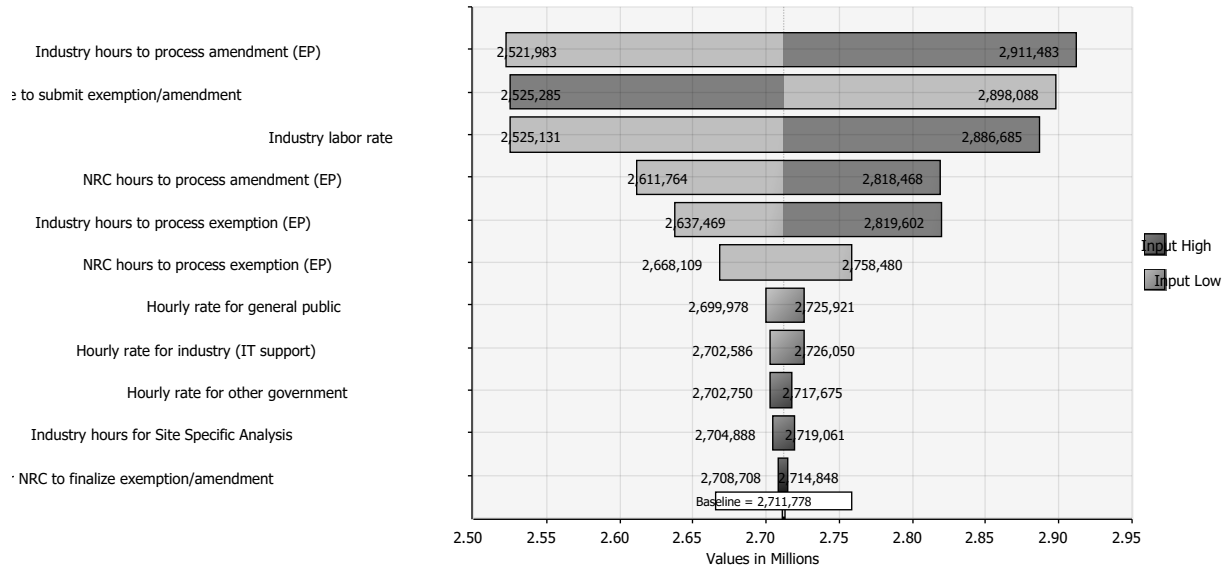


Figure 4 Tornado chart showing the variation of total cost due to each Emergency Preparedness cost driver (Alternative EP-2)

The regulatory changes to the EP area of decommissioning under Alternative EP-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$2.57 million to \$26.7 million (7 percent net present value (NPV)) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the industry hours to process amendments, the time at which the licensee submits an exemption or amendment request to the NRC for processing (i.e., 1 year before, during, or 1 year after decommissioning), and the industry labor rate.

6.8.2 Physical Security

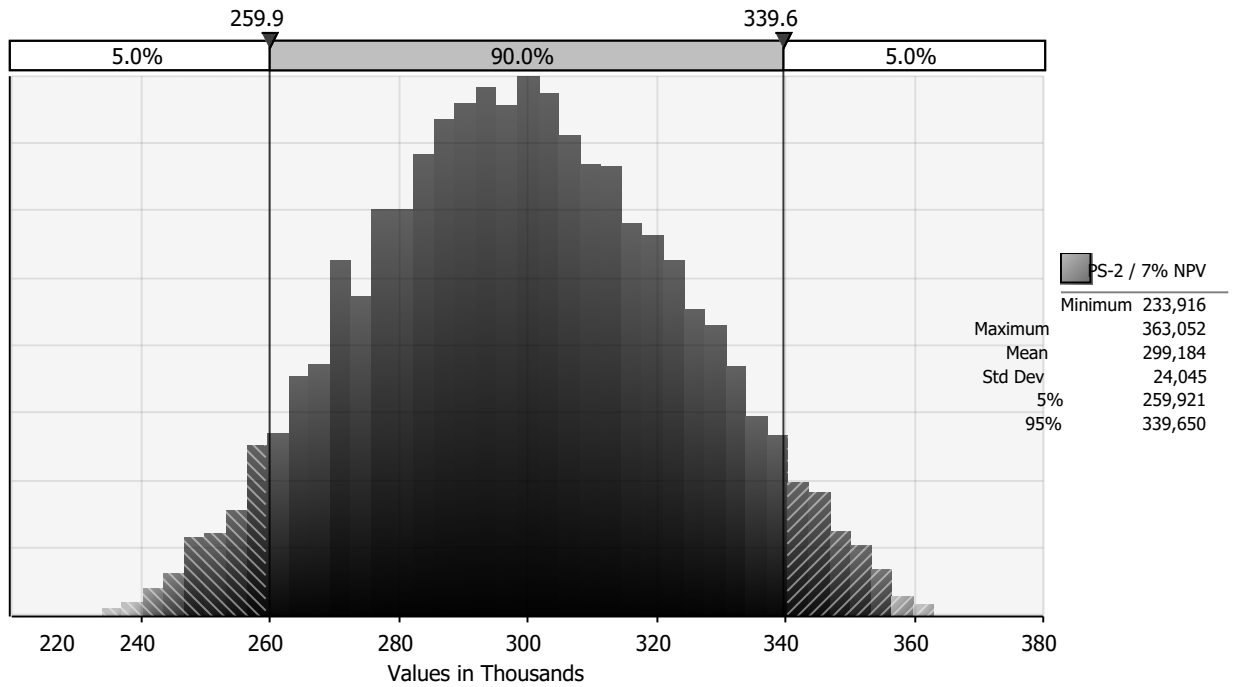


Figure 5 Variation of industry cost due to uncertainty in the Physical Security cost drivers (Alternative PS-2)

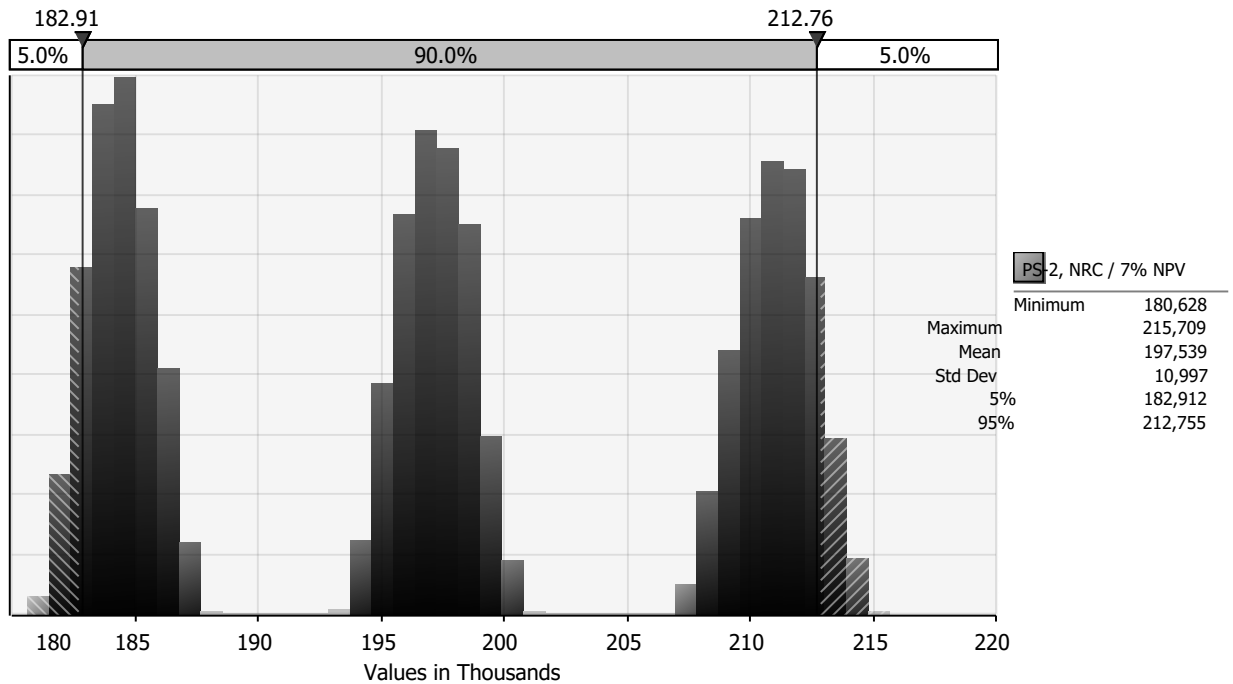


Figure 6 Variation of NRC cost due to uncertainty in the Physical Security cost drivers (Alternative PS-2)

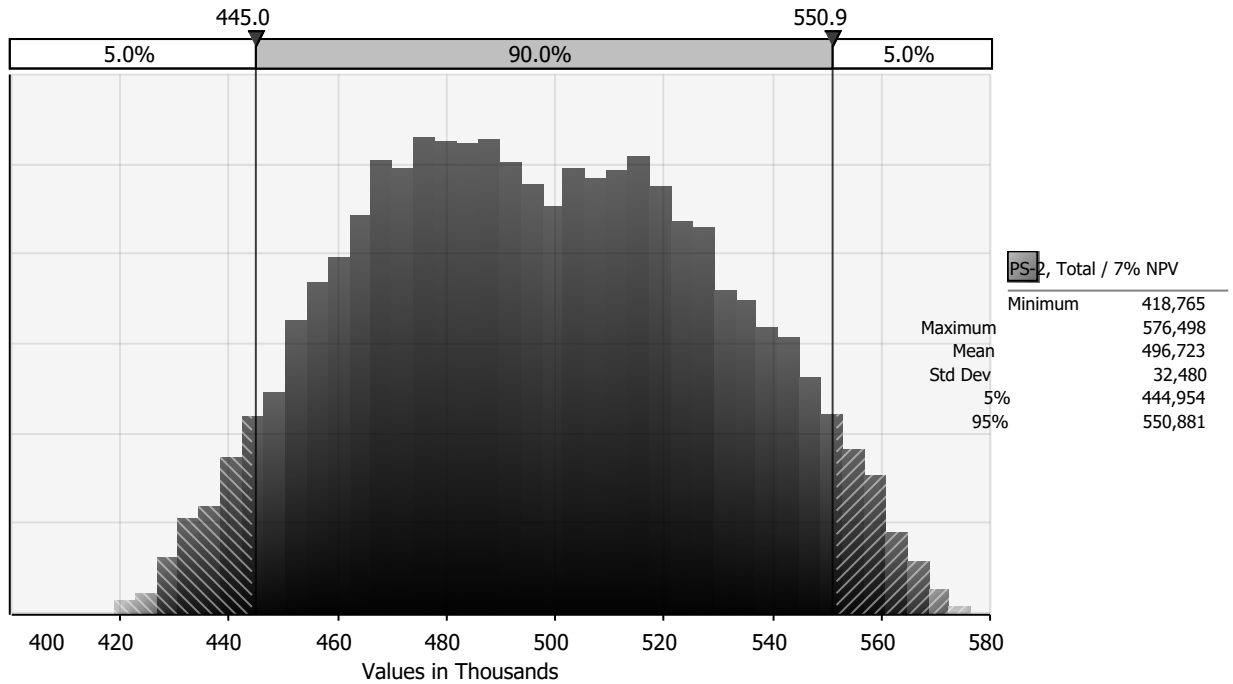


Figure 7 Variation of total cost due to uncertainty in the Physical Security cost drivers (Alternative PS-2)

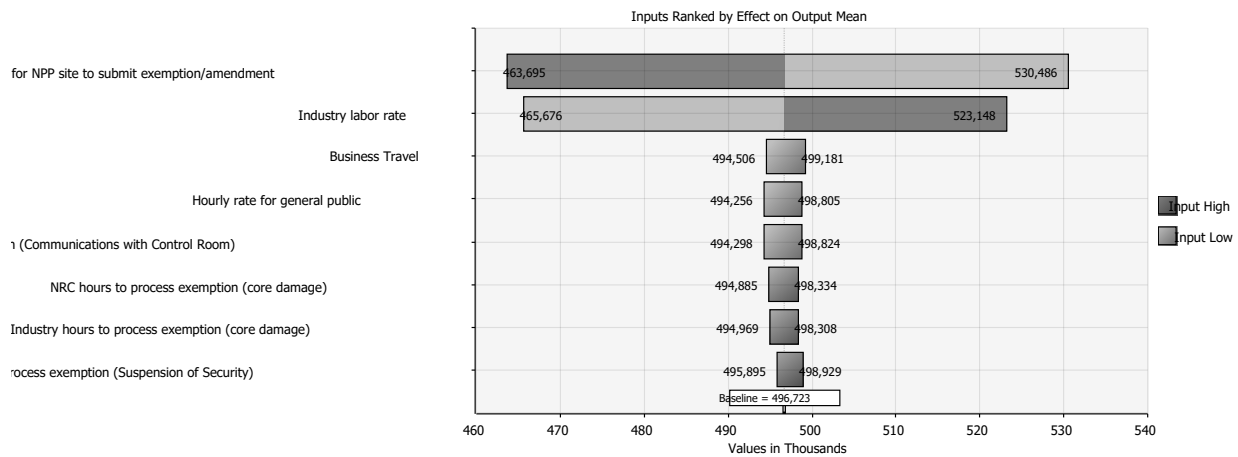


Figure 8 Tornado chart showing the variation of total cost due to each Physical Security cost driver (Alternative PS-2)

The regulatory changes to the Physical Security area of decommissioning under Alternative PS-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$445,000 to \$551,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the time at which the licensee submits an exemption or amendment request to the NRC for processing and the nuclear power industry labor rate used in the analysis.

6.8.3 Cybersecurity

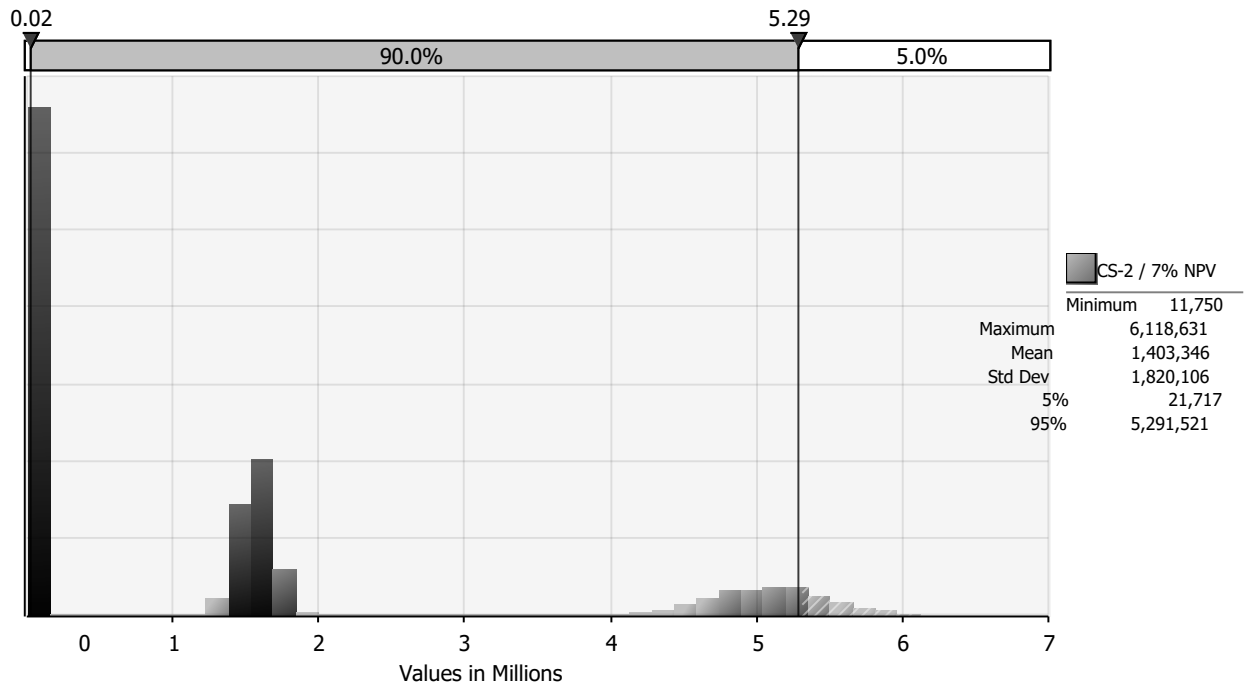


Figure 9 Variation of industry cost due to uncertainty in the Cybersecurity cost drivers (Alternative CS-2)

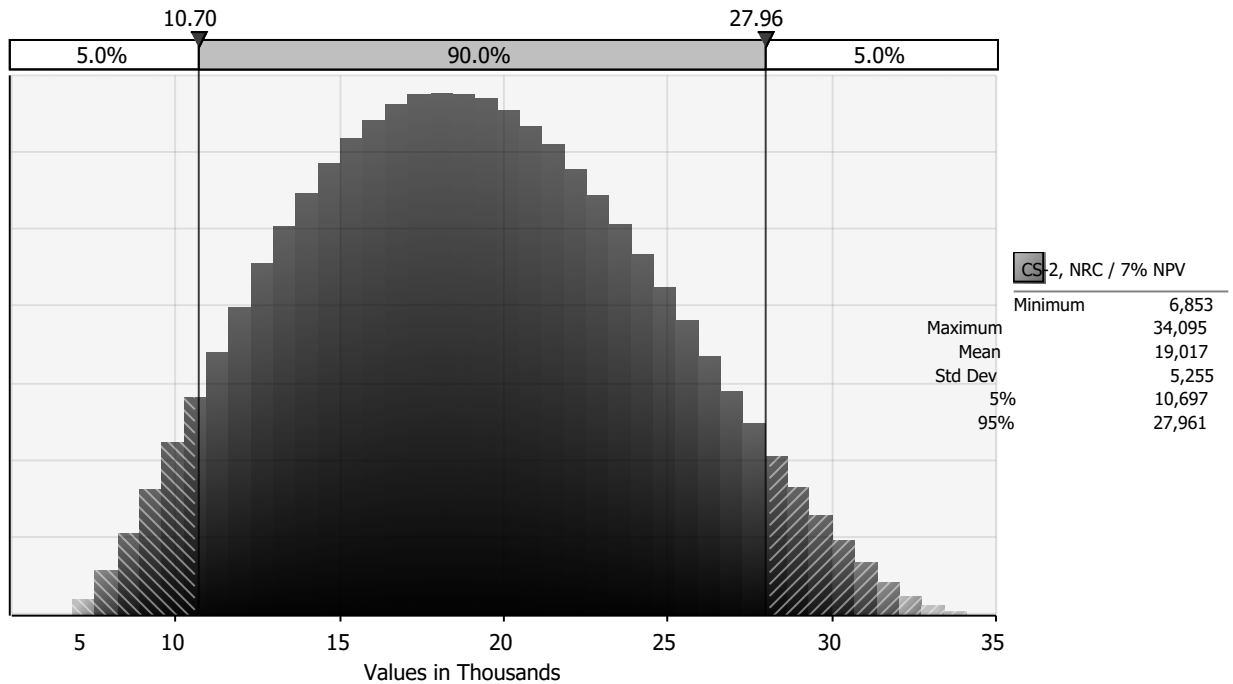


Figure 10 Variation of NRC cost due to uncertainty in the Cybersecurity cost drivers (Alternative CS-2)

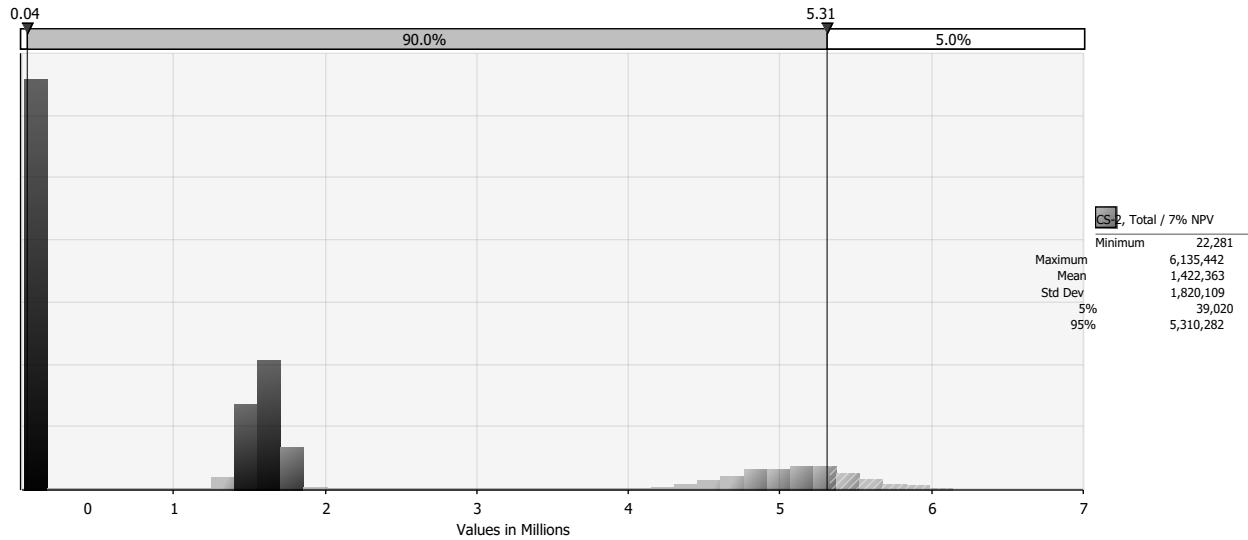


Figure 11 Variation of total cost due to uncertainty in the Cybersecurity cost drivers (Alternative CS-2)

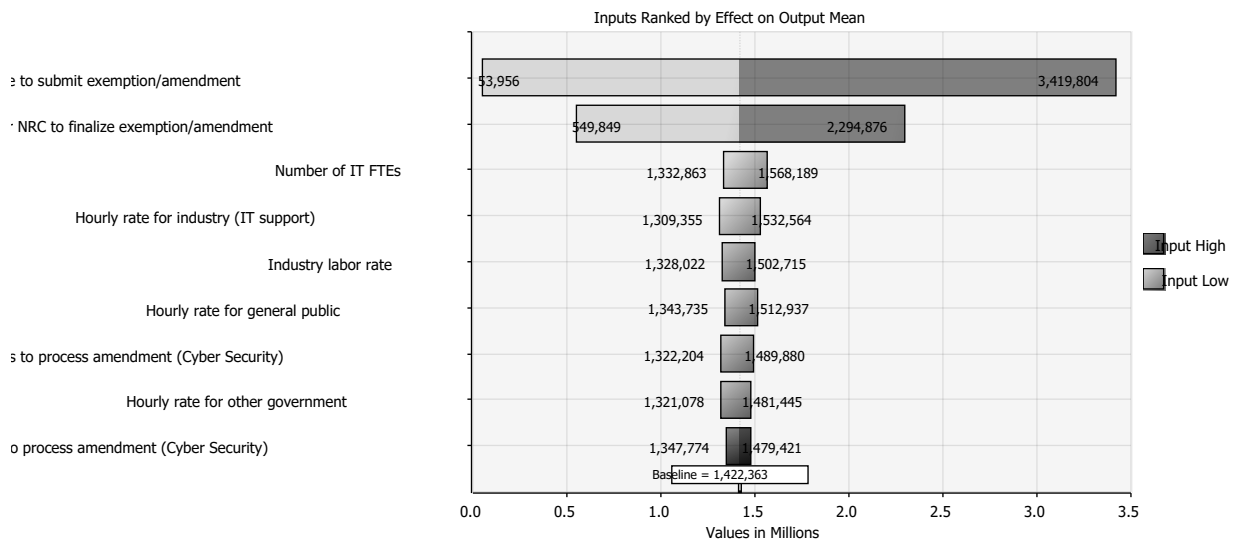


Figure 12 Tornado chart showing the variation of total cost due to each cybersecurity cost driver (Alternative CS-2)

The regulatory changes to the Cybersecurity area of decommissioning under Alternative CS-2 will result in additional or averted costs for the industry and the NRC, over the decommissioning period, in the range of \$39,000 to \$5.31 million (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the time at which the licensee submits an exemption or amendment request to the NRC for processing (i.e., 1 year before, during, or 1 year after decommissioning) and the time it takes the NRC to finalize the exemption or amendment.

6.8.4 Drug and Alcohol Testing

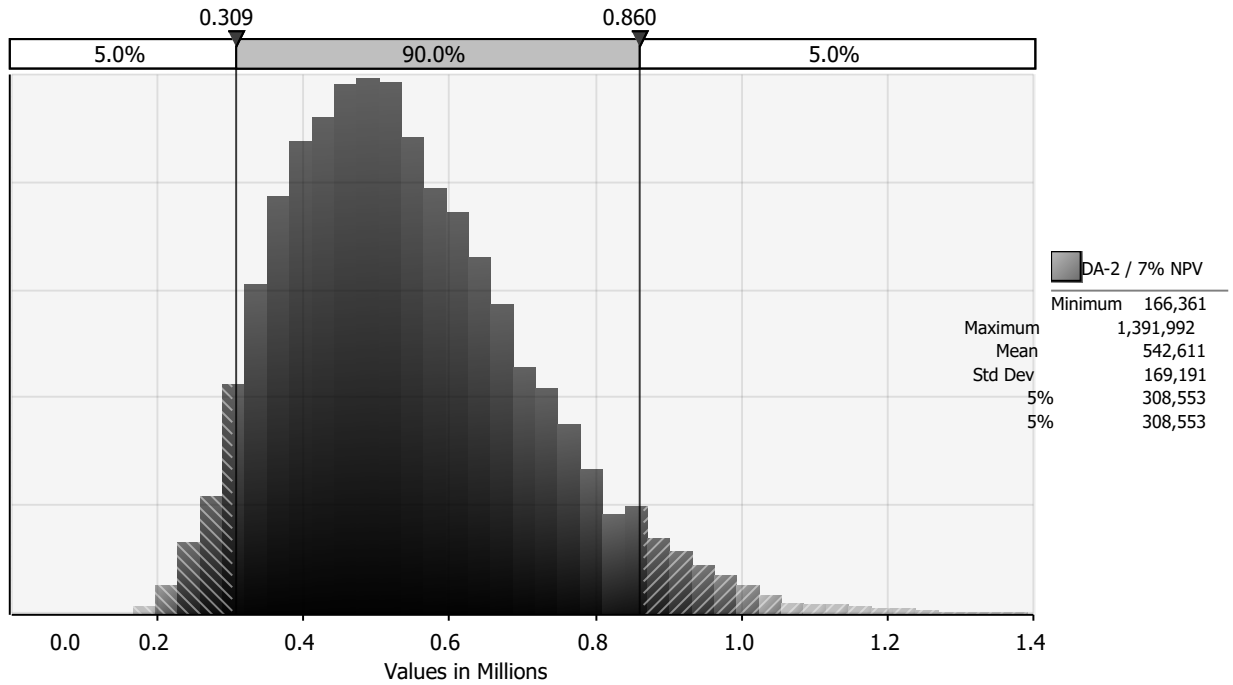


Figure 13 Variation of industry cost due to uncertainty in the Drug and Alcohol Testing cost drivers (Alternative DA-2)

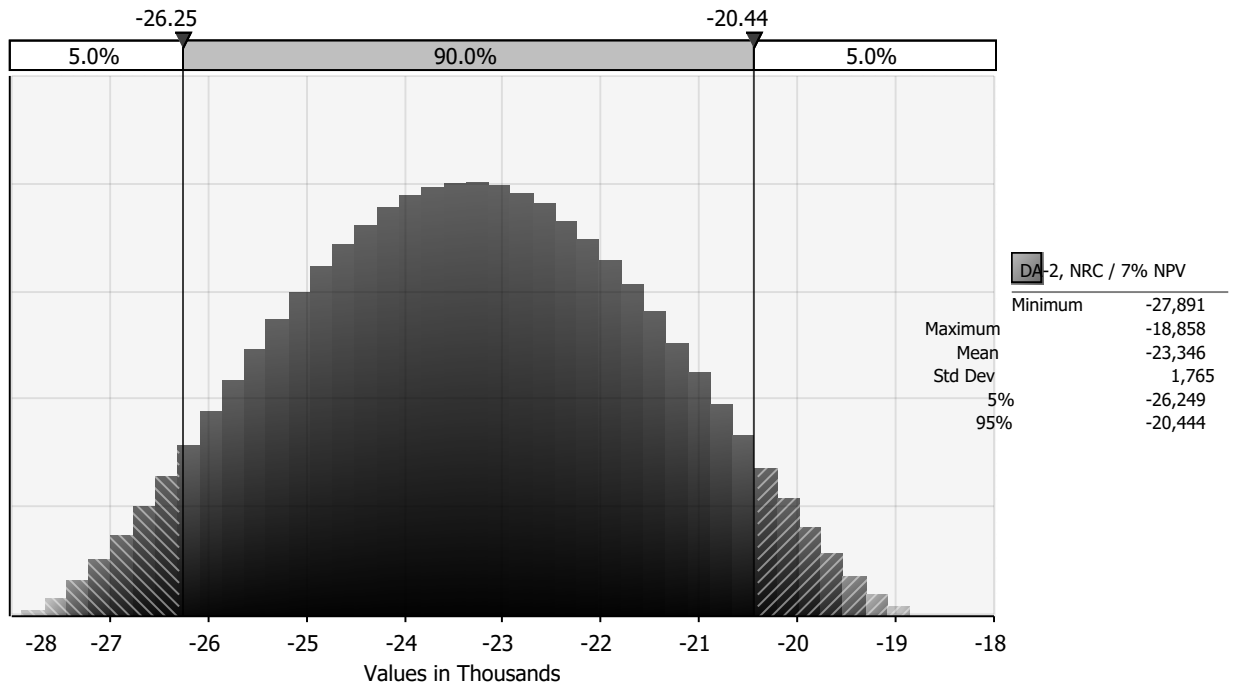


Figure 14 Variation of NRC cost due to uncertainty in the Drug and Alcohol Testing cost drivers (Alternative DA-2)

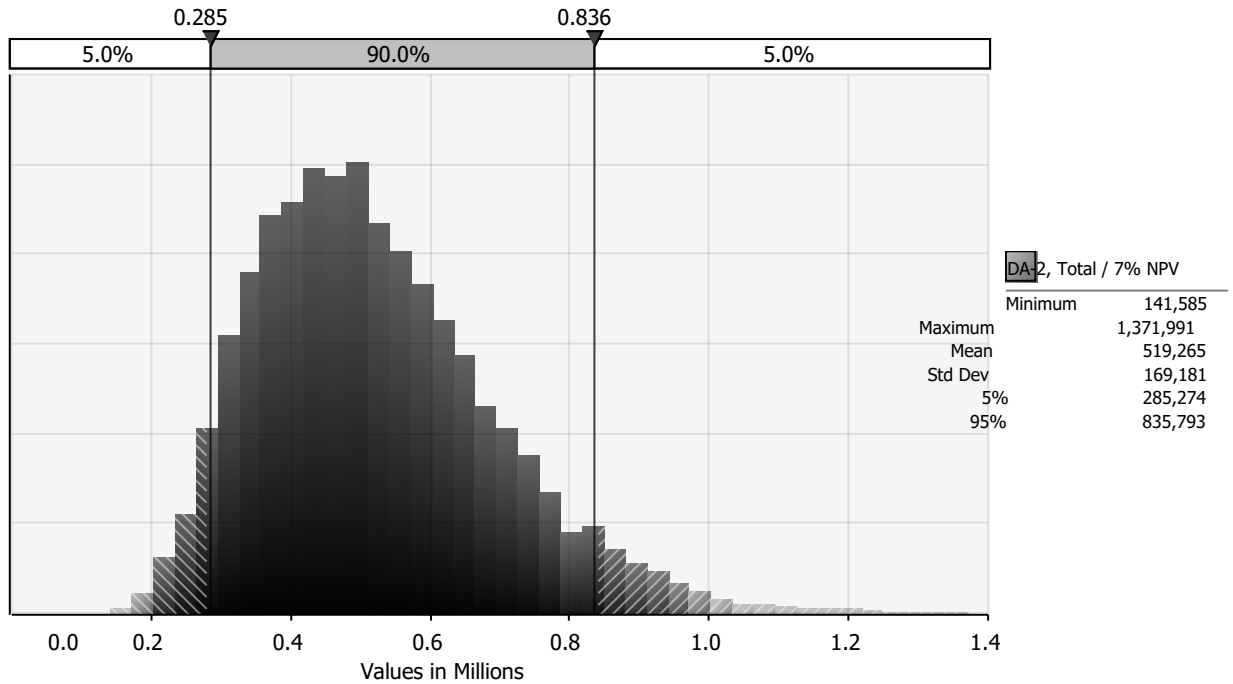


Figure 15 Variation of total cost due to uncertainty in the Drug and Alcohol Testing cost drivers (Alternative DA-2)

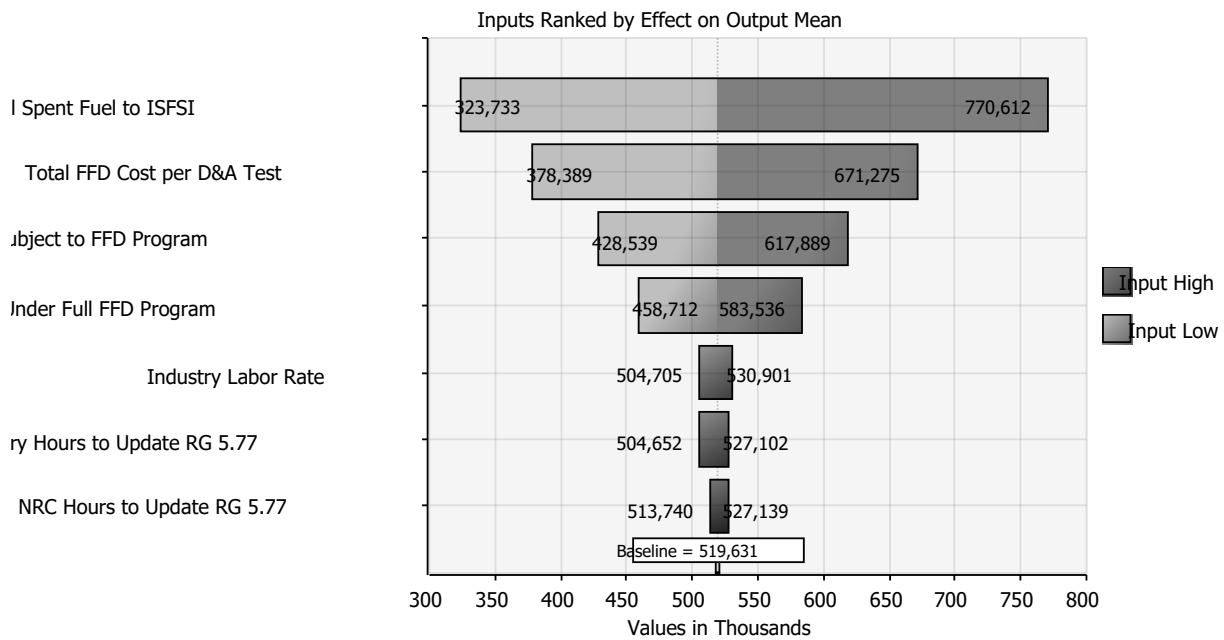


Figure 16 Tornado chart showing the variation of total cost due to each Drug and Alcohol Testing cost driver (Alternative DA-2)

The regulatory changes to the Drug and Alcohol Testing area of decommissioning under Alternative DA-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$285,000 to \$836,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are

the number of years to transfer all spent fuel to an ISFSI, the total cost per drug test, and the size of the workforce subject to the FFD program.

6.8.5 Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor

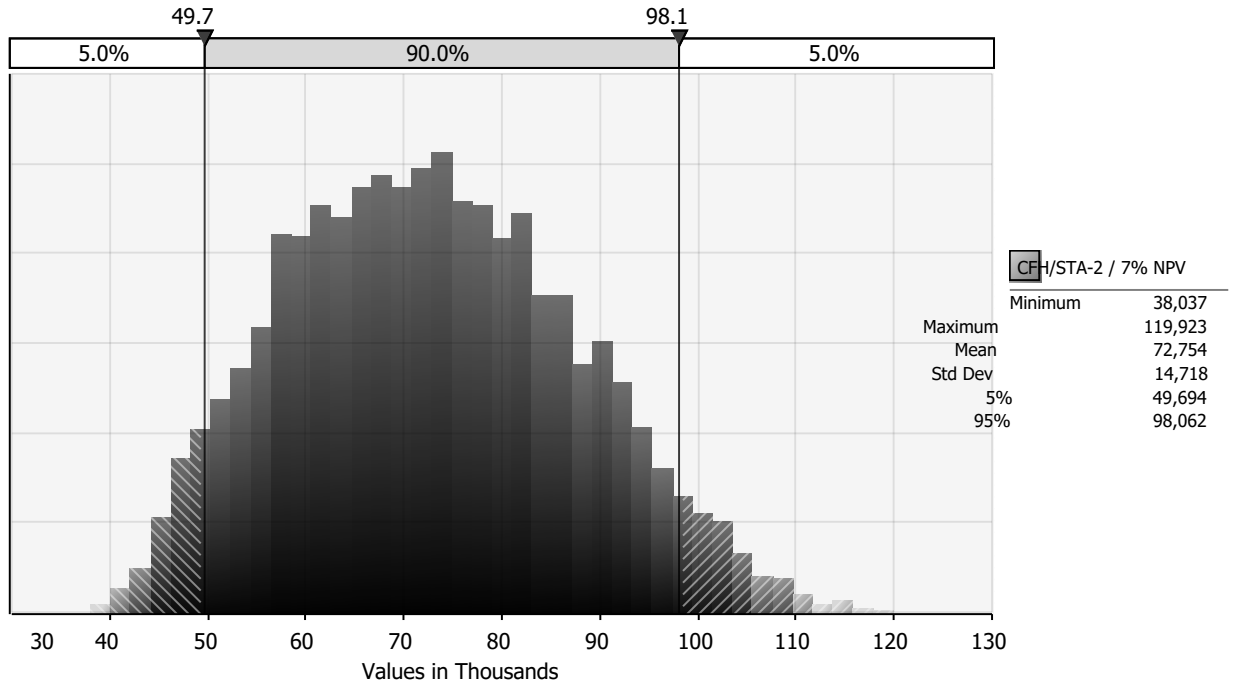


Figure 17 Variation of industry cost due to uncertainty in the Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor cost drivers (Alternative CFH/STA-2)

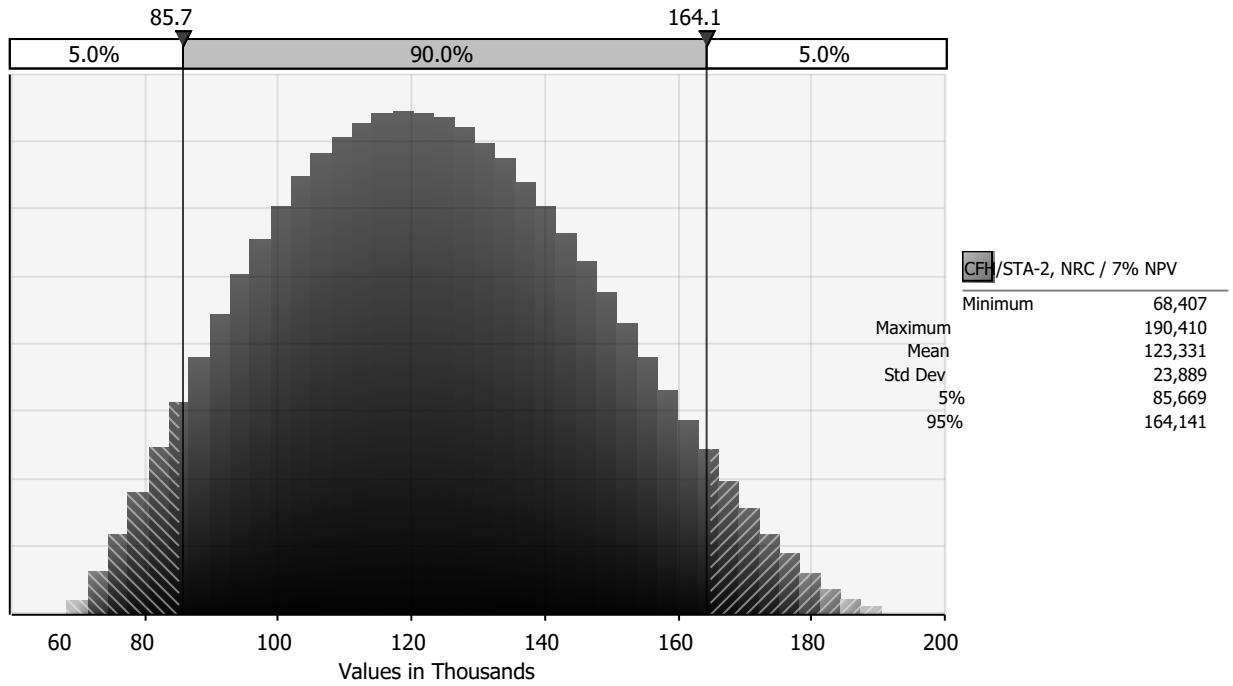


Figure 18 Variation of NRC cost due to uncertainty in the Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor cost drivers (Alternative CFH/STA-2)

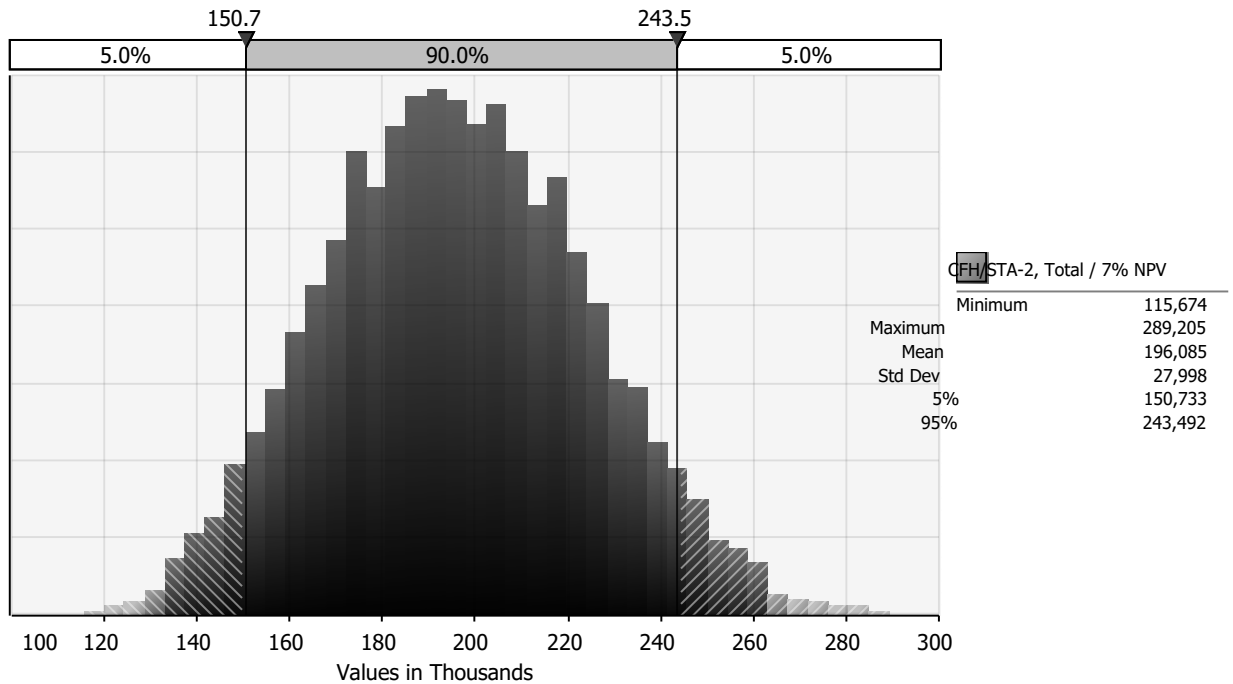


Figure 19 Variation of total cost due to uncertainty in the Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor cost drivers (Alternative CFH/STA-2)

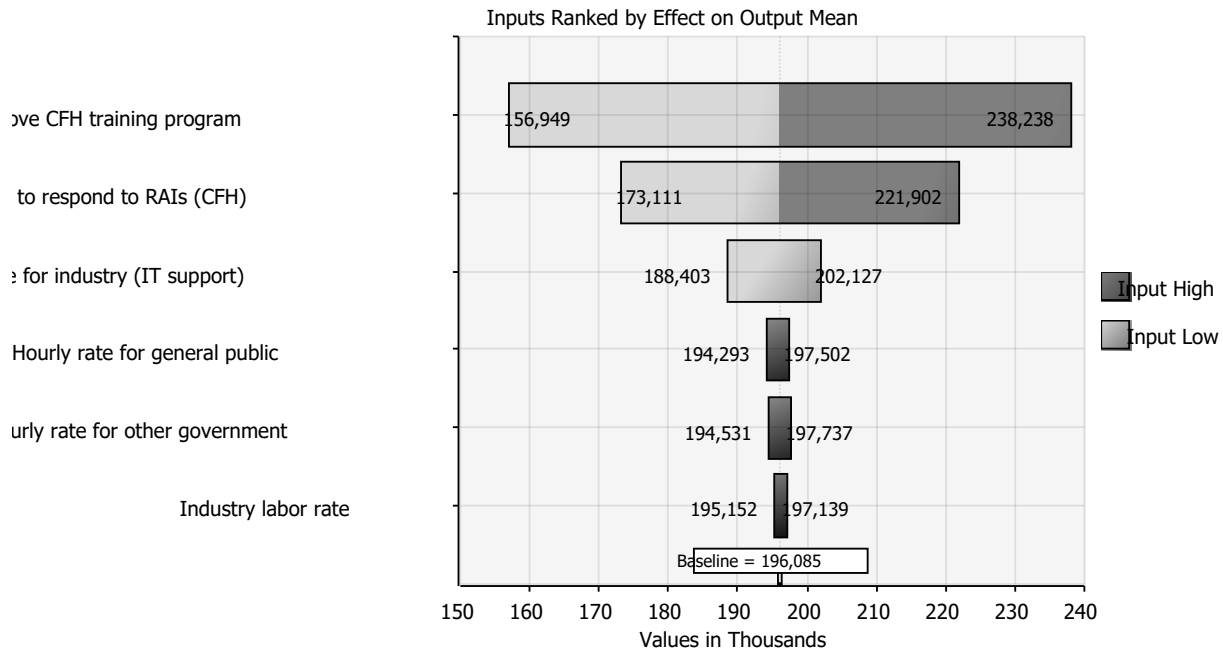


Figure 20 Tornado chart showing the variation of total cost due to each Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor cost driver (Alternative CFH/STA-2)

The regulatory changes to the Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor area of decommissioning under Alternative CFH/STA-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$151,000 to \$243,000 (7 percent NPV) with a 90 percent confidence interval. The cost driver that has the greatest influence on total cost is the number of hours for the NRC to approve a CFH training program.

6.8.6 Decommissioning Funding Assurance

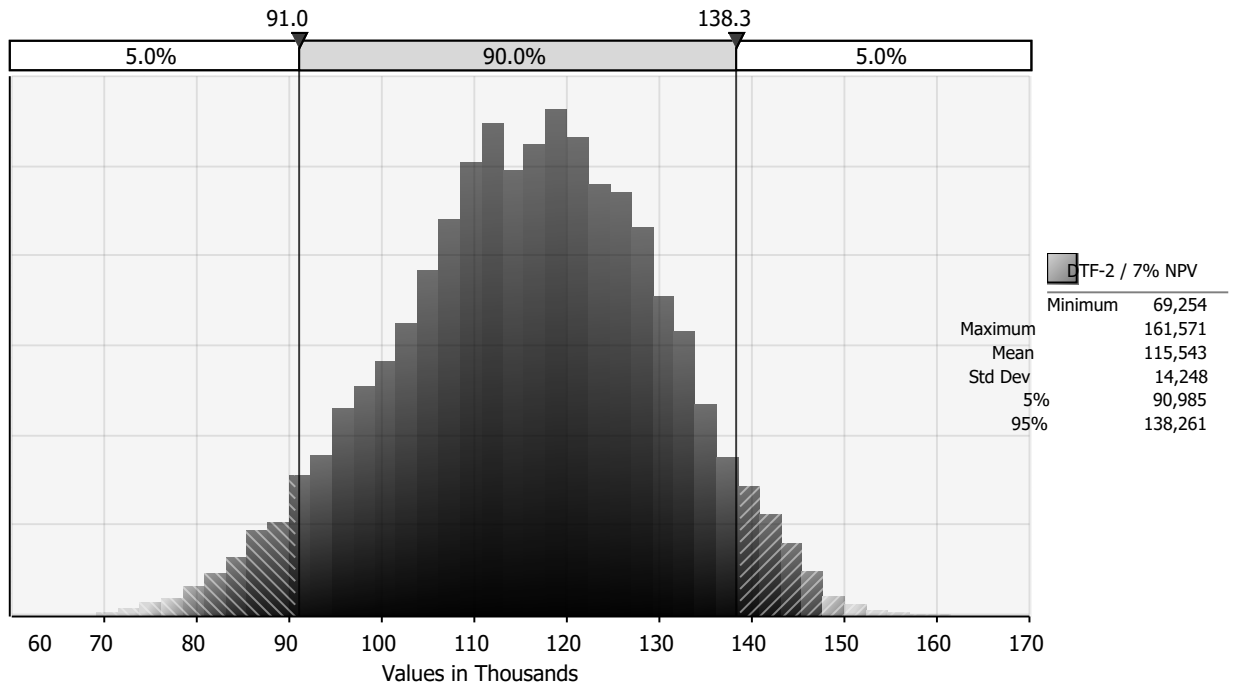


Figure 21 Variation of industry cost due to uncertainty in the Decommissioning Funding Assurance cost drivers (Alternative DTF-2)

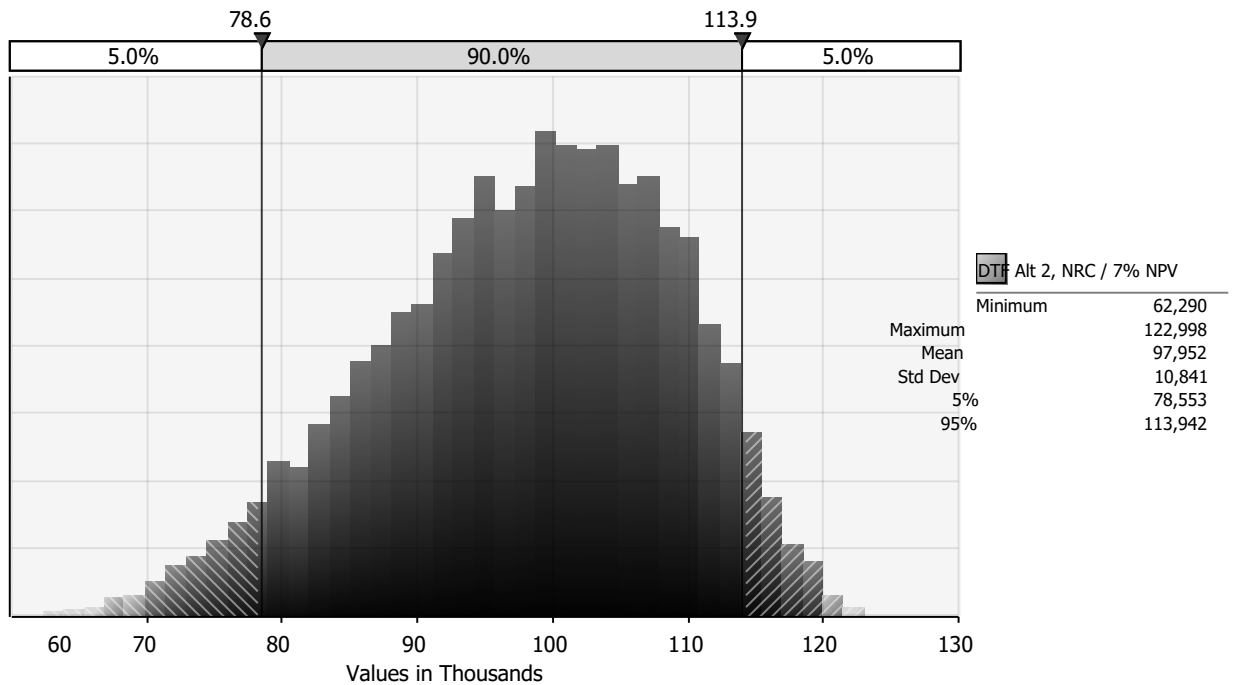


Figure 22 Variation of NRC cost due to uncertainty in the Decommissioning Funding Assurance cost drivers (Alternative DTF-2)

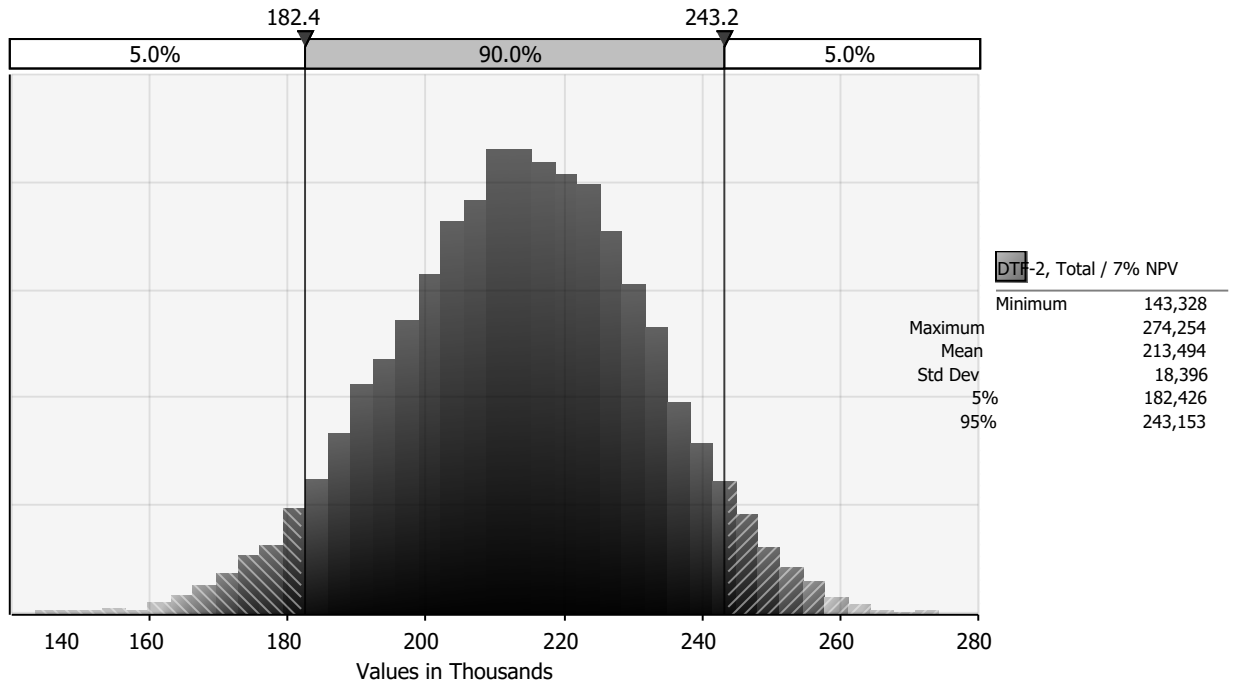


Figure 23 Variation of total cost due to uncertainty in the Decommissioning Funding Assurance cost drivers (Alternative DTF-2)

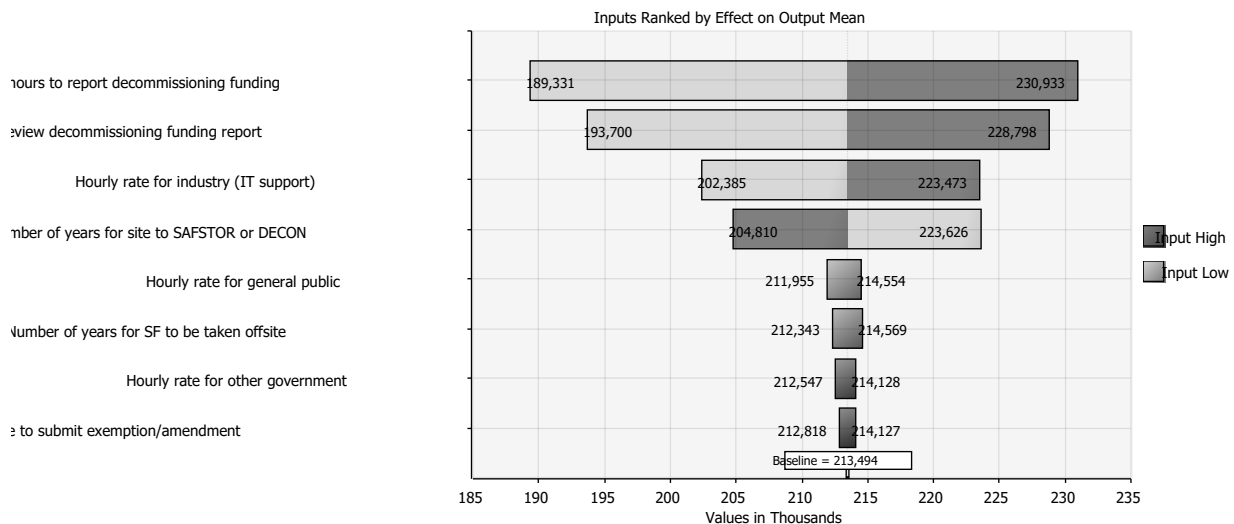


Figure 24 Tornado chart showing the variation of total cost due to each Decommissioning Funding Assurance cost driver (Alternative DTF-2)

The regulatory changes to the Decommissioning Funding Assurance area of decommissioning under Alternative DTF-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$182,000 to \$243,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the number of hours the industry takes to report decommissioning funding and the number of hours the NRC takes to review those reports, followed by the industry hourly rate used in the analysis and the number of years a site takes to complete decommissioning.

6.8.7 Offsite and Onsite Financial Protection Requirements and Indemnity Agreements

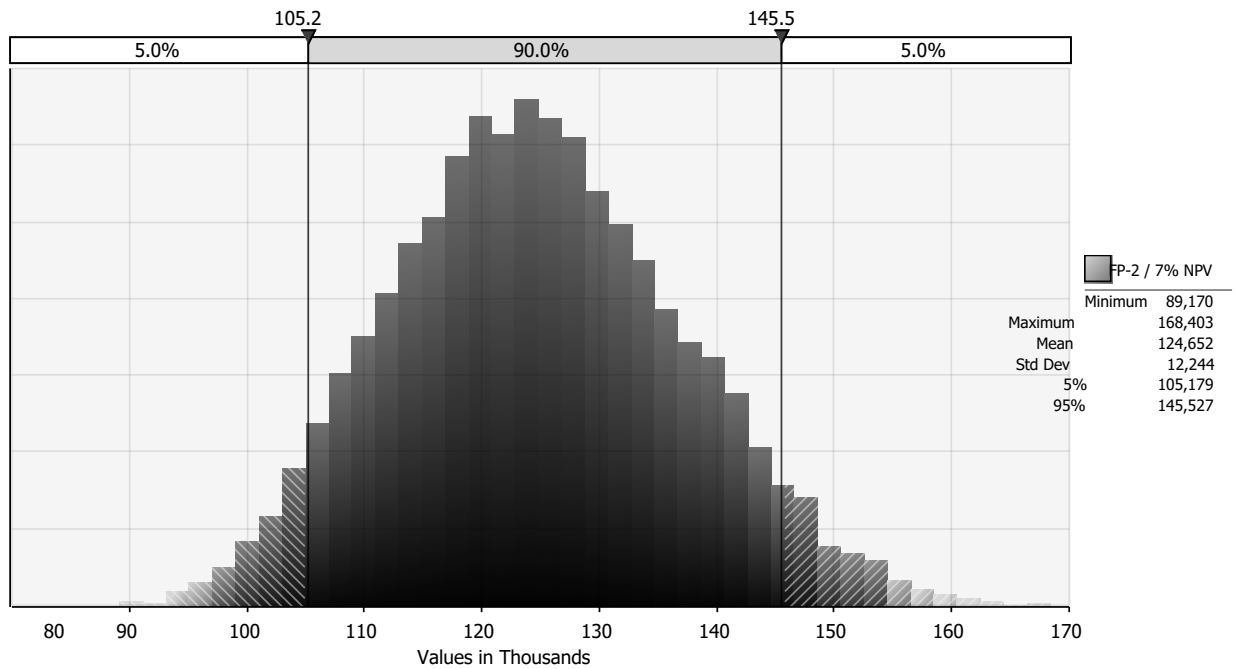


Figure 25 Variation of industry cost due to uncertainty in the Financial Protection cost drivers (Alternative FP-2)

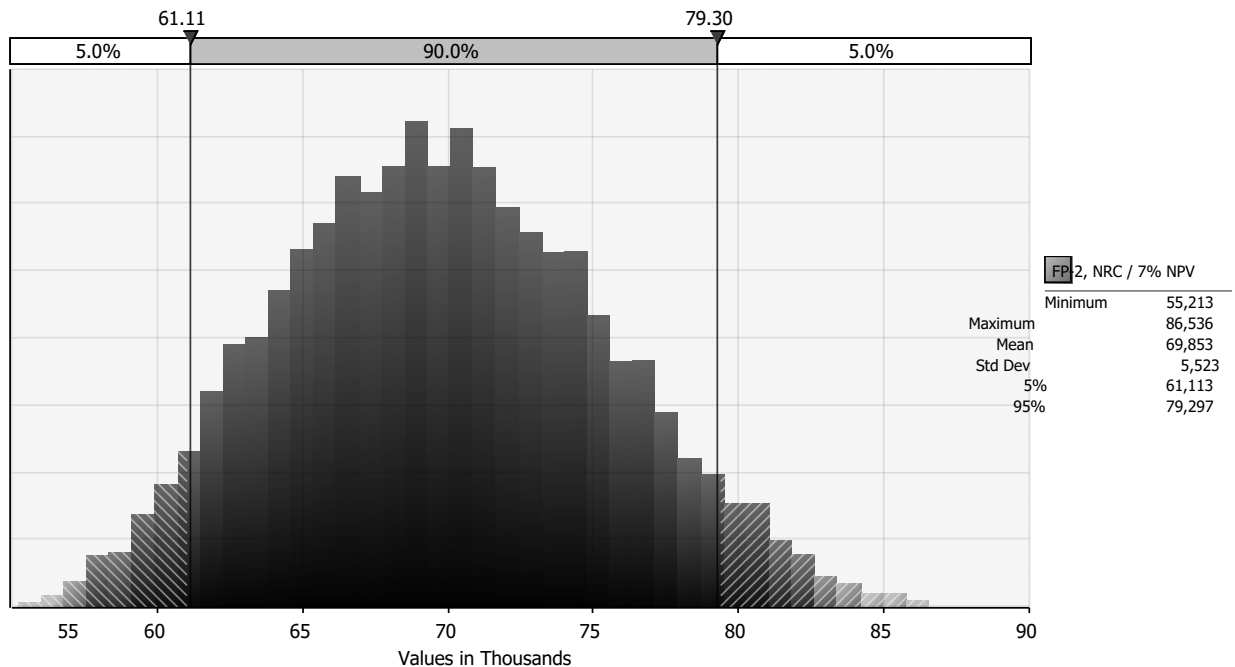


Figure 26 Variation of NRC cost due to uncertainty in the Financial Protection cost drivers (Alternative FP-2)

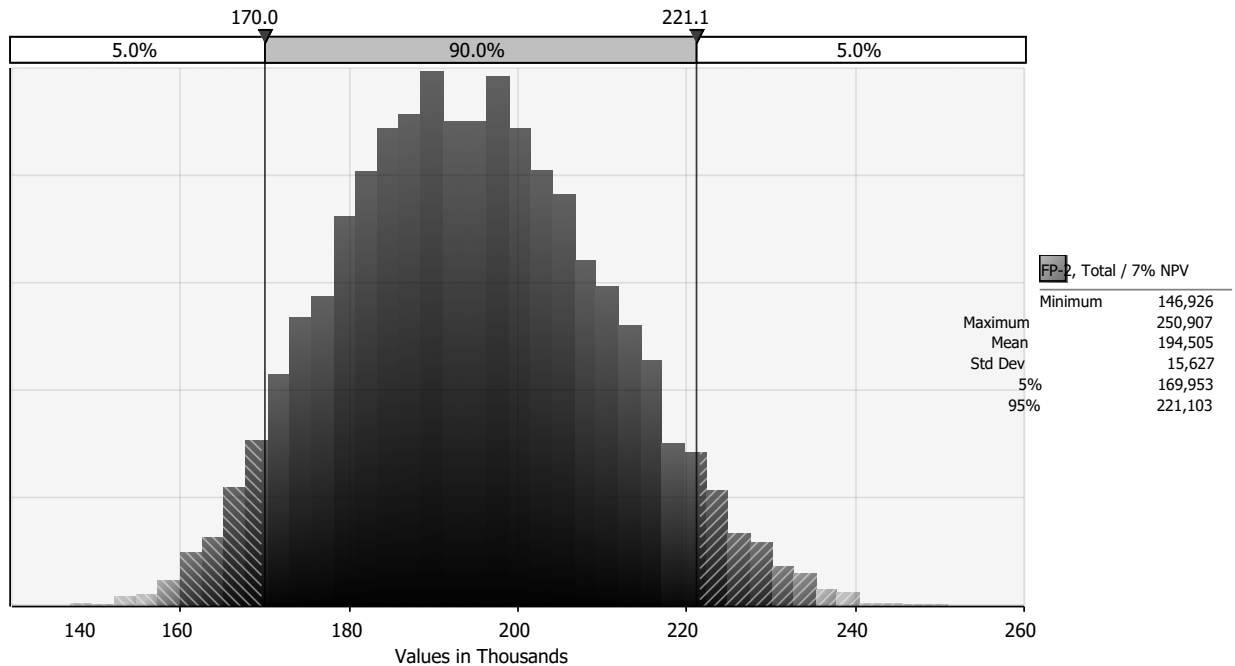


Figure 27 Variation of total cost due to uncertainty in the Financial Protection cost drivers (Alternative FP-2)

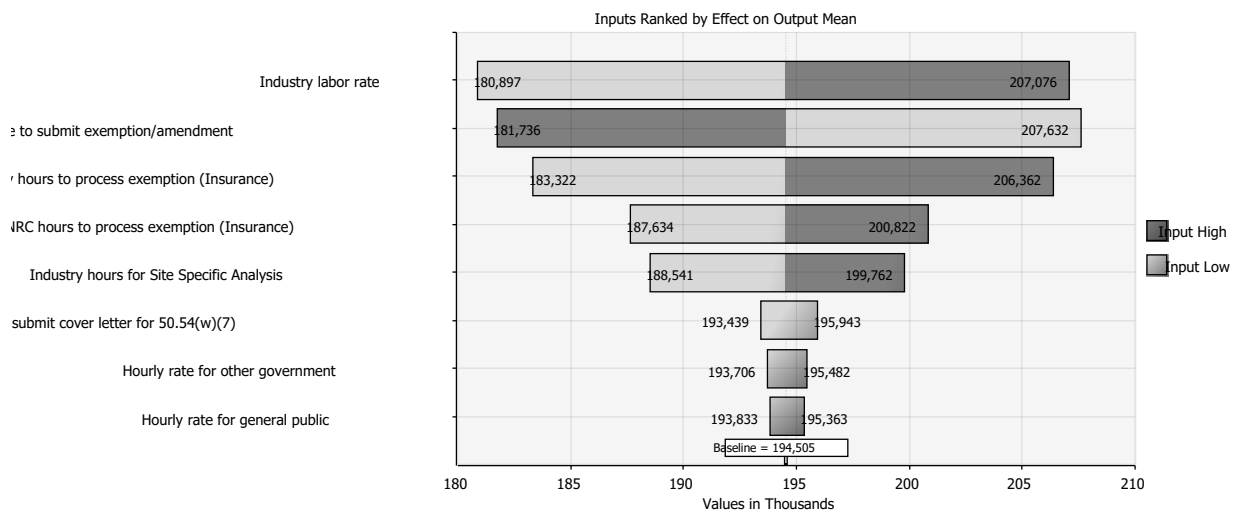


Figure 28 Tornado chart showing the variation of total cost due to each Financial Protection cost driver (Alternative FP-2)

The regulatory changes to the Offsite and Onsite Financial Protection Requirements and Indemnity Agreements area of decommissioning under Alternative FP-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$170,000 to \$221,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the nuclear power industry labor rate, the time at which the licensee submits an exemption or amendment request to the NRC for processing (i.e., 1 year before, during, or 1 year after decommissioning), and the number of hours needed for a licensee to process an exemption for insurance.

6.8.8 Environmental Considerations

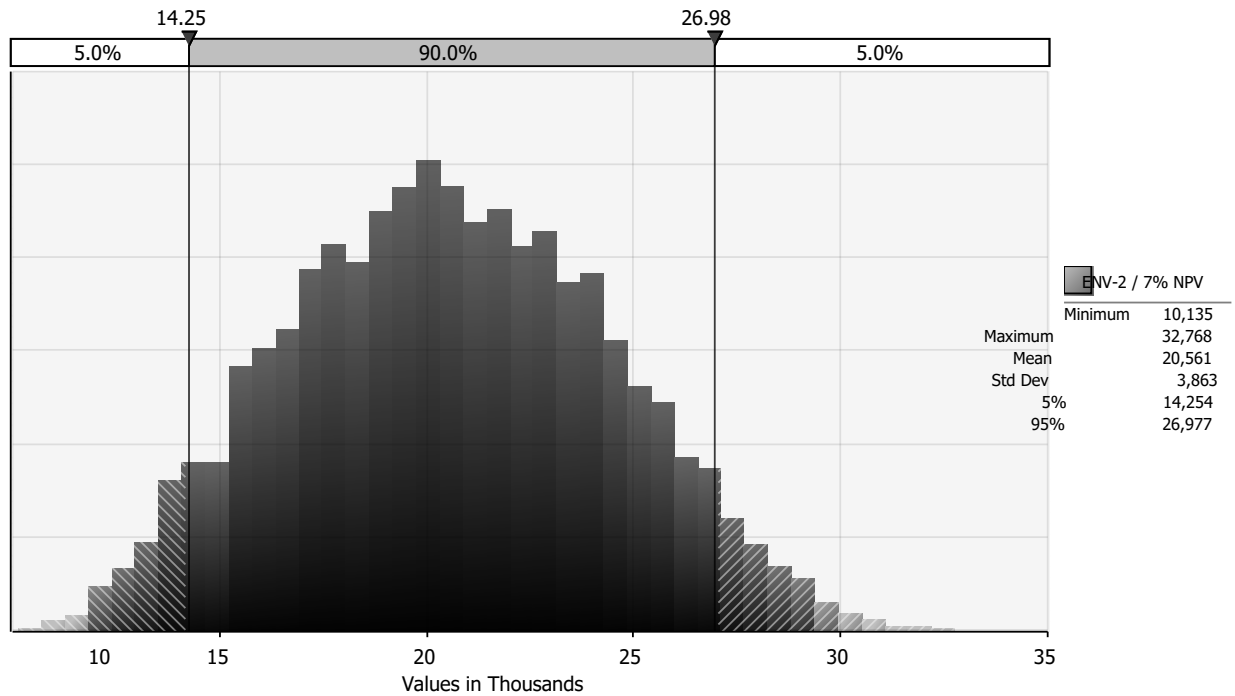


Figure 29 Variation of industry (total) cost due to uncertainty in the Environmental Considerations cost drivers (Alternative ENV-2)

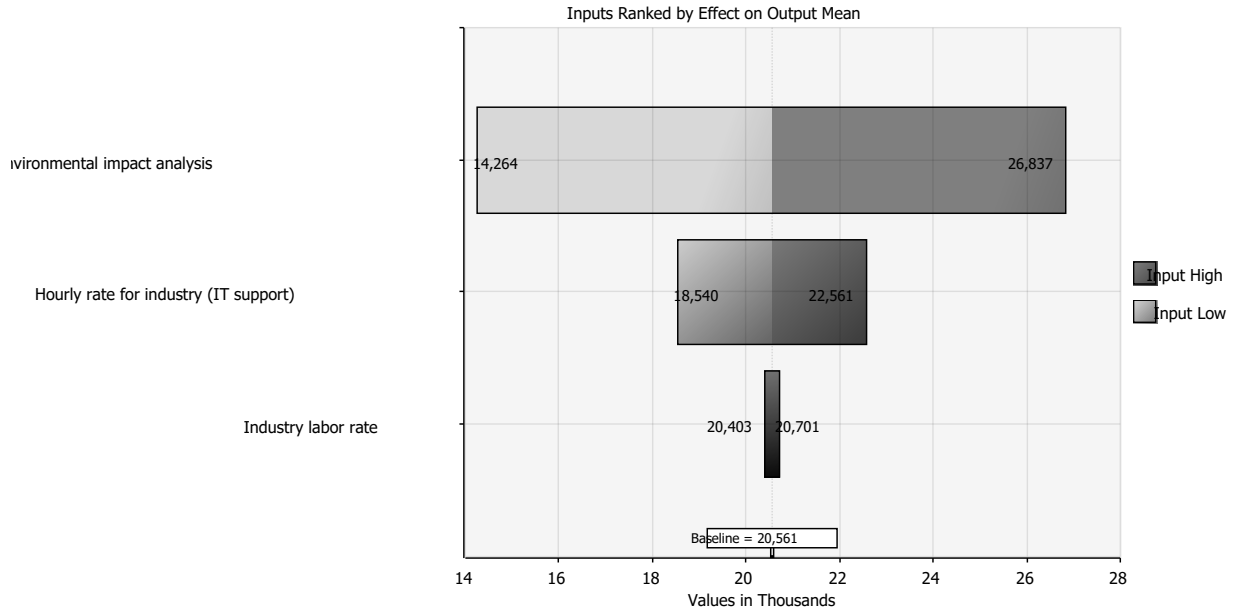


Figure 30 Tornado chart showing the variation of total cost due to each Environmental Considerations cost driver (Alternative ENV-2)

The regulatory changes to the Environmental Considerations area of decommissioning under Alternative ENV-2 will result in averted costs for the industry, over the decommissioning period, in the range of \$14,000 to \$27,000 (7 percent NPV) with a 90 percent confidence interval. The

cost driver that has the greatest influence on total cost is the number of NRC full-time equivalents needed to implement the rulemaking.

6.8.9 Record Retention Requirements

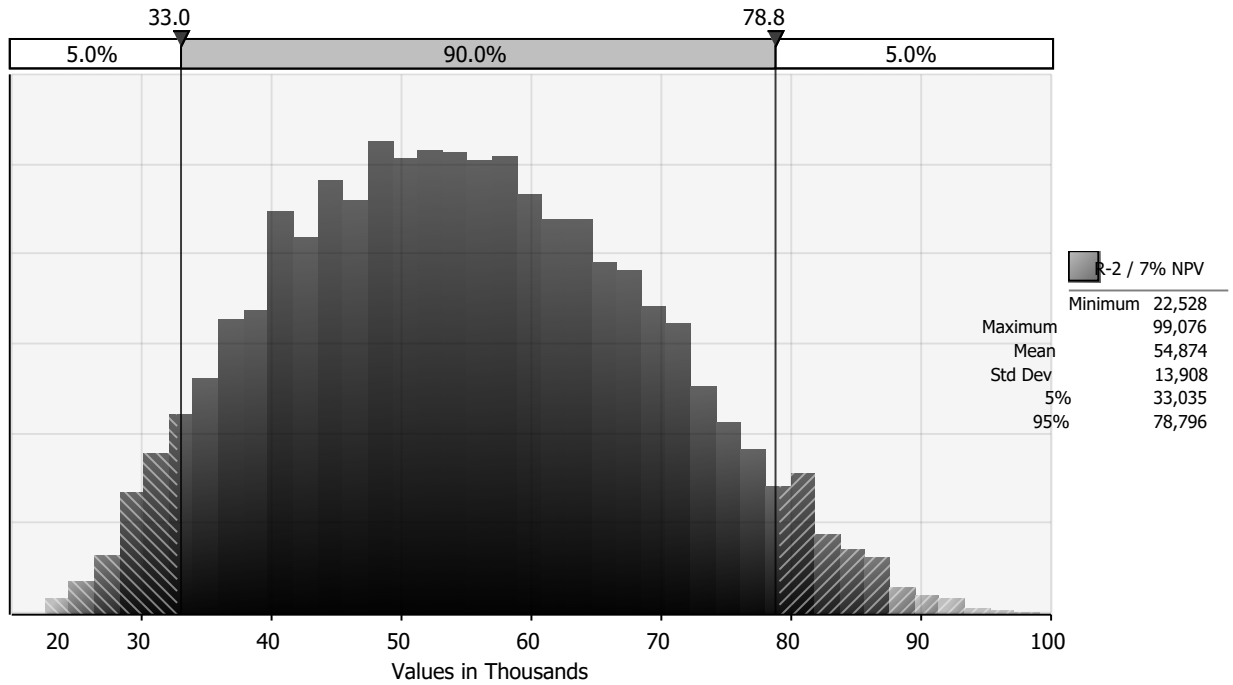


Figure 31 Variation of industry cost due to uncertainty in the Record Retention Requirements cost drivers (Alternative R-2)

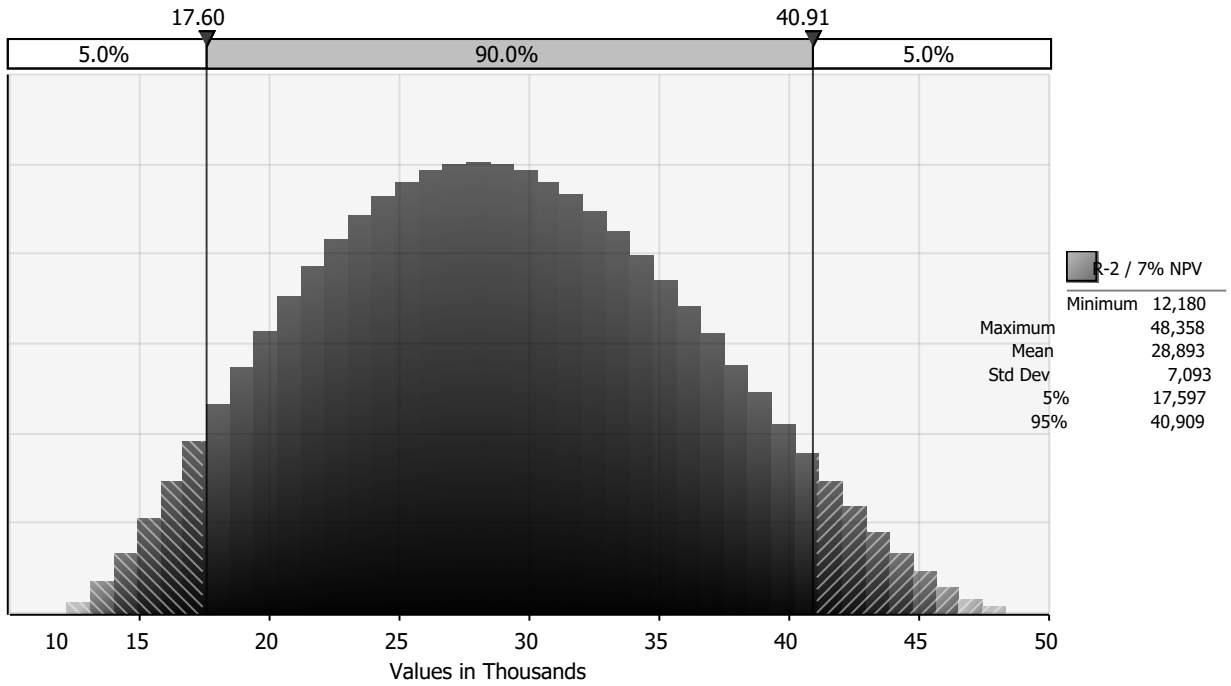


Figure 32 Variation of NRC cost due to uncertainty in the Record Retention Requirements cost drivers (Alternative R-2)

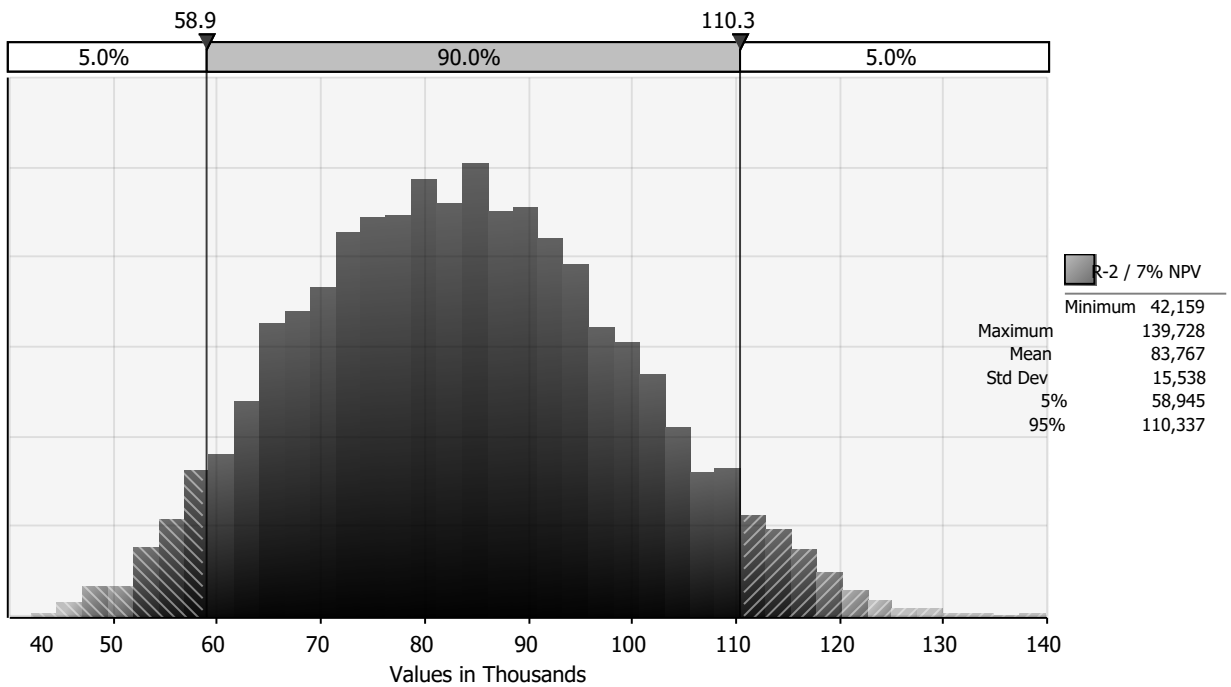


Figure 33 Variation of total cost due to uncertainty in the Record Retention Requirements cost drivers (Alternative R-2)

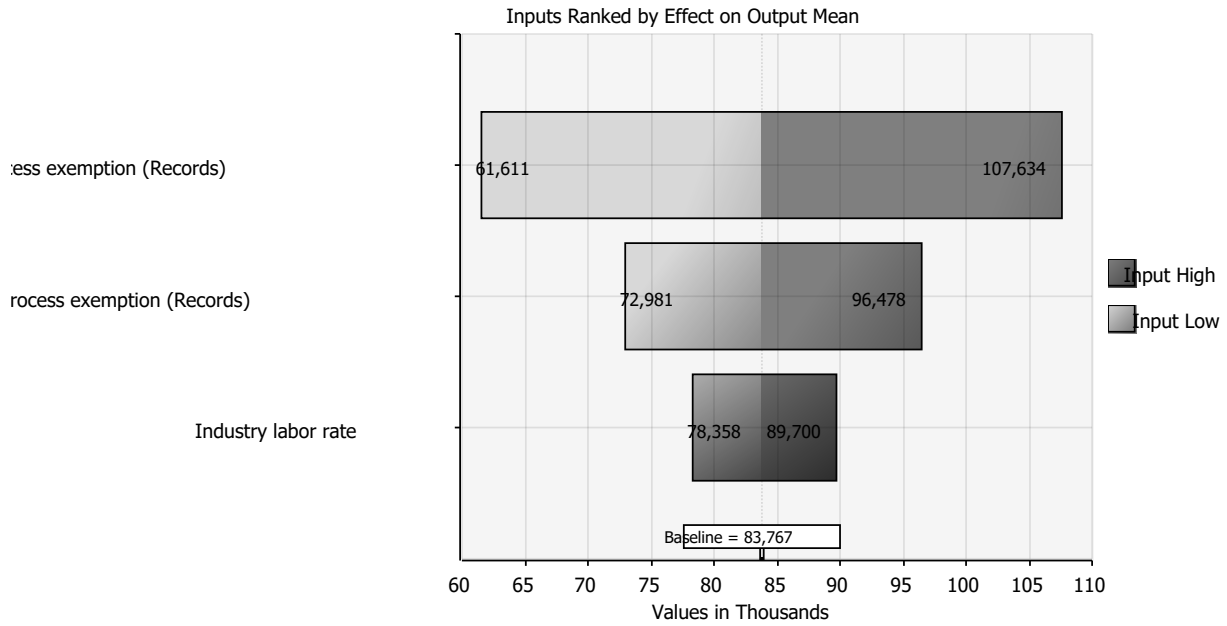


Figure 34 Tornado chart showing the variation of total cost due to each Record Retention Requirements cost driver (Alternative R-2)

The regulatory changes to the Record Retention Requirements area of decommissioning under Alternative R-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of \$59,000 to \$110,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the number of industry and NRC hours needed to process exemptions from recordkeeping requirements.

6.8.10 Low-Level Waste Transportation

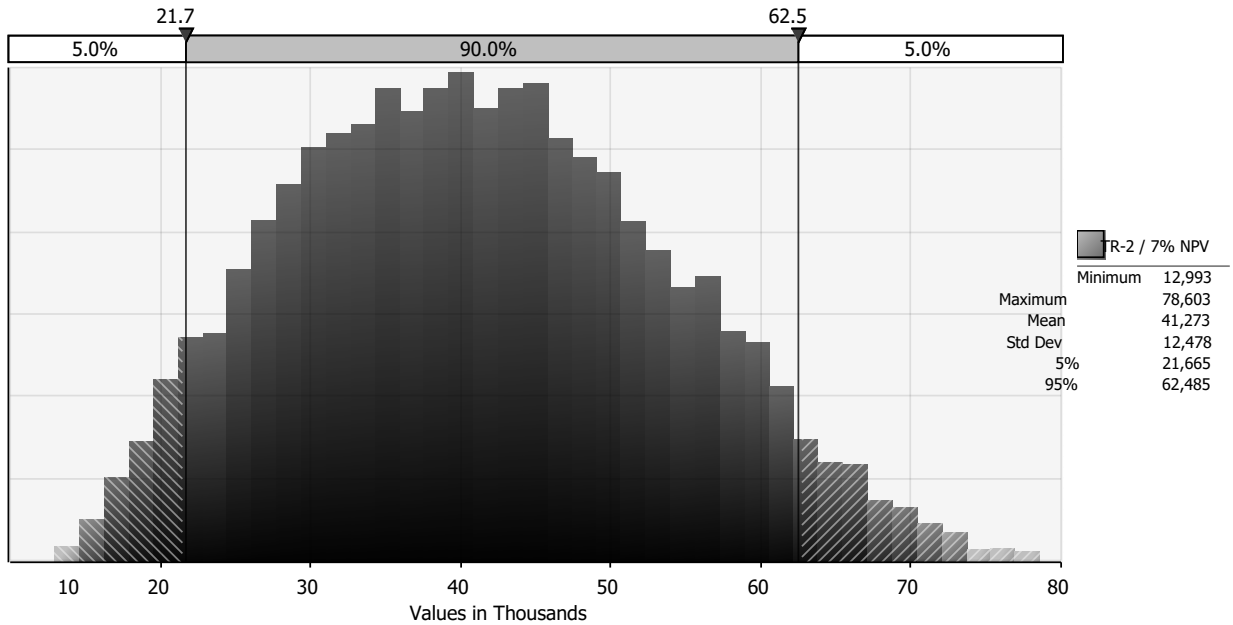


Figure 35 Variation of industry cost due to uncertainty in the Low-Level Waste Transportation cost drivers (Alternative TR-2)

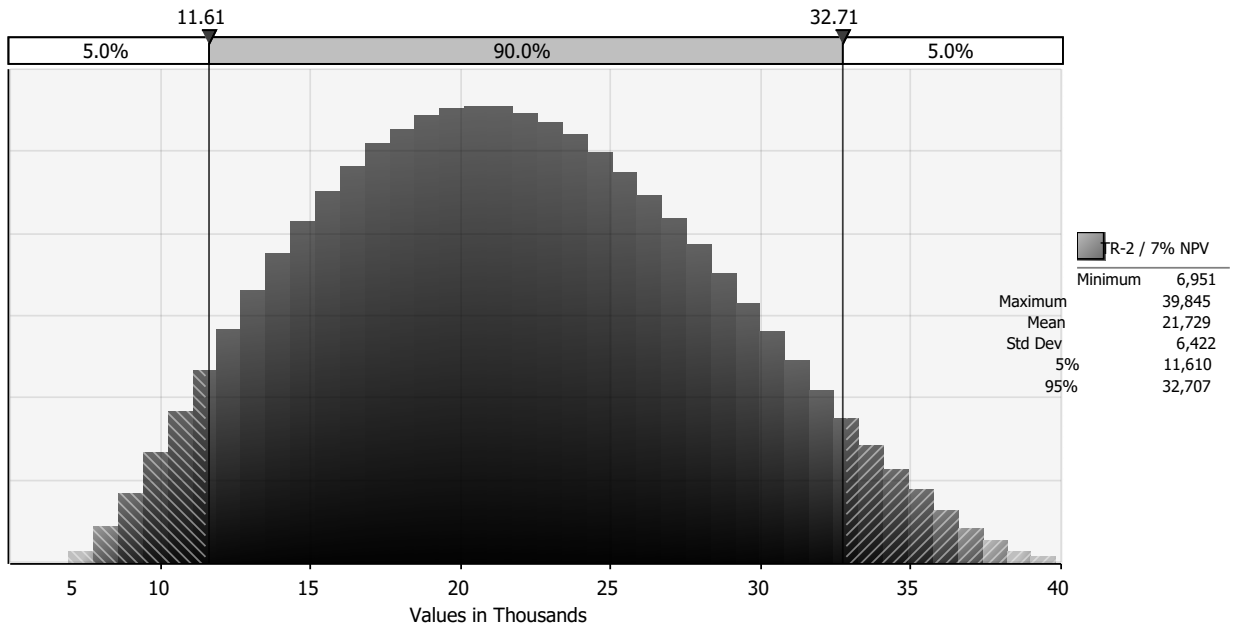


Figure 36 Variation of NRC cost due to uncertainty in the Low-Level Waste Transportation cost drivers (Alternative TR-2)

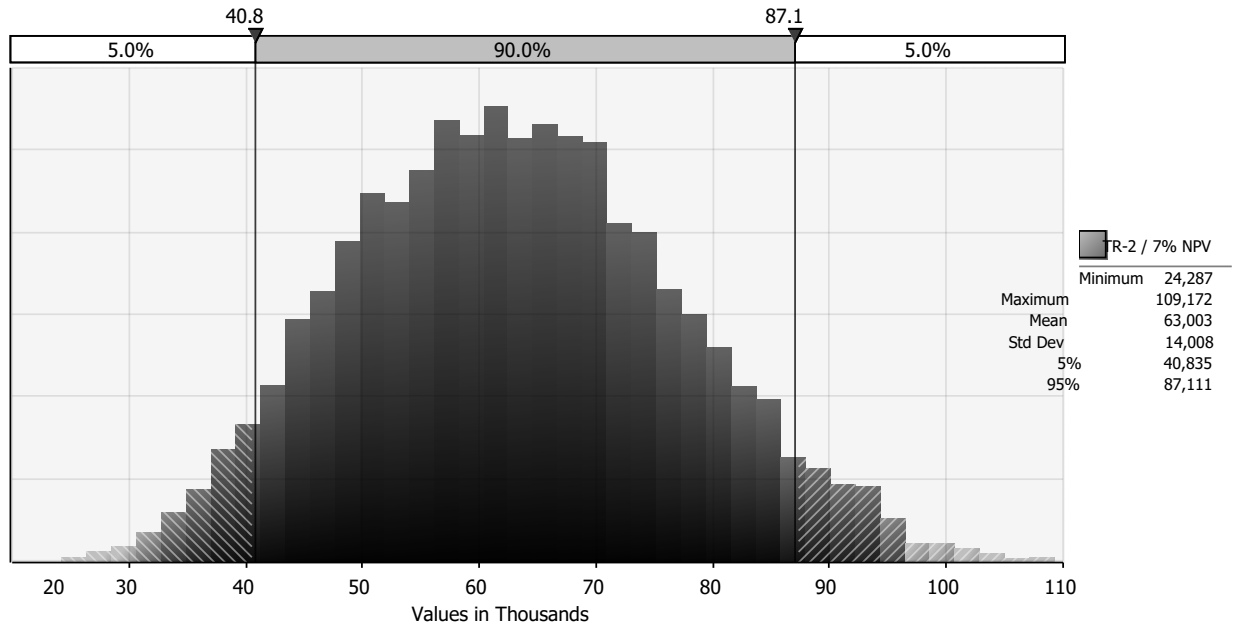


Figure 37 Variation of total cost due to uncertainty in the Low-Level Waste Transportation cost drivers (Alternative TR-2)

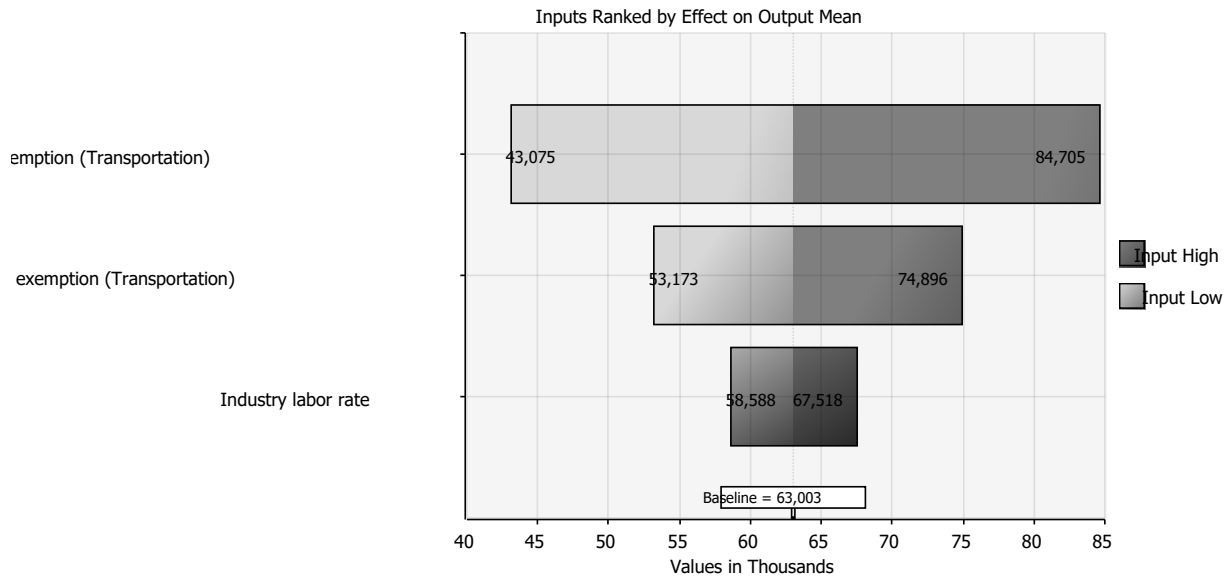


Figure 38 Tornado chart showing the variation of total cost due to each Low-Level Waste Transportation cost driver (Alternative TR-2)

The regulatory changes to the Low-Level Waste Transportation area of decommissioning under Alternative TR-2 will result in averted costs for the industry and the NRC, over the decommissioning period, in the range of (\$41,000) to \$87,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the number of industry and NRC hours needed to process exemptions for transportation of LLW.

6.8.11 Spent Fuel Management Planning

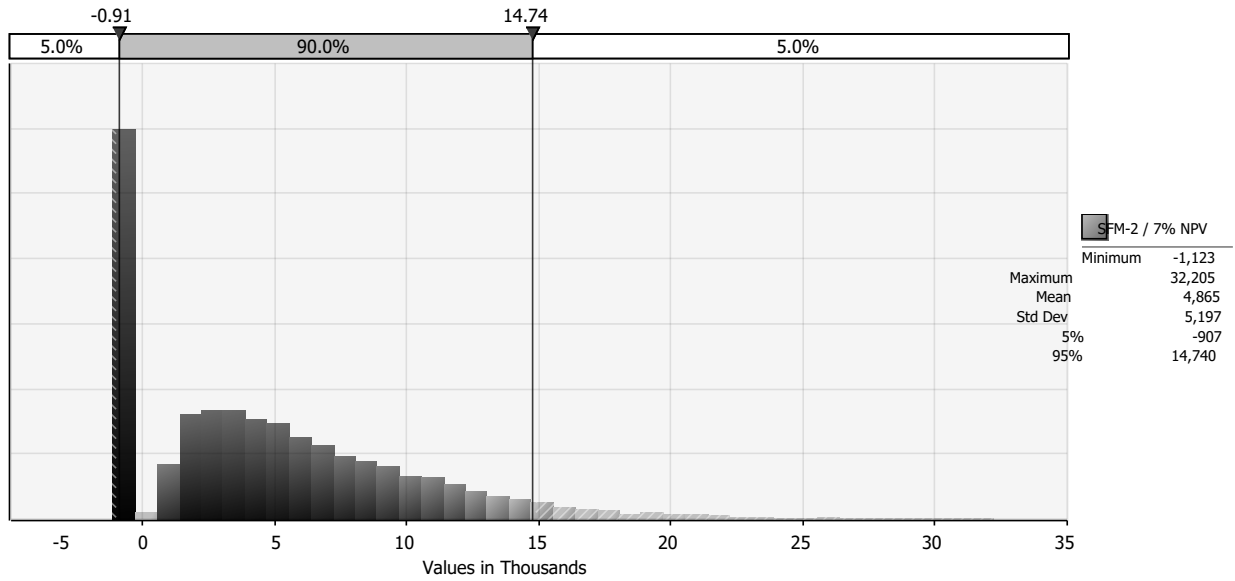


Figure 39 Variation of industry cost due to uncertainty in the Spent Fuel Management Planning cost drivers (Alternative SFM-2)

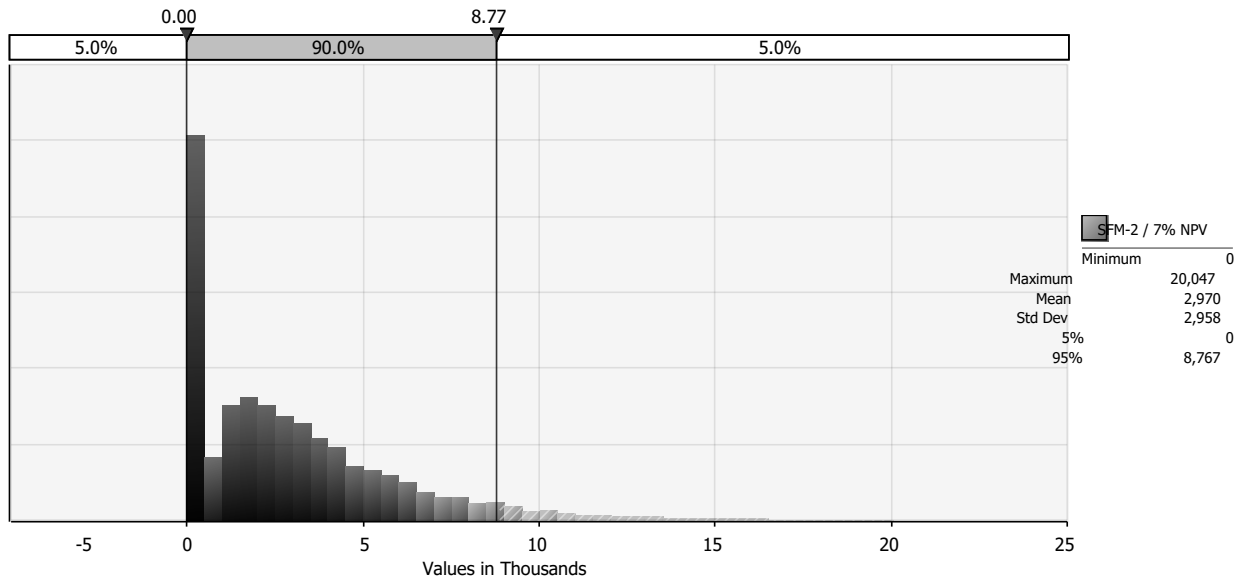


Figure 40 Variation of NRC cost due to uncertainty in the Spent Fuel Management Planning cost drivers (Alternative SFM-2)

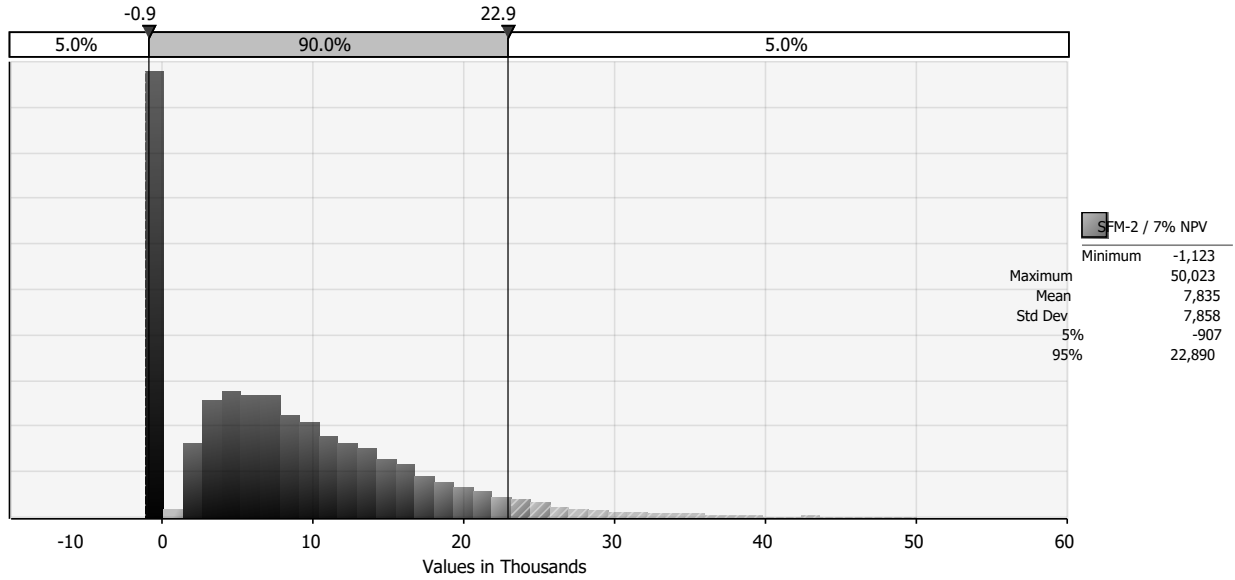


Figure 41 Variation of total cost due to uncertainty in the Spent Fuel Management Planning cost drivers (Alternative SFM-2)

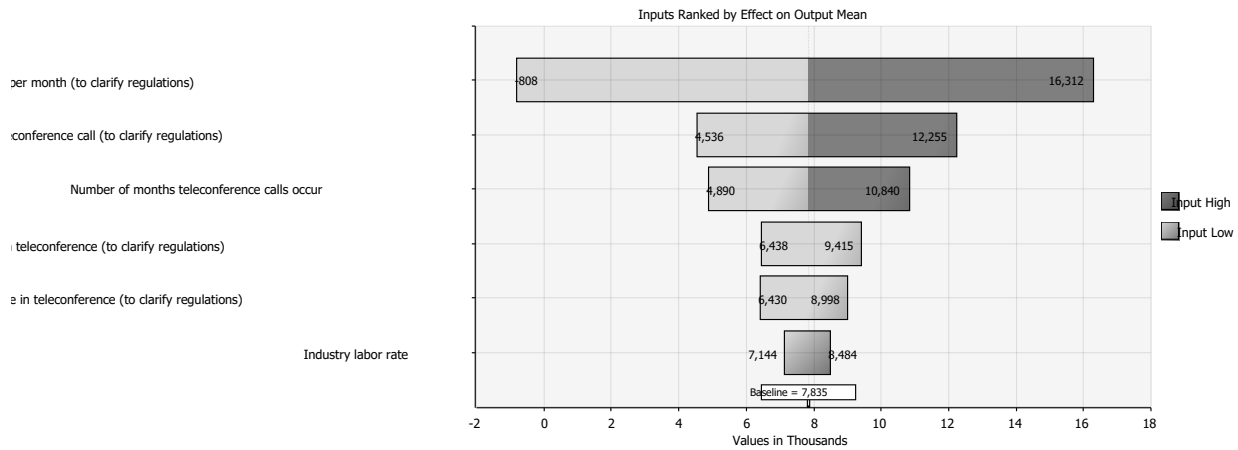


Figure 42 Tornado chart showing the variation of total cost due to each Spent Fuel Management Planning cost driver (Alternative SFM-2)

The regulatory changes to the Spent Fuel Management Planning area of decommissioning under Alternative SFM-2 will result in costs for the industry, the NRC, State and local governments, and the general public, over the decommissioning period, in the range of (\$1,000) to \$23,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on total cost are the number of interactions between licensees and the NRC per month, the number of months these interactions occur, and the averted time per interaction.

6.8.12 Foreign Ownership, Control, or Domination

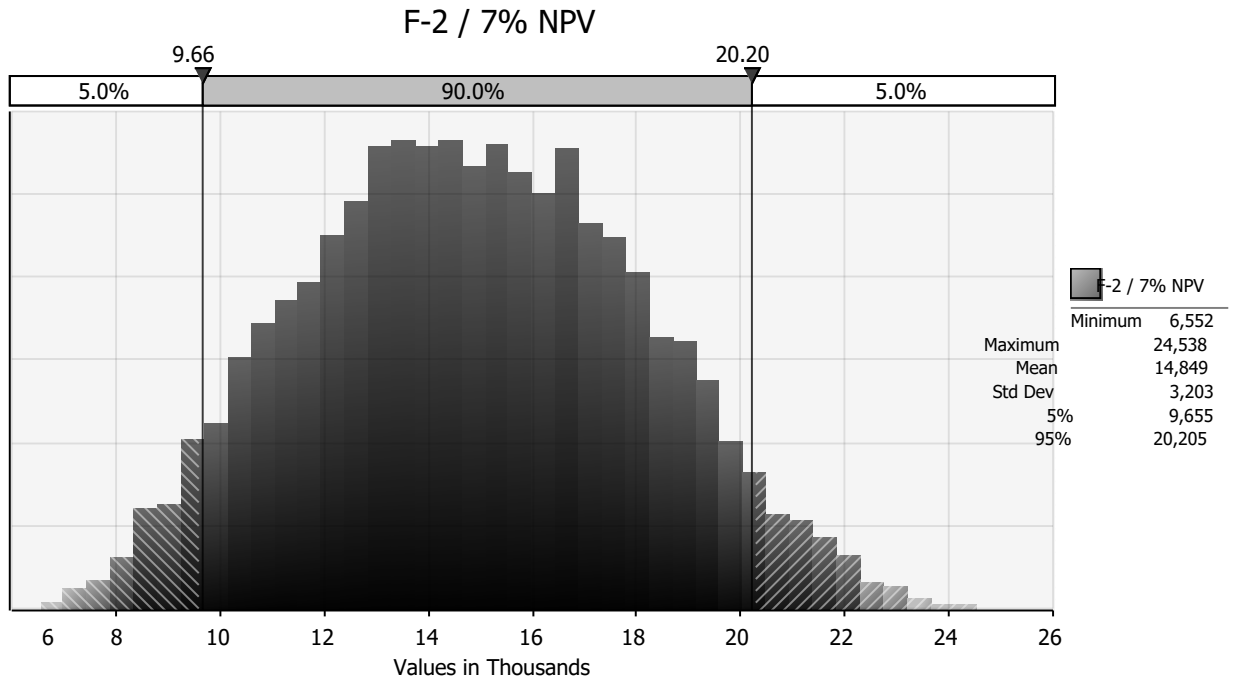


Figure 43 Variation of industry cost due to uncertainty in the FOCD cost drivers (Alternative F-2)

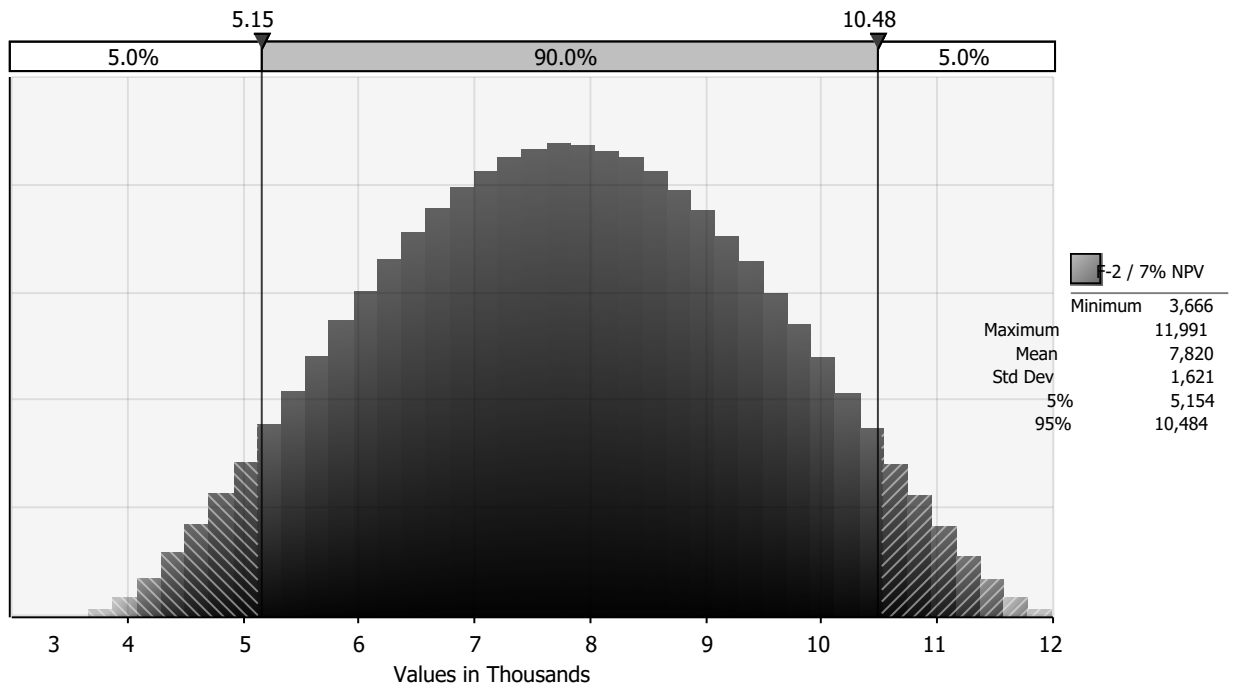


Figure 44 Variation of NRC cost due to uncertainty in the FOCD cost drivers (Alternative F-2)

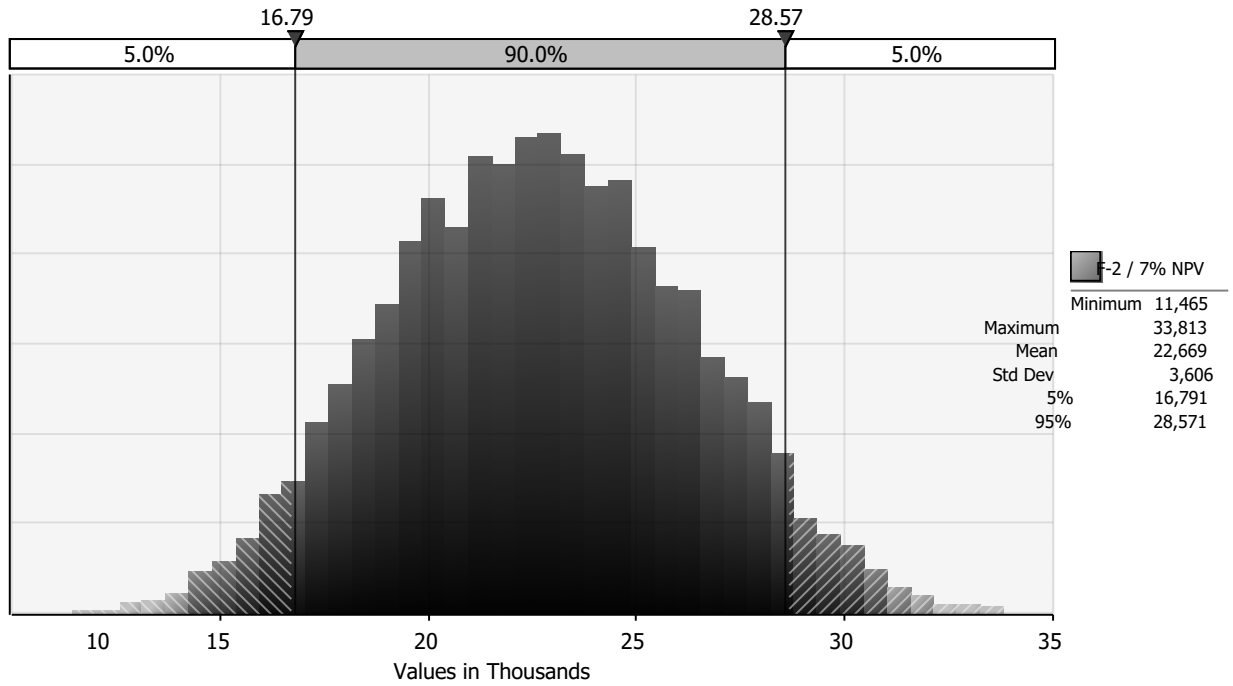


Figure 45 Variation of total cost due to uncertainty in the FOCD cost drivers (Alternative F-2)

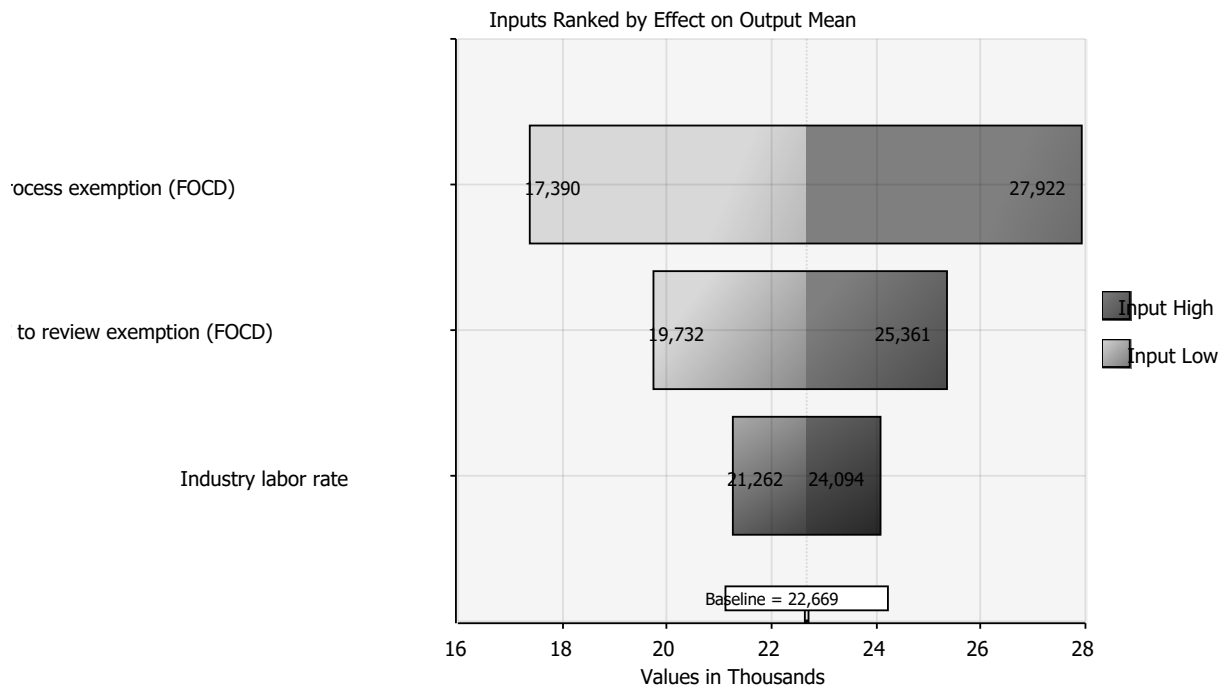


Figure 46 Tornado chart showing the variation of total cost due to each FOCD cost driver (Alternative F-2)

The regulatory changes to the FOCD area of decommissioning under Alternative F-2 will result in averted costs for the industry and the NRC in the range of \$17,000 to \$29,000 (7 percent NPV) with a 90 percent confidence interval. The cost drivers that have the greatest influence on

total cost are the number of hours it takes for the industry to process exemption requests and the number of hours it takes the NRC to review them.

6.9 Summary

This regulatory analysis identifies and integrates costs and benefits that will emerge from implementing the final rule in the areas of decommissioning that contain rulemaking and guidance alternatives.

6.9.1 Quantified Net Benefit

The following tables show the estimated total incremental net averted costs (and costs), relative to the regulatory baseline, for each area of decommissioning.

Table 9 Industry Costs and Benefits

Areas of Decommissioning	Alternatives	Industry Costs and Benefits		
		Undiscounted	7% NPV	3% NPV
Emergency Preparedness	EP-2	\$ 18,595,000	\$ 1,771,000	\$ 6,452,000
Physical Security	PS-2	\$ 3,136,000	\$ 299,000	\$ 1,088,000
Cybersecurity	CS-2	\$ 184,000	\$ 35,000	\$ 123,000
Drugs and Alcohol Testing	DA-2	\$ 7,852,000	\$ 534,000	\$ 2,368,000
Certified Fuel Handler Training	CFH/STA-2	\$ 764,000	\$ 73,000	\$ 265,000
Decommissioning Funding Assurance	DTF-2	\$ 1,007,000	\$ 115,000	\$ 298,000
Offsite & Onsite Financial Protection	FP-2	\$ 1,601,000	\$ 124,000	\$ 508,000
Environmental Considerations	ENV-2	\$ 264,000	\$ 21,000	\$ 84,000
Record Retention Requirements	R-2	\$ 706,000	\$ 55,000	\$ 224,000
Low Level Waste Transportation	TR-2	\$ 531,000	\$ 41,000	\$ 169,000
Spent Fuel Management Requirements	SFM-2	\$ 38,000	\$ 3,000	\$ 12,000
Backfit Rule	B-2	\$ -	\$ -	\$ -
Foreign Ownership, Control, or Domination	F-2	\$ 191,000	\$ 15,000	\$ 61,000
Scope of License Termination Plan	T-2	\$ -	\$ -	\$ -

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars.

Table 10 NRC Costs and Benefits

Areas of Decommissioning	Alternatives	NRC Costs and Benefits		
		Undiscounted	7% NPV	3% NPV
Emergency Preparedness	EP-2	\$ 9,830,000	\$ 936,000	\$ 3,411,000
Physical Security	PS-2	\$ 2,071,000	\$ 197,000	\$ 719,000
Cybersecurity	CS-2	\$ 302,000	\$ 19,000	\$ 83,000
Drugs and Alcohol Testing	DA-2	\$ (29,000)	\$ (23,000)	\$ (26,000)
Certified Fuel Handler Training	CFH/STA-2	\$ 1,295,000	\$ 123,000	\$ 449,000
Decommissioning Funding Assurance	DTF-2	\$ 853,000	\$ 97,000	\$ 252,000
Offsite & Onsite Financial Protection	FP-2	\$ 897,000	\$ 70,000	\$ 285,000
Environmental Considerations	ENV-2	\$ -	\$ -	\$ -
Record Retention Requirements	R-2	\$ 372,000	\$ 29,000	\$ 118,000
Low Level Waste Transportation	TR-2	\$ 279,000	\$ 22,000	\$ 89,000
Spent Fuel Management Requirements	SFM-2	\$ 26,000	\$ 2,000	\$ 8,000
Backfit Rule	B-2	\$ -	\$ -	\$ -
Foreign Ownership, Control, or Domination	F-2	\$ 101,000	\$ 8,000	\$ 32,000
Scope of License Termination Plan	T-2	\$ -	\$ -	\$ -

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars.

6.9.2 Qualitative Costs and Benefits

Apart from regulatory efficiency, the final rule provides additional costs and benefits as described below. These costs and benefits have not yet been quantified as monetary values.

Decommissioning Funding Assurance

Under Alternative DTF-2, licensees that report a shortfall pursuant to 10 CFR 50.75(f)(1) will be required to make up the shortfall (from the minimum regulatory required amount as set forth in 10 CFR 50.75(c) or by the licensee’s site-specific decommissioning cost estimate) by the next decommissioning funding status report for licensees that are not “electric utilities” as defined in 10 CFR 50.2, or the decommissioning funding status report two reports later for licensees that are electric utilities. This requirement will affect individual licensees differently, depending on the amount and cause of the DTF shortfall and the time period that the licensee would otherwise have had to make up the shortfall under the current regulatory framework and guidance. The more money needed to overcome the shortfall, the greater the impact will be on the licensee. The combination of these two factors could worsen the licensee’s financial condition if the licensee is unable to recover decommissioning costs through electrical generation rates and fees or through reductions in its operating plant budget. If the funding period is too short, licensees not under rate-setting regulations that report a shortfall will be at a competitive disadvantage, which could lead to insolvency and premature plant shutdown. In turn, the premature shutdown of a plant could create a dramatic shortfall between the funds needed to decommission the plant and the funds that have been collected. Other possible effects of accelerated shortfall funding are interference with licensees’ business planning and negative tax consequences.

6.10 Safety Goal Evaluation

Safety goal evaluations are applicable to regulatory initiatives considered to be generic safety enhancement backfits subject to the substantial additional protection standard in 10 CFR 50.109(a)(3). A safety goal evaluation is designed to determine whether a regulatory

requirement should not be imposed generically on nuclear power plants because the residual risk is already acceptably low.

This final rule is amending certain regulations affecting production and utilization facilities that are decommissioning. The amendments in the following areas of decommissioning will not constitute backfits: EP, Physical Security, Drug and Alcohol Testing, Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor, Decommissioning Funding Assurance, Offsite and Onsite Financial Protection Requirements and Indemnity Agreements, Environmental Considerations, Record Retention Requirements, Low-Level Waste Transportation, Spent Fuel Management Planning, Backfit Rule, FOCD, Cybersecurity Plans for OL Holders, and Clarification of Scope of License Termination Plan Requirement. Hence, a safety goal evaluation is not applicable to these areas of the final rule.

Holders of a 10 CFR Part 52 COL are currently required to maintain a CSP only as long as 10 CFR 73.54 is applicable to them. Because 10 CFR 73.54 no longer applies to a licensee once it is not authorized to operate a nuclear power reactor, and a power reactor licensee is not authorized to operate a nuclear power reactor during decommissioning, COL holders are not currently required to maintain their CSPs during decommissioning. This final rule will require licensees to maintain their CSPs for 10 months (for a BWR) or 16 months (for a PWR) beyond the date of permanent cessation of operations and permanent removal of fuel from the reactor vessel, for burnups less than 72 GWd/MTHM and zirconium-clad fuel, unless an alternative spent fuel decay period is proposed by the licensee and approved by the NRC. For fuel with burnups greater than 72 GWd/MTHM or nonzirconium cladding, the licensee would propose an alternative spent fuel decay period for NRC approval under 10 CFR 50.54(q)(8)(ii). Thus, the final rule will extend the duration over which a COL holder will be required to maintain a CSP. That extension will constitute a new or changed requirement for that licensee and, thus, constitute a change affecting the issue finality (i.e., backfitting) for that licensee.

Although the risk of a potential radiological release from spent fuel has not been quantified, the NRC has identified two qualitative benefits to the common defense and security and public health and safety that will be realized if the change affecting issue finality is implemented. Specifically, the NRC finds that extending the duration over which the licensee must meet cybersecurity requirements will do the following:

- Constitute a substantial increase in the protection of the common defense and security, by ensuring that a compromise of digital systems cannot adversely impact the effective operation of licensees' physical security programs, and
- Constitute a substantial increase in the protection of public health and safety, by ensuring that a compromise of digital systems cannot adversely impact the effective operation of EP systems in the event of a zirconium fire scenario.

These two qualitative arguments satisfy the intent of the safety goal evaluation for the changes to the cybersecurity requirements and demonstrate that the substantial additional protection standard in 10 CFR 50.109(a)(3) is met.

6.11 Results for the Committee to Review Generic Requirements

This section addresses regulatory analysis information requirements for rulemaking actions subject to review by the Committee to Review Generic Requirements (CRGR). All information called for by the CRGR procedures (Ref. 55) is presented in this regulatory analysis or in the

Federal Register notice for the final rule. Table 11 cross-references the relevant information to its location in this document or the *Federal Register* notice.

Table 11 Specific CRGR Regulatory Analysis Information Requirements

CRGR Procedures Citation	Information Item to Be Included in a Regulatory Analysis Prepared for CRGR Review	Where Item Is Discussed
Appendix B, (i)	The new or revised generic requirement in the final rule	Final rule text in <i>Federal Register</i> notice
Appendix B, (ii)	Papers or other documents supporting the requirements	<i>Federal Register</i> notice for final rule
Appendix B, (iii)	The sponsoring office's position on whether each requirement would modify, implement, relax, or reduce existing requirements	Regulatory analysis, section 5, and Section IX, "Backfitting and Issue Finality," of <i>Federal Register</i> notice for final rule
Appendix B, (iv)	The method of implementation	Regulatory analysis, section 7
Appendix B, (vi)	The category of power reactors, new reactors, or nuclear materials facilities or activities to which the generic requirement applies	Regulatory analysis, section 4.2.2
Appendix B, (vii)–(viii)	The items required at 10 CFR 50.109(c) and the required rationale at 10 CFR 50.109(a)(3) if the action involves a power reactor backfit and the exceptions at 10 CFR 50.109(a)(4) are not applicable	Section IX, <i>Federal Register</i> notice for final rule
Appendix B, (xvi)	An assessment of how the action relates to the Commission's Safety Goal Policy Statement	Regulatory analysis, section 5.7

7 DECISION RATIONALE FOR THE AREAS OF DECOMMISSIONING RULEMAKING

This section discusses the final rule alternative for each area of decommissioning that would be the most cost-beneficial to the nuclear power industry; Federal, State, and local governments; and the general public. For all areas that are being modified in the final rule, a quantitative cost-benefit analysis was completed to inform the staff of those alternatives that provide the most cost-beneficial solutions. The NRC has established a decision rationale for each area of decommissioning with respect to the final rule. This section presents these rationales, together with the quantitative costs and benefits shown previously.

The regulatory analysis finds that there is a quantitative and qualitative basis for pursuing the decommissioning rulemaking based on the following.

7.1 Emergency Preparedness

The NRC is finalizing rulemaking under Alternative EP-2 because it will provide regulatory certainty concerning EP requirements for permanently shutdown and defueled facilities. Also, in the status quo, decommissioning power reactor licensees need to submit exemption and amendment requests to reduce their EP requirements throughout the decommissioning process. This results in regulatory costs to both licensees and the NRC from expending resources to prepare and process the exemption and amendment requests. Additionally, Alternative EP-2 will provide a graded approach to reduce EP requirements at decommissioning sites. Finally, the cost-benefit analysis shows that Alternative EP-2 is cost-beneficial. The NRC is issuing an amendment of the regulations to provide a graded approach to EP, which would provide a regulatory process for licensees to reduce their EP requirements in accordance with their level of decommissioning, without needing to consider whether the change reduces the effectiveness of licensees' emergency plans.

7.2 Physical Security

The NRC is finalizing rulemaking under Alternative PS-2 because a decommissioning reactor poses a lower risk of offsite consequences due to radiological sabotage than an operating reactor. The NRC has concluded that existing physical security requirements can be stepped down commensurate with this reduced risk. Also, Alternative PS-2 will reduce regulatory costs for nuclear power plant licensees by eliminating the need to request exemptions and license amendments to reduce physical security requirements during decommissioning that are no longer necessary to ensure adequate protection. This alternative will also reduce the need for the NRC to review these exemption and amendment requests, and it has been shown to be cost-beneficial.

7.3 Cybersecurity

The NRC is finalizing rulemaking under Alternative CS-2. Under this alternative, the NRC will allow the removal of cybersecurity requirements from a 10 CFR Part 50 power reactor licensee's license and the termination of cybersecurity requirements for COL holders once the spent fuel in the SFP has decayed sufficiently. This change to existing regulations will clarify the degree of cybersecurity that needs to be maintained during each stage of the decommissioning process, while ensuring that safety concerns (e.g., a postulated zirconium fire scenario) are properly addressed in a manner that provides reasonable assurance of adequate protection of public health and safety and the common defense and security. This change will result in minor costs to one COL holder, but the removal of the need for a license amendment will benefit all OL holders, making this alternative cost-beneficial.

7.4 Drug and Alcohol Testing

The NRC is finalizing rulemaking under Alternative DA-2. The cost-benefit analysis shows that Alternative DA-2 results in cost savings to the industry as summarized in **Table 12**. The qualitative benefit of this alternative is regulatory clarity on which FFD program elements defined in 10 CFR Part 26 apply to the workforce at a decommissioning power reactor through

the licensee's IMP. Additionally, this alternative establishes consistency between Part 50 and 52 licensees.

7.5 Certified Fuel Handler Definition and Elimination of Licensed Operators and the Shift Technical Advisor

The NRC is finalizing rulemaking under Alternative CFH/STA-2. The cost-benefit analysis shows that Alternative CFH/STA-2 benefits both the industry and the NRC by eliminating the need for a decommissioning licensee to seek Commission approval for its CFH training program.

7.6 Decommissioning Funding Assurance

The NRC is finalizing rulemaking under Alternative DTF-2. The reporting requirements for decommissioning funding assurance will be changed from a biennial to a triennial reporting period until within 5 years of decommissioning and during decommissioning, and from an annual to a triennial reporting period once decommissioning has been completed but for the decommissioning of the ISFSI to be consistent with the reporting requirements for ISFSIs in 10 CFR 72.30(c). This will reduce licensees' costs for reporting. The final rule will increase the transparency of a licensee's decommissioning costs and plans for funding at licensing, as well as throughout operations and decommissioning. This will minimize the uncertainty in estimating decommissioning costs, so that a licensee would be able to plan for, and provide assurances for, funding decommissioning earlier in the facility's life cycle. Licensees will thus be able to address shortfalls in a timely manner, with greater transparency. Finally, as detailed in **Table 12**, Alternative DTF-2 is cost-beneficial to the industry and the NRC.

7.7 Offsite and Onsite Financial Protection Requirements and Indemnity Agreements

The NRC is finalizing rulemaking under Alternative FP-2 because a decommissioning reactor poses a lower risk of offsite and onsite consequences due to accidents than an operating reactor, and the amounts of financial protection provided in Levels 1 and 2 are consistent with exemptions that have previously been granted to decommissioning reactors. The NRC has concluded that existing insurance requirements can be stepped down commensurate with the reduced level of risk and consistent with the graded approach described in section 2.1 of this document. Alternative FP-2 reduces regulatory costs to nuclear reactor licensees by eliminating the need to request exemptions to reduce offsite and onsite financial protection. This will also reduce the costs to the NRC of reviewing such exemption requests.

7.8 Environmental Considerations

The NRC is finalizing rulemaking under Alternative ENV-2, which will improve the regulatory process for decommissioning nuclear power plants by providing clarity and flexibility about what information a licensee is required to include in the PSDAR about the environmental impacts associated with site-specific decommissioning activities. This will not reduce the flexibility provided by the use of a PSDAR instead of a decommissioning plan for decommissioning nuclear power plants, nor will it impose unnecessary burdens on licensees and the NRC by requiring them to create and review additional documents with no net positive impact on public health and safety.

Alternative ENV-2 clarifies that in the PSDAR licensees are required only to discuss the environmental impacts associated with site-specific decommissioning activities and whether such impacts will be bounded by appropriate federally issued environmental review documents, rather than to conclude definitively that such impacts are bounded by previously issued environmental impact statements. The regulations at 10 CFR 50.82(a)(6)(ii) and 10 CFR 52.110(f)(2), which prohibit performing a decommissioning activity that would result in a significant environmental impact not previously reviewed, remain in place, although clarifying language has been added in the final rule, so that the prohibition specifies that the impact must be bounded by federally issued environmental review documents.

7.9 Record Retention Requirements

The NRC is finalizing rulemaking under Alternative R-2 because it will decrease costs for decommissioning licensees by reducing their need to develop and submit exemption requests, and because it will promote greater record storage efficiency throughout the decommissioning process. In the long term, because decommissioning licensees will submit fewer requests for exemptions from recordkeeping and record retention requirements, the NRC will spend less time processing and reviewing these requests. The increased clarity of the requirements associated with recordkeeping and record retention during decommissioning will increase the overall transparency of the decommissioning process.

7.10 Low-Level Waste Transportation

The NRC is finalizing rulemaking under Alternative TR-2 because it will maintain safety, reduce unnecessary regulatory costs, and improve efficiency and effectiveness in the regulatory process for decommissioning nuclear power plants. Under this alternative, licensees' costs will decrease because they will not have to develop and submit exemption requests, and they will achieve greater efficiency throughout the LLW transportation process. Because licensees will submit fewer requests for exemptions from the investigation, tracing, and reporting requirements for LLW transportation, the NRC will spend less time processing and reviewing these requests. By reducing the administrative burden associated with the investigation, tracing, and reporting requirements for LLW transportation, during both facility operation and decommissioning, Alternative TR-2 will increase the overall efficiency of the regulatory process.

7.11 Spent Fuel Management Planning

The NRC is finalizing rulemaking under Alternative SFM-2, amending 10 CFR 50.82, 10 CFR 50.54(bb), 10 CFR 52.110, and 10 CFR 72.218 to clarify and update the regulations as previously described, as well as to enhance overall regulatory transparency and openness. The NRC estimates that this change will have only a small impact on both licensees and the NRC because it promulgates rule language that is already present in other sections of the regulations, moving it to the appropriate parts of 10 CFR 50.82 and 10 CFR 52.110. In addition, decommissioning licensees will need to expend relatively little time and effort to provide the additional detail suggested under the adjusted requirements for spent fuel management and handling capabilities during decommissioning, since most decommissioning licensees are already taking these considerations into account.

The NRC concludes that under Alternative SFM-2, both the NRC and licensees will save resources in the future, because the clarified regulations and additional detail in the guidance will reduce or eliminate the NRC's need to engage in site-specific interactions with licensees

about the management of spent fuel during decommissioning. It will also improve the efficiency of NRC communications with stakeholders who have questions and concerns in this area. Additionally, Alternative SFM-2 will increase opportunities for public involvement in the decommissioning process and resolve inconsistencies identified in the regulations.

7.12 Backfit Rule

The NRC is finalizing rulemaking under Alternative B-2 to provide regulatory clarity about how the Backfit Rule would apply to NRC actions affecting decommissioning plants. As a result, the industry and the NRC may need to spend less time to determine whether a given regulatory action applied to a decommissioning licensee is a backfit. These determinations will help define the scope of activities and approvals that would continue from the operations phase into the decommissioning phase.

7.13 Foreign Ownership, Control, or Domination

The NRC is finalizing rulemaking under Alternative F-2 to clarify that the regulations in 10 CFR Part 50 and 10 CFR Part 52 provide not only for the licensing of utilization and production facilities, but also for their decommissioning and the termination of their associated licenses. The final rule will also allow foreign entities to acquire 10 CFR Part 50 and 10 CFR Part 52 licenses for facilities that are no longer utilization or production facilities, consistent with maintaining public health and safety and the common defense and security. This will reduce the number of exemptions needed from 10 CFR 50.38 for facilities that no longer meet the definition of a utilization or production facility, resulting in cost savings to the nuclear power industry and the NRC. Additionally, the final rule will offer NPUFs the option to request only one licensing action—the decommissioning plan license amendment—which will also address the licensee’s operating authority, rendering a possession-only license amendment unnecessary and resulting in cost savings to NPUFs and the NRC from not processing these amendments.

7.14 Clarification of Scope of License Termination Plan Requirement

The NRC is finalizing rulemaking under Alternative T-2 to clarify that COL holders that seek to surrender their licenses before initial fuel load do not need to submit a license termination plan to the NRC for approval. While this will increase regulatory clarity, the NRC did not quantify any averted costs associated with these changes.

8 FINAL RULE TOTAL COSTS

The following table summarizes the NRC alternatives for the final rule along with their incremental averted costs (or costs). The total incremental cost for the final rule is also displayed. These averted costs are accrued by licensees (the industry) and the NRC.

Table 12 Summary of Total Costs and Benefits for the Selected Alternatives

Areas of Decommissioning	Alternatives	Total Costs and Benefits	
		7% NPV	3% NPV
Emergency Preparedness	EP-2	\$ 2,708,000	\$ 9,863,000
Physical Security	PS-2	\$ 496,000	\$ 1,807,000
Cybersecurity	CS-2	\$ 54,000	\$ 205,000
Drugs and Alcohol Testing	DA-2	\$ 511,000	\$ 2,342,000
Certified Fuel Handler Training	CFH/STA-2	\$ 196,000	\$ 714,000
Decommissioning Funding Assurance	DTF-2	\$ 212,000	\$ 550,000
Offsite & Onsite Financial Protection	FP-2	\$ 194,000	\$ 793,000
Environmental Considerations	ENV-2	\$ 21,000	\$ 84,000
Record Retention Requirements	R-2	\$ 84,000	\$ 342,000
Low Level Waste Transportation	TR-2	\$ 63,000	\$ 257,000
Spent Fuel Management Planning	SFM-2	\$ 5,000	\$ 20,000
Backfit Protection	B-2	\$ -	\$ -
Foreign Ownership, Control, or Domination	F-2	\$ 23,000	\$ 93,000
Scope of License Termination Plan	T-2	\$ -	\$ -
Total:		\$ 4,565,000	\$ 17,070,000

* There may be discrepancies in calculations due to rounding.

** All values are in 2022 dollars.

The cost-benefit analysis shows that these alternatives are overall cost-beneficial to the nuclear power industry and the NRC and that the revised requirements will result in estimated net averted costs ranging from \$4.57 million (7 percent NPV) to \$17.1 million (3 percent NPV). Most of the cost savings are attributable to the elimination of the exemption and amendment requests that licensees would typically submit to the NRC for review and approval during decommissioning.

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1. NRC, "General Requirements for Decommissioning Nuclear Facilities: Final Rule," 53 FR 24018, June 27, 1988.
2. NRC, "Decommissioning of Nuclear Power Reactors: Proposed Rule," 60 FR 37374, July 20, 1995.
3. NRC, "Decommissioning of Nuclear Power Reactors: Final Rule," 61 FR 39278, July 29, 1996.
4. NRC, SRM-SECY-99-168, "Staff Requirements—SECY-99-168—Improving Decommissioning Regulations for Nuclear Power Plants," December 21, 1999 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML003752190).
5. NRC, NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," February 2001, ML010430066.
6. NRC, SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning," June 28, 2000, ML003721626.

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APPENDIX A: INDUSTRY LABOR RATES

Utilities (Sector 22)—Industry: Nuclear Electric Power Generation and Electric Power Generation, Transmission and Distribution (North American Industry Classification System codes 221113 and 221100)

Position Title	Occupation (SOC Code)	Hourly Mean Wage (2022 dollars)	Hourly 25th Percentile Wage (2022 dollars)	Hourly 75th Percentile Wage (2022 dollars)
Executive	Top Executives (111000)	\$109.88	\$77.34	\$142.42
	Chief Executives (111011)	\$144.09	\$88.98	\$199.20
Managers	First-Line Supervisors of Production and Operating Workers (511011)	\$73.88	\$62.83	\$82.92
	First-Line Supervisors of Mechanics Installers and Repairers (491011)	\$62.78	\$52.16	\$69.15
	Industrial Production Managers (113051)	\$87.13	\$73.82	\$98.93
	General and Operations Managers (111021)	\$98.62	\$77.34	\$106.32
Technical Staff	Nuclear Engineers (172161)	\$56.84	\$47.34	\$64.35
	Computer Support Specialists (151150)	\$49.88	\$37.41	\$55.08
	Nuclear Technicians (194051)	\$49.83	\$46.35	\$54.44
	Nuclear Power Reactor Operators (518011)	\$57.06	\$48.47	\$63.31
	Industrial Machinery Mechanics (499041)	\$49.83	\$46.90	\$54.19
Admin Staff	Office and Administrative Support Occupations (430000)	\$37.76	\$27.43	\$47.80
	First-Line Supervisors of Office and Administrative Support Workers (431011)	\$55.11	\$46.34	\$62.06
	Office Clerks General (439061)	\$28.90	\$23.78	\$30.83
Licensing Staff	Paralegals and Legal Assistants (232011)	\$47.18	\$38.22	\$48.08
	Lawyers (231011)	\$94.69	\$72.15	\$112.45
FFD Staff	MRO*	\$151.36	\$113.52	\$189.20
	FFD Manager*	\$48.59	\$37.84	\$54.58

*Source: Regulatory analysis for 10 CFR Part 26 final rule, 2022 (Ref. 56).

APPENDIX B: UNCERTAINTY ANALYSIS VARIABLES

Low, most likely, and high values were derived from similar historical cost data and the expert opinion of the NRC staff.

Parameter	Mean Value	Distribution Type	Low	Most Likely (Base)	High
2022 weighted hourly rate for industry (reports, paperwork)	\$135.77	PERT	\$112.47	\$136.80	\$154.97
2022 weighted hourly rate for industry (technical work)	\$168.69	PERT	\$140.42	\$170.38	\$190.23
2022 FFD weighted hourly rate	\$114.70	PERT	\$92.66	\$115.81	\$132.29
2022 NRC labor rate	\$143.00				
Number of nuclear power plant sites that will enter the decommissioning transition phase after rulemaking becomes effective	55	NONE			
Number of years from start of decommissioning to transfer all spent fuel to dry cask storage in ISFSI	4	PERT	2	4	7
Number of years from start of decommissioning until all spent fuel is transferred to U.S. Department of Energy	20	PERT	18	20	23
Number of years from start of decommissioning to site dismantlement (SAFSTOR method)	50	PERT	40	50	60
Number of years for site to decommission (DECON method)	12	PERT	8	12	16
Number of years for site to decommission (SAFSTOR method)	28	PERT	8	25	60
Number of years for site to decommission (DECON or SAFSTOR method)	21	PERT	8	15	60
Number of years post-DECON/SAFSTOR when all spent fuel is transferred offsite	15	PERT	10	15	20
Number of years for spent fuel management	19	PERT	3	21	24
Information technology staff personnel required to implement cybersecurity protection	3.3	UNIFORM	3		4
Cost impact to develop site-specific cost estimate for DTF	\$(333,333)	PERT	\$(300,000)	\$(300,000)	\$(500,000)
Hours for industry to process exemption (EP)	1428.6	PERT	1246.8	1419.7	1646.2
Hours for NRC to process exemption (EP)	714.3	PERT	623.4	709.8	823.1
Hours for industry to process amendment (EP)	1043.6	PERT	632.2	1039.0	1473.6

Parameter	Mean Value	Distribution Type	Low	Most Likely (Base)	High
Hours for NRC to process amendment (EP)	521.8	PERT	316.1	519.5	736.8
Hours for industry to process exemption (suspension of security)	20.0	PERT	18.2	20.0	21.8
Hours for NRC to process exemption (suspension of security)	10.0	PERT	9.1	10.0	10.9
Hours for industry to process exemption (core damage)	20.0	PERT	18.2	20.0	21.8
Hours for NRC to process exemption (core damage)	10.0	PERT	9.1	10.0	10.9
Hours for industry to process exemption (communications with control room)	40.0	PERT	36.4	40.0	43.6
Hours for NRC to process exemption (communications with control room)	16.0	PERT	14.6	16.0	17.4
Hours for industry to process amendment (reduction of control room)	100	PERT	93	100	107
Hours for NRC to process amendment (reduction of control room)	40.0	PERT	37.2	40	42.8
Hours for industry to process amendment (applying Part 72 to ISFSI)	300	PERT	279	300	321
Hours for NRC to process amendment (applying Part 72 to ISFSI)	150.0	PERT	139.5	150	160.5
Hours for industry to process amendment (cybersecurity)	70.5	PERT	24.0	68.3	126.0
Hours for NRC to process amendment (cybersecurity)	34.7	PERT	12.0	33.3	63.0
Hours for NRC to update a regulatory guide	866.7	PERT	600	700	1800
Hours for industry to respond to request for additional information (RAI) on CFH training program	82.3	PERT	45.0	79.7	130.0
Hours for NRC to approve CFH training program	164.6	PERT	90.0	159.4	260.0
Hours for industry to update site-specific cost estimate	7	PERT	4	7	10
Hours for NRC to review update to site-specific cost estimate	7	PERT	4	7	10
Hours for industry to report decommissioning funding assurance per report	6.7	PERT	4.0	7.0	8.0
Hours for NRC to review single report on decommissioning funding assurance	6.7	PERT	4.0	7.0	8.0

Parameter	Mean Value	Distribution Type	Low	Most Likely (Base)	High
Hours for industry to respond to RAIs for approval of ISFSI reports under 10 CFR 72.30(c)	14.4	PERT	0.0	14.4	28.8
Hours for NRC to approve ISFSI reports under 10 CFR 72.30(c)	8.2	PERT	0.0	8.2	16.4
Hours for industry to process exemption (insurance)	200.7	PERT	171.8	199.4	234.6
Hours for NRC to process exemption (insurance)	100.3	PERT	85.9	99.7	117.3
Hours for industry to submit notification in compliance with 10 CFR 50.54(w)(6)	0.8	PERT	0.5	0.8	1.0
Hours for industry to complete site-specific analysis for adiabatic heatup of fuel assembly	14.5	PERT	8.7	13.9	22.3
Hours for NRC to review site-specific analysis for the adiabatic heatup of fuel assembly	7.2	PERT	4.4	7.0	11.1
Hours for industry to update PSDAR	160	PERT	80	160	240
Hours for NRC to review update of PSDAR	80	PERT	40	80	120
Hours for industry to complete full environmental analysis for decommissioning	1500	PERT	1000	1500	2000
Hours for NRC to complete NEPA analysis	1500	PERT	1000	1500	2000
Hours for industry to prepare and submit PSDAR amendment	4000	PERT	3000	4000	5000
Hours for NRC to review PSDAR amendment	2000	PERT	1500	2000	2500
Hours for industry to summarize spent fuel management and add summary to PSDAR	1.1	PERT	0.8	1.1	1.5
Hours for industry to process exemption (records)	94.5	PERT	38.7	91.6	162.0
Hours for NRC to process exemption (records)	47.2	PERT	19.4	45.8	81.0
Hours for industry to process exemption (transportation)	77.5	PERT	35.0	77.5	120.0
Hours for NRC to process exemption (transportation)	38.8	PERT	17.5	38.8	60.0
Hours for industry to process exemption (FOCD)	71.1	PERT	22.0	67.6	134.0

Parameter	Mean Value	Distribution Type	Low	Most Likely (Base)	High
Hours for NRC to process exemption (FOCD)	35.5	PERT	11.0	33.8	67.0
Averted time for follow-up communication for clarification (environmental considerations, record retention requirements, and LLW transportation), hours	0.3	PERT	0.1	0.3	0.5
Number of follow-up communications per licensee per month for status updates and to resolve issues (environmental considerations, record retention requirements, and LLW transportation)	1	DUNIFORM	1		3
Number of industry people involved in follow-up communications (environmental considerations, record retention requirements, and LLW transportation)	8	DUNIFORM	6		10
Number of NRC people involved in follow-up communications (environmental considerations, record retention requirements, and LLW transportation)	4	DUNIFORM	2		6
Number of months for follow-up communications	3	DUNIFORM	2		4
Industry hours to update RG 5.77	100	PERT	80	100	120
NRC hours to update RG 5.77	200	PERT	160	200	240
Average cost of business travel per week	\$950	PERT	\$600	\$950	\$1,300
Labor—FFD program staff (random test selection and donor notification to appear for testing), hours	0.51	PERT	0.33	0.50	0.75
Labor—collector (drug and alcohol specimen collection), hours	0.41	PERT	0.35	0.40	0.50
Labor—worker (drug and alcohol specimen collection process), hours	0.41	PERT	0.35	0.40	0.50
Labor—worker (travel to/from work location to collection site), hours	1.25	PERT	1.00	1.25	1.50
Total labor per drug and alcohol test (FFD staff, Collector, Worker), hours	2.65	PERT	2.08	2.62	3.33
Specimen testing cost (HHS-certified laboratory drug and validity)	\$22.50	PERT	\$15.00	\$22.50	\$30.00
Total FFD cost per drug and alcohol test	\$330.19	PERT	\$208.04	\$325.54	\$470.96
Workforce at decommissioning site subject to FFD program	347	PERT	264	344	441
Percentage of workforce at decommissioning site (VA UA, FFD program personnel, site security, CFHs)	40%	PERT	30%	40%	50%

Parameter	Mean Value	Distribution Type	Low	Most Likely (Base)	High
Percentage of workforce at decommissioning site (PA-only UA)	60%	PERT	50%	60%	70%
Time (in years) for nuclear power plant site to submit exemption/amendment requests with respect to shutdown date	0	DISCRETE UNIFORM	-1	0	1
Time (in years) for NRC to finalize exemptions/ amendments with respect to shutdown date	1.5	DISCRETE UNIFORM	1	2	