# FINANCIAL ASSURANCE REQUIREMENTS FOR DISPOSITION OF CATEGORY 1–3 BYPRODUCT MATERIAL RADIOACTIVE SEALED SOURCES

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# Abbreviations and Acronyms

Am-241	americium-241
Am/Be	americium/beryllium
BLS	U.S. Bureau of Labor Statistics
Bq	becquerel
CFR	Code of Federal Regulations
Ci	curie
Co-60	cobalt-60
CPI	Consumer Price Index
CRCPD	Conference of Radiation Control Program Directors, Inc.
Cs-137	cesium-137
DFA	decommissioning financial assurance
DFP	decommissioning funding plan
DOE	U.S. Department of Energy
ECB	engineered concrete barrier
FR	Federal Register
FTE	full-time equivalent
FY	fiscal year
GAO	Government Accountability Office
GTCC	greater than Class C
H&S	Health and Safety
IAEA	International Atomic Energy Agency
ISMP	Integrated Source Management Portfolio
LLW	low-level waste
mCi	millicurie

- NIOSH National Institute for Occupational Safety and Health
- NNSA National Nuclear Security Administration
- NSTS National Source Tracking System
- NPV net present value
- NRC U.S. Nuclear Regulatory Commission
- OAS Organization of Agreement States
- ORS Office of Radiological Security
- OSRP Off-Site Source Recovery Program
- PERT program evaluation and review technique
- RSS radioactive sealed source
- SCATR Source Collection and Threat Reduction
- SECY Office of the Secretary of the Commission
- SRM staff requirements memorandum
- U.S.C. United States Code
- WBL Web-Based Licensing
- WCS Waste Control Specialists

# **Definition of Terms (as Used in This Document)**

#### Applicant

Any person, including a current licensee, who submits an application for a license or license amendment to the U.S. Nuclear Regulatory Commission (NRC) or an Agreement State for the use of byproduct material.

#### Decommission

To remove a facility or site safely from service and reduce residual radioactivity to a level that permits (1) release of the property for unrestricted use and termination of the license or (2) release of the property under restricted conditions and termination of the license (see Title 10 of the *Code of Federal Regulations* (10 CFR) 30.4, "Definitions").

#### Decommissioning Funding Plan

A document that contains a site-specific cost estimate for decommissioning, describes the method for providing assurance of funds for decommissioning, describes the means for adjusting both the cost estimate and funding level over the life of the facility, and contains the certification of financial assurance and the signed originals of the financial instruments provided as financial assurance (see 10 CFR 30.35(e)).

### Disposition (of a radioactive sealed source)

Transfer of a radioactive sealed source to an authorized recipient for reuse, recycling, storage, or disposal.

#### Disused Radioactive Sealed Source

A source that is no longer being used and is not intended to be used in the application(s) for which it is authorized.

#### Financial Assurance

A guarantee or other financial arrangement provided by a licensee to ensure that funds are available for decommissioning when needed.

#### Person

(1) Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the NRC or the U.S. Department of Energy, except that the Department shall be considered a person within the meaning of the regulations in 10 CFR part 30 to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the NRC pursuant to section 202 of the Energy Reorganization Act of 1974 (88 Stat. 1244), any State or any political subdivision of or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing (see 10 CFR 30.4).

# **Executive Summary**

The U.S. Nuclear Regulatory Commission (NRC) is considering revising the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) 30.35, "Financial Assurance and Recordkeeping for Decommissioning." The rulemaking would establish new decommissioning financial assurance (DFA) requirements for the disposition of Category 1–3 byproduct material radioactive sealed sources (RSSs).<sup>1</sup>

The NRC's regulations in 10 CFR 30.35 require a fixed dollar amount of financial assurance or a decommissioning funding plan (DFP) for licensees possessing byproduct material with a half-life greater than 120 days and at activity levels above certain thresholds. However, the thresholds for sealed byproduct material are such that many licensees possessing Category 1–3 byproduct material RSSs are not required to provide financial assurance for decommissioning.

The Commission approved initiation of this rulemaking in Staff Requirements Memorandum (SRM) SECY-16-0115, "Staff Requirements - SECY-16-0115—Rulemaking Plan on Financial Assurance for Disposition of Category 1 and 2 Byproduct Material Radioactive Sealed Sources," dated December 8, 2021.<sup>2</sup> The next step in the NRC's rulemaking process is the development of a regulatory basis that serves as a precursor to the proposed rule. This regulatory basis document summarizes the current regulatory framework, describes the regulatory issues, and evaluates alternatives for establishing financial assurance requirements. This regulatory basis also includes a cost benefit analysis that considers impacts to the NRC, Agreement States, and industry (i.e., licensees) for each alternative.

Licensees subject to 10 CFR Parts 50, 52, 72, 76 and 10 CFR Part 70, Subpart H, would be exempt from this rulemaking for the facilities and activities covered under those licenses. These licensees are already required to prepare a decommissioning plan and demonstrate sufficient financial assurance for decommissioning these facilities, including the disposition of any Category 1-3 byproduct material RSSs.

The NRC staff considered several regulatory alternatives and is recommending that the agency conduct a rulemaking as described in Alternative 6b of this regulatory basis. Under Alternative 6b, the NRC would establish fixed DFA amounts for the disposition of many common Category 1–3 byproduct material source and device types, while in more complex situations, licensees would be required to prepare a DFP. The rulemaking would align with the existing criteria in 10 CFR 30.35, which only require DFA for radionuclides with a half-life greater than 120 days. The staff's recommended alternative would only apply to licensees possessing Category 1–3 byproduct material sources or devices that are subject to the requirements in 10 CFR Part 37, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material."<sup>3</sup> This includes

<sup>&</sup>lt;sup>1</sup> Category 1 and category 2 quantities of radioactive material, consistent with the IAEA Code of Conduct on the Safety and Security of Radioactive Sources, are defined in Appendix A, "Category 1 and Category 2 Radioactive Materials," to 10 CFR Part 37 "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material." Category 3 sources are defined in the IAEA Code of Conduct on the Safety and Security of Radioactive Sources.

<sup>&</sup>lt;sup>2</sup> Agencywide Documents Access and Management System (ADAMS) Accession No. ML21342A032.

<sup>&</sup>lt;sup>3</sup> The regulations in 10 CFR Part 37 apply to any licensee that possesses an aggregated Category 1 or 2 quantity of radioactive material listed in Appendix A, "Category 1 and Category 2 Radioactive Materials," to 10 CFR Part 37. Specific requirements for access to material, use of material, transfer of material, and transport of material are included.

licensees that possess Category 1 and 2 byproduct material sealed sources, and Category 3 sources that could, in aggregate, exceed a Category 2 quantity of radioactive material.

The staff's recommended alternative would result in an updated, risk-informed approach that best addresses the direction provided by the Commission in SRM-SECY-16-0115 and the regulatory concerns identified by the NRC staff. The NRC staff determined Alternative 6b was the most risk-informed choice because it has significantly lower costs than all but one other alternative (Alternative 6c), while focusing DFA requirements on the sources with the greatest potential radiological risk, including some Category 3 sources. The NRC staff collected and analyzed extensive data on Category 1–3 device characteristics, disposition pathways, and costs to develop this approach, which would require predictable, easy-to-determine DFA amounts for many affected licensees. In selecting this alternative, the NRC staff is considering the associated regulatory burden and implementation costs, and addressing Commission direction to mitigate potential adverse impacts on existing and future licensees. The staff will seek and consider comments from stakeholders and the public on all the alternatives presented in this regulatory basis.

At this stage, the staff holds that the qualitative benefits from conducting the rulemaking described in Alternative 6b would justify the potential cost impacts to licensees, Agreement States, and the NRC. Alternative 6b would result in projected costs totaling \$44.0 million over the 15-year analysis period using a 7 percent discount factor. Table ES-1 provides the different alternatives with their respective costs. The staff will prepare a regulatory analysis of the qualitative and quantitative costs and benefits that considers public comments received on this regulatory basis for the proposed rule, consistent with NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission, Draft Report for Comment."

	Net Benefits (Costs) in 2023 Dollars		
DESCRIPTION	Undiscounted	7% NPV	3% NPV
Alternative 1—Status	Quo (No Action T	aken)	
	\$0	\$0	\$0
Alternative 2—Financial Assurance Base	d on Device Type	and Disposition	Pathway
Alternative 2 Total Net Benefits (Cost)	(\$138,556,100)	(\$81,059,500)	(\$108,443,800)
Alternative 3—Fixed Financial As	surance Based or	n Source Catego	ry
Alternative 3 Total Net Benefits (Cost)	(\$165,555,700)	(\$99,000,800)	(\$131,009,800)
Alternative 4—Financial Assurance	Determined by a	Parametric Form	nula
Alternative 4 Total Net Benefits (Cost)	(\$140,994,600)	(\$86,185,800)	(\$112,766,700)
Alternative 5—Financial Assurance Based on a Decommissioning Funding Plan			
Alternative 5 Total Net Benefits (Cost)	(\$492,971,800)	(\$258,933,600)	(\$367,074,600)

# Table ES-1 Summary Table of Alternatives and Benefits (Costs)

	Net Benefits (Costs) in 2023 Dollars		
DESCRIPTION	Undiscounted	7% NPV	3% NPV
Alternative 6a—Hybrid Approa	ch for All Categor	y 1-3 Licensees	
(Combines Alter	natives 2, 3, and 5	5)	
Alternative 6a Total Net Benefits (Cost)	(\$99,569,300)	(\$63,456,800)	(\$81,275,800)
Alternative 6b—Hybrid Approach Limited to C	ategory 1-3 Licens	sees Subject to 1	0 CFR Part 37
(Combines Alternatives	2, 3, and 5) (NRC \$	Selected)	
Alternative 6b Total Net Benefits (Cost)	(\$68,944,400)	(\$44,034,200)	(\$56,278,600)
			$\langle \rangle$
Alternative 6c—Hybrid Approach Limited to Category 1 and 2 Licensees			
(Combines Alternatives 2, 3, and 5)			
Alternative 6c Total Net Benefits (Cost)	(\$65,467,100)	(\$42,109,400)	(\$53,623,300)

Note: Values are rounded to the nearest hundred. Values in parentheses, e.g., "()", denote a cost of negative value. DOE = U.S. Department of Energy; NPV = net present value.

)

# 1. Introduction

The U.S. Nuclear Regulatory Commission (NRC) established regulations in Title 10 of the *Code* of *Federal Regulations* (10 CFR) Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," that set forth the technical and financial criteria for decommissioning licensed nuclear materials facilities that use sealed and unsealed byproduct radioactive materials. The requirements in 10 CFR 30.35, "Financial Assurance and Recordkeeping for Decommissioning," require a fixed dollar amount of financial assurance or a decommissioning funding plan (DFP) for licensees possessing byproduct material with a half-life greater than 120 days and at activity levels above certain thresholds. The thresholds that require financial assurance for sealed byproduct material are seven orders of magnitude higher than for unsealed material. As a result, many licensees that possess byproduct material radioactive sealed sources (RSSs), including many Category 1–3 RSSs, are not required to provide financial assurance for decommissioning.<sup>4</sup> If financial assurance is required, it is intended to support site decommissioning, not necessarily the disposition of an individual RSS that has become disused or unwanted.

In SECY-16-0115, "Rulemaking Plan on Financial Assurance for Disposition of Category 1 and 2 Byproduct Material Radioactive Sealed Sources," dated October 7, 2016,<sup>5</sup> the staff sought Commission approval to initiate a rulemaking to require financial assurance for the disposition of Category 1 and 2 byproduct material RSSs. The Commission approved initiation of such a rulemaking in Staff Requirements Memorandum (SRM) SECY-16-0115, dated December 8, 2021.<sup>6</sup>

Consistent with the Commission's direction and the NRC's rulemaking process, the staff has prepared this regulatory basis, which does the following:

- Provides background information on policies, laws, and regulations related to the issue.
- Explains how a change in the regulations could resolve the issue.
- Identifies different approaches that could address the regulatory issue and evaluates the cost and benefits of the rulemaking and the alternatives.
- Provides the scientific, policy, legal, and technical information used to support the evaluation.
- Explains limitations on the scope and quality of the regulatory basis, such as known uncertainties in the data or methods of analysis.
- Discusses stakeholder interactions and views, to the extent known.

<sup>&</sup>lt;sup>4</sup> For example, two of the most common radionuclides tracked in the National Source Tracking System (NSTS) are cobalt (Co)-60 and cesium (Cs)-137. For Co-60 in sealed form, the threshold quantity for Category 2 radioactive material is 8.1 Ci (0.3 TBq), while the 10 CFR 30.35 threshold for financial assurance is 10,000 Ci (370 TBq). For Cs-137 in sealed form, the threshold quantity for Category 2 radioactive material is 27 Ci (1.0 TBq), while the 10 CFR 30.35 threshold for financial assurance is 100,000 Ci (3,700 TBq).

<sup>&</sup>lt;sup>5</sup> ML16200A223.

<sup>&</sup>lt;sup>6</sup> ML21342A032.

The purpose of this rulemaking is to improve the regulatory framework by amending 10 CFR 30.35 to require affected licensees to provide decommissioning financial assurance (DFA) for the disposition of Category 1–3 byproduct material RSSs with half-lives greater than 120 days. Requiring financial assurance for the disposition of these Category 1-3 byproduct material RSSs would do the following:

- Help ensure affected licensees are prepared for RSS disposition and facilitate timely disposition of disused RSSs.
- Ensure adequate financial resources are available to support RSS disposition in the event of unforeseen circumstances, such as licensee bankruptcy.
- Help ensure dispositioning costs for Category 1–3 RSSs are borne by those who receive the associated economic benefits.
- Address recommendations on this issue provided by the Government Accountability Office (GAO), the interagency Radiation Source Protection and Security Task Force, and other groups.

In addition, this rulemaking would provide an updated, risk-informed approach that addresses the regulatory concerns identified by the NRC staff while providing appropriate flexibility to affected licensees in meeting the new requirements.

The scope of this rulemaking includes solely byproduct material and the associated financial assurance requirements in 10 CFR 30.35. While more than 99 percent of Category 1 and 2 RSSs tracked in the NRC's NSTS are byproduct material, a small percentage are special nuclear material or source material.<sup>7</sup> Financial assurance requirements for special nuclear material are provided in 10 CFR 70.25, "Financial assurance and recordkeeping for decommissioning." Financial assurance requirements for source material are provided in 10 CFR 40.36, "Financial assurance and recordkeeping for decommissioning."

# 2. Background and Existing Regulatory Framework

This section briefly discusses the background and existing regulatory framework relative to the DFA requirements for byproduct material RSSs. Specifically, this section discusses the statutes, regulations, Commission policies, and recent staff activities that are relevant to development of this regulatory basis. An extensive discussion regarding the history of the NRC's DFA regulations in 10 CFR 30.35 is provided in the regulatory basis for another recent rulemaking effort, "Decommissioning Financial Assurance Requirements for Sealed and Unsealed Radioactive Materials," issued April 2022 (82 FR 25157).<sup>8</sup> That discussion is not repeated here. Additional information regarding that rulemaking effort can be found in SECY-23-0062,

<sup>&</sup>lt;sup>7</sup> Plutonium-238 and plutonium-239 sealed sources, which are subject to 10 CFR Part 37 requirements, are tracked in the NSTS and are special nuclear material. NSTS tracks four extra radionuclides (actinium-227, polonium-210, thorium-228, and thorium-229) which are not subject to 10 CFR Part 37 requirements. Thorium-228 and thorium-229 sealed sources are source material.

<sup>&</sup>lt;sup>8</sup> ML21235A480.

"Proposed Rule: Decommissioning Financial Assurance for Sealed and Unsealed Radioactive Materials," dated July 24, 2023.<sup>9</sup>

# 2.1 General Background

The NRC or an Agreement State regulates uses of nuclear materials, including Category 1–3 RSSs, through licensing, inspection and enforcement of regulations including requirements for DFA. In 10 CFR 30.4, "Definitions," the NRC defines decommissioning as the process whereby a facility or site is safely removed from service and residual radioactivity is reduced to a level that permits (1) release of the property for unrestricted use and termination of the license or (2) release of the property under restricted conditions and termination of the license. Decommissioning activities are initiated when any one of the following events occurs:

- The license expires.
- The licensee decides to permanently cease operations at the entire site or in any separate building or outdoor area that contains residual radioactivity, such that the building or outdoor area is unsuitable for release in accordance with NRC requirements.
- No principal activities have been conducted at the site for a period of 24 months.
- No principal activities have been conducted for a period of 24 months in any separate building or outdoor area that contains residual radioactivity, such that the building or outdoor area is unsuitable for release in accordance with NRC requirements.

DFA is a guarantee or other financial arrangement provided by a licensee to ensure that funds are available for decommissioning when needed. The NRC provides guidance for meeting DFA requirements in NUREG-1757, Volume 3, Revision 1, "Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness," issued February 2012.<sup>10</sup> The NRC uses DFA requirements to ensure that the decommissioning of licensed nuclear facilities is performed in a safe and timely manner, and to ensure that adequate funds are available to complete decommissioning. The NRC's overall objective with respect to decommissioning is to protect public health and safety and the environment during the decommissioning process and after the property is released.

# 2.2 The Existing Regulatory Framework

# 2.2.1 NRC Regulatory Program

The NRC regulations in 10 CFR 30.35 are intended to ensure adequate financing for the decommissioning of facilities containing byproduct material above prescribed thresholds. The regulations in 10 CFR 30.35 and Appendix B, "Quantities of Licensed Material Requiring Labeling," to 10 CFR Part 30 are used together to determine the amount of DFA required for sealed byproduct material. The requirements in 10 CFR 30.35(b) state that licensees possessing byproduct material with a half-life greater than 120 days and in quantities specified in 10 CFR 30.35(d) shall either submit a DFP according to 10 CFR 30.35(e) or submit a DFA certification in the amount prescribed by 10 CFR 30.35(d). A funding amount of \$113,000 is required for licensees having possession limits greater than 10<sup>10</sup> but less than or equal to 10<sup>12</sup>

<sup>&</sup>lt;sup>9</sup> ML23010A137.

<sup>&</sup>lt;sup>10</sup> ML12048A683.

times the applicable quantities defined in of 10 CFR Part 30, Appendix B, in sealed sources or plated foils. Licensees having possession limits exceeding 10<sup>12</sup> times the applicable quantities defined in 10 CFR Part 30, Appendix B, in sealed sources or plated foils must base their financial assurance on a DFP.

The thresholds in 10 CFR 30.35 that require financial assurance for sealed radioactive material are seven orders of magnitude higher than for unsealed material. As a result, many licensees that possess byproduct material RSSs, including many Category 1–3 RSSs, are not required to provide financial assurance for decommissioning. For licensees possessing multiple RSSs subject to the requirements in 10 CFR 30.35, the "sum of fractions" rule applies when determining whether financial assurance is required.<sup>11</sup> Licensees that possess both sealed and unsealed material must consider the thresholds for each type of material when determining financial assurance requirements.

The history and basis for the 120-day half-life criterion is discussed in the NRC's April 2022 "Decommissioning Financial Assurance Requirements for Sealed and Unsealed Radioactive Materials: Regulatory Basis," referenced above. This criterion is consistent with the agency's regulation of low-level waste (LLW) disposal through onsite decay-in-storage. The NRC previously had two decay-in-storage license conditions: one was for medical licensees and the other for nonmedical licensees. Both license conditions authorized decay-in-storage for waste containing radioactive material with half-lives less than or equal to 120 days, provided additional conditions were met.<sup>12</sup> As noted in the April 2022 regulatory basis, the NRC's licensing experience and other technical studies indicate that (1) radioactive materials with very short half-lives less than or equal to 120 days will significantly decay in a few years.

Regulatory requirements for a DFP can be found in 10 CFR 30.35(e), and guidance for DFPs is provided in NUREG-1757, Volume 3. A DFP outlines the work required to decommission a facility, provides a site-specific cost estimate for the decommissioning, and states that the funds necessary to complete the decommissioning have been obtained. The DFP should be based on the costs required for an independent contractor to meet the criteria for unrestricted or restricted use and should include (1) key assumptions used to develop the cost estimate, (2) the method for providing assurance of funds for decommissioning, (3) the volume of material containing residual radioactivity that will require remediation, and (4) the certification of financial assurance and the signed originals of the financial instruments provided as financial assurance.

Decommissioning costs are estimated using generally accepted costs for labor, materials, waste management and disposal, and other necessary steps. Additionally, materials licensees are required to include a contingency factor due to the uncertainty often associated with contamination levels, waste disposal costs, and other associated decommissioning costs. Licensees that use DFPs must specify the means (i.e., the method and frequency) by which they will periodically adjust their cost estimates and associated funding levels over the life of

<sup>&</sup>lt;sup>11</sup> For example, a fixed financial assurance amount of \$113,000 applies to 10 CFR Part 30 licensees authorized to possess or use a <u>combination</u> of sealed sources with a half-life greater than 120 days if R divided by 10<sup>10</sup> is greater than 1 (where R is defined as the sum of the ratios of the quantity of each isotope to the applicable value in Appendix B to 10 CFR Part 30).

<sup>&</sup>lt;sup>12</sup> See Appendix E, "Standard License Conditions," to NUREG-1556, Volume 20, "Consolidated Guidance About Materials Licenses: Guidance About Administrative Licensing Procedures, Final Report," issued December 2000 (ML010250252). Additional information on the NRC's decay-in-storage rulemakings appears in the discussions of 10 CFR 35.92, "Decay-in-storage," in 51 FR 36951 and 67 FR 20299.

their facilities. In general, cost estimates should be updated with the current prices of goods and services at least every 3 years or when the amounts or types of material at the facility change.

The review and approval of DFPs prepared under 10 CFR 30.35(e) is resource intensive for both the licensee and the regulatory agency. The DFP requirements in 10 CFR 30.35(e) were intended for major facilities possessing large quantities of radioactive material with half-lives greater than the 120-day criterion because they require a significant decommissioning effort. However, other licensees possessing smaller quantities of radioactive material that are subject to the fixed DFA amounts prescribed in 10 CFR 30.35(d) may elect to prepare a DFP if they can demonstrate through a DFP that a lower amount of financial assurance is sufficient.

# 2.2.2 Agreement State Regulatory Program

Section 274 of the Atomic Energy Act of 1954, as amended, authorizes the NRC to enter into agreements with individual States, known as Agreement States. The NRC discontinues its authority and the Agreement State assumes authority for administering a regulatory program for the safe use of radioactive materials within their borders. For the duration of such agreements, the Agreement States have the authority to regulate the materials covered by the agreement for the protection of public health and safety and the environment from radiation hazards. The Agreement States are required to adopt regulations in accordance with the compatibility category designation assigned to each NRC regulation, as discussed in NRC Management Directive 5.9, "Adequacy and Compatibility of Program Elements for Agreement State Programs," dated April 26, 2018.<sup>13</sup> The provisions of 10 CFR 30.35 relating to decommissioning funding, including 10 CFR 30.35(a), (b), (e), and (g), are classified as Category Health & Safety (H&S). Category H&S is not required for purposes of compatibility. However, the State must adopt program elements in this category that embody the basic health and safety aspects of the NRC's program elements.

## 2.3 The NRC's Integrated Source Management Portfolio

The Integrated Source Management Portfolio (ISMP) is a suite of information technology tools used by the NRC and Agreement State programs to conduct materials licensing, oversight, and radioactive source accountability. The key systems that comprise the ISMP include the NSTS, the Web-Based Licensing (WBL) System, and the License Verification System. The NSTS is a secure online national registry used to track Category 1 and Category 2 radioactive sources. The NSTS does not include Category 3 radioactive sources.<sup>14</sup> Currently, Category 3 quantities of radioactive materials are not defined in NRC regulations. However, radionuclides and threshold activities for Category 3 sources are defined in the International Atomic Energy Agency (IAEA) Code of Conduct on the Safety and Security of Radioactive Sources (hereafter "Code of Conduct").<sup>15</sup>

The WBL is a materials licensing system and provides a single platform for the NRC and participating Agreement States<sup>16</sup> to manage the licensing information of entities that are authorized to possess or use radioactive materials. The License Verification System enables

<sup>&</sup>lt;sup>13</sup> ML18081A070.

<sup>&</sup>lt;sup>14</sup> In SRM-SECY-17-0083, "Staff Requirements—SECY-17-0083—Re-Evaluation of Category 3 Source Security and Accountability in Response to SRM-COMJMB-16-0001," dated December 21, 2021 (ML21355A290), the Commission approved the staff's recommendation not to amend the regulations to require inclusion of Category 3 sources in the NSTS.

<sup>&</sup>lt;sup>15</sup> See <u>http://www-pub.iaea.org/MTCD/publications/PDF/Code-2004\_web.pdf</u>.

<sup>&</sup>lt;sup>16</sup> Agreement States can elect to use WBL or their own system to manage their licensing information.

licensees that have been credentialed for system access to verify certain information about licensees authorized to possess, use, or transport radioactive materials.

The staff used the NSTS to identify how many Category 1 and Category 2 sources licensees possess. As of May 2024, the NSTS lists approximately 84,000 such sources. Of these sources, approximately 91.5 percent are Co-60 sources, 4 percent are iridium-192 sources, 3.5 percent are Cs-137 sources, and the remaining approximately 1 percent are a variety of radionuclides, including americium (Am)-241 and americium/beryllium (AmBe) sources. The devices that contain these sources are used for medical, industrial, academic, and research and development purposes. Some devices, like a gamma camera, may contain a single source, while others, like a blood irradiator, may contain multiple sources (often two or three sources each). Gamma stereotactic irradiators, used to treat cancer, may contain as many as 200 Co-60 sources, with a total source activity exceeding 6,000 curies (222 terabecquerels). Panoramic irradiators used for the sterilization of medical, pharmaceutical, and food products also contain numerous Co-60 sources, and several irradiators are licensed to contain as much as 5 million curies (185 petabecquerels) of source activity.

## 2.4 NRC Evaluations of Financial Assurance Requirements and Commission Direction

# 2.4.1 SECY-16-0046 (Scoping Study)

The NRC staff conducted a scoping study to determine whether additional financial planning requirements for end-of-life management for some radioactive byproduct material, particularly RSSs, were needed. The scoping study is documented in SECY-16-0046, "Results of the Byproduct Material Financial Scoping Study," dated April 7, 2016.<sup>17</sup> The NRC staff recommended in the scoping study that the NRC expand the financial assurance requirements in 10 CFR 30.35 to include all Category 1 and 2 byproduct material RSSs tracked in the NSTS.<sup>18</sup>

In SECY-16-0046, the NRC staff cited a number of studies noting the potential for increased safety and security risks when disused sources are not promptly dispositioned. For example, a 2006 report from the Radiation Source Protection and Security Task Force (Task Force)<sup>19</sup> noted that some NRC licensees "may not have sufficient funds set aside to cover the costs of disposal or other appropriate disposition, potentially resulting in prolonged storage and possible misuse or abandonment." The report also noted that high disposal costs may prompt licensees to delay disposal, either by choice or economic necessity. The 2010 Task Force report<sup>20</sup> reiterated that "while secure storage is a temporary measure, the longer sources remain disused or unwanted the chances increase that they will become unsecured or abandoned." The 2014 Task Force report<sup>21</sup> recommended "that the NRC evaluate the need for sealed source licensees to address the eventual disposition/disposal costs of Category 1 and 2 quantities of radioactive sources through source disposition/disposal financial planning or other mechanisms." SECY-16-0046

<sup>19</sup> ML062190349.

<sup>&</sup>lt;sup>17</sup> ML16067A367.

<sup>&</sup>lt;sup>18</sup> Nationally Tracked Source Thresholds are listed in Appendix E, "Nationally Tracked Source Thresholds," to 10 CFR Part 20, "Standards for Protection Against Radiation." Tracking of these sources is required by 10 CFR 20.2207, "Reports of transactions involving nationally tracked sources." The NSTS tracks approximately 84,000 Category 1 and 2 RSSs held by both NRC and Agreement State licensees. More than 99 percent of RSSs tracked in the NSTS are byproduct material.

<sup>&</sup>lt;sup>20</sup> ML102230141.

<sup>&</sup>lt;sup>21</sup> ML14219A642.

also cited recommendations from other groups for the NRC to expand its financial assurance requirements for Category 1–3 RSSs, including the 2010 report of an interagency working group led by the NRC<sup>22</sup> and a 2014 report issued by the LLW Forum Disused Sources Working Group.<sup>23</sup>

In addition to considering stakeholder feedback as part of the scoping study, the staff reviewed current NRC regulations and guidance in the area of financial assurance, relevant internal and external reports, and information obtained through discussions with subject matter experts. The staff noted in SECY-16-0046 that it agreed with the assessments of numerous state and Federal partners, organizations such as the Organization of Agreement States (OAS), the Conference of Radiation Control Program Directors, Inc. (CRCPD), the Task Force, and other commenters that providing financial assurance for the disposition of RSSs supports safety and security goals, helps facilitate timely disposition of disused RSSs, and ensures that licensees appropriately consider the full cost of using these RSSs.

# 2.4.2 SECY-16-0115 and Associated SRM-SECY-16-0115

On October 7, 2016, the NRC staff sought Commission approval to initiate rulemaking in SECY-16-0115.<sup>24</sup> In SECY-16-0115, the staff proposed to require financial assurance for the disposition of Category 1 and 2 byproduct material RSSs, noting that these new requirements would do the following:

- Ensure that licensees possessing these risk-significant RSSs are financially prepared for the costs of end-of-life dispositioning.
- Complement the existing regulatory framework to ensure safe and secure management of Category 1 and 2 byproduct material RSSs by facilitating timely disposition when these RSSs become disused or unwanted.
- Help ensure that dispositioning costs are borne by those who receive the associated economic benefits from the use of these sources.

On December 8, 2021, the Commission approved initiation of rulemaking in SRM-SECY-16-0115.<sup>25</sup> The Commission approved the staff's recommendation to expand the financial assurance requirements in 10 CFR 30.35 to require financial assurance for the disposition of Category 1 and 2 byproduct material RSSs tracked in the NSTS. In addition, the Commission directed the staff to do the following:

- Carefully explore options to mitigate potential adverse impacts on existing and future licensees, particularly medical users, and those who benefit from the use of these radioactive materials.
- Consider and seek public comment on whether financial assurance requirements should also be extended to Category 3 sources.

<sup>&</sup>lt;sup>22</sup> ML100050105.

<sup>&</sup>lt;sup>23</sup> ML14084A394.

<sup>&</sup>lt;sup>24</sup> ML16200A223.

<sup>&</sup>lt;sup>25</sup> ML21342A032.

• Develop and seek public comment on a risk-informed basis for establishing financial assurance for the disposition of RSS, considering factors such as the overall risk and total cost of disposal when determining the appropriate requirements.

# 3. Statement of Regulatory Concerns

This section examines the regulatory concerns that are to be addressed as a part of this rulemaking to expand the DFA requirements in 10 CFR 30.35 to include disposition of Category 1–3 byproduct material RSSs.

#### 3.1 Licensees Unprepared for Costs Associated with Disposition of Some Category 1– 3 Sources

End-of-life costs for dispositioning Category 1–3 RSSs can be significant. These can include costs for interim storage, packaging and conditioning, and transportation, as well as costs associated with the selected disposition option. Depending on the characteristics of the RSS and the associated device, dispositioning may include options such as return to the manufacturer or supplier for reuse or recycling, transfer to another licensee, disposal at a commercial LLW facility, decay in storage, or transfer to the U.S. Department of Energy (DOE) for subsequent management and disposal. If a licensee has not anticipated and planned for the cost of dispositioning, it may represent a significant financial burden.

Several reports prepared by the Federal Government and external stakeholders have noted the potential for licensees to be unprepared for the costs associated with RSS disposition. For example, a 2023 report by the GAO on improving the security of certain disused sources<sup>26</sup> noted that "licensees possessing large cesium-137 sources face a financial challenge in disposing of their sources and typically rely on government subsidies to help with disposal." This GAO report further stated that "it may cost \$200,000 to \$220,000 to dispose of waste from a category 2 quantity of cesium-137, according to a broker. Furthermore, some licensees [the GAO] spoke with said they were unaware of disposal options and their costs when acquiring these sources." A 2014 report by the LLW Forum's Disused Sources Working Group<sup>27</sup> stated that "contributing to the accumulation of disused sources is the fact that some users are unaware of and/or fail to adequately budget for the eventual disposition of sources." Other reports are discussed in SECY-16-0046, as summarized in section 2.4.1.

The 2023 GAO report also described additional challenges of dispositioning RSSs containing Am-241. First, unlike Co-60 and Cs-137, RSSs that contain Am-241 exceed Class C LLW disposal concentrations at Category 3 quantities. Consequently, all Category 1-3 RSSs containing Am-241 are generally unacceptable for commercial disposal. Although the DOE can dispose of transuranic waste in greater concentrations than commercial disposal sites, the DOE is prohibited from accepting Am-241 of foreign origin, which includes many Am-241 sources produced after 2003. Therefore, many RSSs that contain Am-241 currently have no permanent disposal pathway and must be stored indefinitely, either by the user or after return to the manufacturer.

<sup>&</sup>lt;sup>26</sup> GAO-24-105998, "High-Risk Radioactive Material: Opportunities Exist to Improve the Security of Sources No Longer in Use," November 2023, available at <u>https://www.gao.gov/products/gao-24-105998</u>

<sup>&</sup>lt;sup>27</sup> ML14084A394.

The current DFA regulations in 10 CFR 30.35 do not require many licensees that possess Category 1–3 byproduct material RSSs to provide any financial assurance. Other licensees that meet the appropriate thresholds in 10 CFR 30.35 must provide a fixed amount of financial assurance or a DFP, as discussed in section 2.2.1. However, these fixed amounts were last updated in 2003<sup>28</sup> and may not be adequate to provide for site decommissioning and disposition of a licensee's RSSs. Consequently, the current 10 CFR 30.35 requirements may not adequately ensure that licensees conduct the necessary financial planning for the disposition of their Category 1–3 byproduct material RSSs.

# 3.2 Inadequate Financial Assurance to Support Disposition of Category 1–3 Sources due to Bankruptcy or Other Unforeseen Circumstances

The current DFA regulations in 10 CFR 30.35 may be inadequate to provide for proper management and disposition of Category 1–3 byproduct material RSSs in the event of licensee bankruptcy or other unforeseen circumstances. As noted in section 3.1, many licensees that possess these sources are not currently required to provide any financial assurance. Other licensees may provide a fixed amount of financial assurance to support overall site decommissioning. However, these fixed amounts were last updated over 20 years ago and were not intended to address the high disposition costs associated with some Category 1–3 RSSs. If a licensee experiences financial distress and does not have adequate financial assurance in place, Federal or State authorities may be required to intervene and provide the necessary resources for RSS disposition.

### 3.3 Lack of Regulatory Incentives to Provide Timely Disposal of Disused Category 1–3 Sources

Licensees may choose indefinite long-term storage of disused RSSs for a variety of reasons, including the cost of other disposition options, lack of a disposal pathway, or limited availability of an appropriate transportation container. The 2022 Task Force Report<sup>29</sup> noted that "many sealed source users have little incentive to dispose of their disused sources, preferring to store them potentially until facility decommissioning." The 2018 Task Force Report<sup>30</sup> stated that "while implementation of 10 CFR Part 37 (or compatible Agreement State requirements) provides reasonable assurance that sources are secure in storage, permanent disposal represents the most effective means of risk reduction."

The Commission's policy is that LLW disposal is preferred to storage.<sup>31</sup> The current lack of DFA requirements for many licensees that possess Category 1–3 byproduct material RSSs may not adequately support the Commission's policy of favoring disposal over long-term storage of these sources when they become disused. As discussed in section 5.2.3, expanded DFA requirements can help to incentivize prompt disposition of RSSs, although they cannot force licensees to dispose of their RSSs prior to decommissioning.

<sup>&</sup>lt;sup>28</sup> NRC, "Financial Assurance for Materials Licensees," 68 FR 57327 (October 3, 2003).

<sup>&</sup>lt;sup>29</sup> ML22213A157.

<sup>&</sup>lt;sup>30</sup> ML18276A155.

<sup>&</sup>lt;sup>31</sup> "Low-Level Radioactive Waste Management and Volume Reduction" (77 FR 25760 at 25781; May 1, 2012).

# 3.4 Disposition Costs for Some Category 1–3 Sources Borne by the Federal Government/Taxpayers Instead of Licensees

The DOE's National Nuclear Security Administration (NNSA) implements programs to remove excess RSSs that pose a potential threat to public health, safety, and national security. These programs include the Off-Site Source Recovery Program (OSRP) and the Source Collection and Threat Reduction (SCATR) program.<sup>32</sup> The SCATR program is an initiative to reduce the number of unused radioactive sealed sources stored by licensees and provides funding to assist with disposal of sealed sources at commercial LLW disposal facilities. The OSRP focuses on high-activity (typically Category 1 or 2) sources that are not otherwise commercially disposable.<sup>33</sup> While acknowledging the safety and security concerns associated with disused sources, the NNSA noted in comments<sup>34</sup> provided on the NRC staff's scoping study that increased government involvement in efforts to address RSS management and disposal is not sustainable. The NNSA stated that additional financial planning requirements could encourage the use of available commercial disposal options, or defray the cost of packaging and transportation, thereby reducing the funding required for NNSA-sponsored RSS recovery and management programs. The 2022 Task Force Report<sup>35</sup> noted that, since 2001, "OSRP has recovered approximately 6,830 Category 1 and 2 sources across the United States . . . However, as viable commercial disposal options increase, the need for Government involvement to recover disused sources should diminish."

The 2014 Disused Sources Working Group report<sup>36</sup> stated the following:

an unintended consequence of both the [Global Threat Reduction Initiative]/OSRP and SCATR programs is that they may provide a disincentive for licensees to promptly reuse, recycle, or dispose of their disused sources. Licensees have gained the economic benefit of using the sealed sources, but...may not bear the full cost of disposal as these programs may subsidize the packaging, transport, and disposal of sources.

Licensees should consider and plan for the full life-cycle costs associated with use of RSSs, including the cost of disposition when the RSSs become disused. However, the lack of DFA requirements under 10 CFR 30.35 for many licensees that possess Category 1–3 byproduct material RSSs may support the reliance on government-sponsored programs for the disposition of these sources. This is particularly true for certain types of devices that are often recovered by the OSRP, such as some self-shielded irradiators containing Cs-137 or Co-60 sources. Licensees may determine that, given the likelihood that the NNSA will recover these devices at taxpayer expense, there is no need to make financial preparations for their disposition.

In some cases, such as for devices that would be classified as Greater-Than-Class-C (GTCC) waste under 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," the OSRP may represent the only disposition option, aside from indefinite storage. Nonetheless, even for these devices, licensees can provide funding to defray the cost of OSRP recovery efforts. The NNSA maintains a "self-ship" option under which licensees fund the cost of removing and transporting a device to the NNSA or its contractors, for subsequent management

<sup>&</sup>lt;sup>32</sup> The SCATR program is funded by the NNSA and administered by the CRCPD. Additional information on the SCATR program is available at <u>https://crcpd.org/scatr</u>.

<sup>&</sup>lt;sup>33</sup> Additional information on the OSRP is available at <u>https://osrp.lanl.gov</u>.

<sup>&</sup>lt;sup>34</sup> ML15310A044.

<sup>&</sup>lt;sup>35</sup> ML22213A157.

<sup>&</sup>lt;sup>36</sup> ML14084A394.

under the OSRP. However, the lack of DFA requirements under 10 CFR 30.35 for many licensees that possess these devices does not provide an incentive to plan for this alternative.

# 4. Evaluation of Rulemaking Alternatives

In SRM-SECY-16-0115, the Commission directed the staff to initiate a rulemaking to expand the financial assurance requirements in 10 CFR 30.35 to require financial assurance for the disposition of Category 1 and 2 byproduct material RSSs tracked in the NSTS, to consider and seek public comment on whether financial assurance requirements should also be extended to Category 3 sources, and to take other actions as described in section 2.4.2. The staff considered multiple alternatives to address the Commission's direction. This section summarizes the six alternatives that the NRC considered.

# 4.1 Alternative 1—The Status Quo

The status quo considers no changes to the current process for assessing a licensee's DFA requirements. The status quo is the baseline from which the staff evaluated the five other alternatives.

# 4.2 Alternative 2—Financial Assurance Based on Device Type and Disposition Pathway

Under this alternative, the NRC would establish financial assurance requirements based on the type of device(s) and RSSs a licensee possesses and the expected disposition pathway. The NRC would exempt radionuclides with a half-life of 120 days or less from these requirements, because these radionuclides are not currently considered when developing DFA. By making these changes, the NRC and the Agreement States would require licensees to use information about the device(s) and RSSs they possess to determine the amount of DFA required.

For most licensees, Alternative 2 would require DFA for each Category 1–3 byproduct material device the licensee possesses, depending on device type and characteristics. For example, a licensee that possesses both a stereotactic irradiator and a self-shielded irradiator would be required to provide a different amount of DFA for each device. For other licensees expected to have a relatively large RSS inventory, such as manufacturers, distributors, or waste collectors, this alternative would require that financial assurance be provided through a site-specific DFP.<sup>37</sup> In addition, all licensees would have the option of providing a site-specific DFP to support a DFA amount different from the amount determined by using the "decision steps" described below.

Alternative 2 would be implemented with decision steps that a licensee would use to determine the required amount of DFA. The decision steps lead to different requirements depending on the licensee type, device type, planned disposition (e.g., disposal site), source activity, and device characteristics. Depending on those factors, the rule would either require a fixed amount of DFA, direct the licensee to evaluate a short equation to determine the DFA amount, or direct the licensee to prepare a site-specific DFP. Appendix C to this regulatory basis further describes the decision steps and required calculations.

In developing this alternative, the NRC staff sought to incorporate all the available information that was collected and analyzed regarding device characteristics, disposition pathways, and

<sup>&</sup>lt;sup>37</sup> The requirements for preparing DFPs currently in 10 CFR 30.35 and the associated guidance in NUREG-1757, Volume 3, would be supplemented to include the attributes discussed in the description of Alternative 5.

disposal costs. The intent was to develop fixed DFA amounts or simple calculations to determine a DFA amount that most licensees could use instead of preparing a DFP. The advantage of this alternative is that it tailors DFA requirements to the main cost contributors while causing less burden on licensees and regulatory staff than requiring a DFP from each licensee.

This alternative is risk-informed for two reasons. First, it uses the 10 CFR Part 37 and the IAEA Code of Conduct sealed source risk categorization system to define some of the DFA categories and, in general, requires more DFA for devices with higher risk sources. Second, the alternative is risk-informed because it balances financial risks with the regulatory burden of licensees developing and regulators reviewing site-specific DFPs. It minimizes the financial risk to the regulators of requiring insufficient financial assurance and the financial risk to licensees of providing excessive financial assurance by using all of the available information to tailor DFA amounts as closely as possible to the anticipated device dispositioning costs without requiring a DFP. Section 5.2.1 contains additional discussion of these risks.

However, this alternative would result in a more complex regulation and additional implementation effort by licensee and regulatory staff compared to the NRC's recommended option. For this reason, the NRC is recommending this alternative as part of a hybrid approach (see Alternative 6b).

Table 1 lists the advantages and disadvantages considered by the NRC for this alternative.

### Table 1: Advantages and Disadvantages of Alternative 2

	Advantages
•	Leverages extensive information collected and analyzed by the NRC staff to assign realistic DFA requirements across a broad range of devices.
•	Links DFA requirements to radiological risk, as represented by the 10 CFR Part 37 and IAEA Code of Conduct risk-based categories.
•	Simple implementation for many licensees possessing sources or devices that are assigned a fixed DFA amount.
•	Provides a DFA estimate tailored to the final disposition scenario for some devices (i.e., disposal through the DOE/NNSA or a commercial LLW disposal facility).
•	Reduces risks associated with under- or over-payment of DFA by tailoring required DFA amounts to estimated disposition costs.
•	More accurately estimates DFA requirements compared to Alternative 3, which assigns a fixed DFA amount based on source category alone.
•	Imposes less burden on licensees and regulatory staff than Alternative 5, which requires a DFP from each licensee.
	Disadvantages
•	Has greater complexity than other alternatives and would result in greater regulatory costs for NRC, Agreement States, and licensees compared to the staff's recommended alternative (Alternative 6b).
•	Would require additional education and training efforts during initial implementation.
•	Includes fixed amounts and equations used to calculate DFA that would become outdated over time and require periodic updates.

• Bases fixed DFA amounts on averages for groups of devices that may not accurately represent the dispositioning cost for all individual cases.

# 4.3 Alternative 3—Fixed Financial Assurance Based on Source Category

For this alternative, the NRC would base DFA requirements on the source category (i.e., Category 1, 2, or 3). Category 1 and Category 2 quantities of radioactive material are those meeting the thresholds defined in both the IAEA Code of Conduct and in Appendix A to 10 CFR Part 37. Category 3 sources, defined in the Code of Conduct, are considered less

dangerous than Category 1 and 2 sources. Radionuclides with a half-life of 120 days or less would be exempt from these requirements.

The NRC would implement three levels of DFA requirements, as shown in table 2: one for Category 1 RSSs or devices,<sup>38</sup> a lower level for Category 2 RSSs or devices, and the lowest level for Category 3 RSSs or devices. The DFA requirements in table 2 are based on estimates for a representative sample of devices in each category. The estimates were based on information from LLW brokers, disposal sites, device manufacturers, and the NNSA's OSRP and SCATR programs. In general, the estimates are based on a mixture of dispositioning pathways. For some device types that could have multiple possible dispositioning pathways (e.g., either commercial disposal or dispositioning by the NNSA for eligible devices), the NRC staff averaged estimated costs for viable pathways. For other devices with one dominant pathway (e.g., return-to-manufacturer agreements for stereotactic radiosurgery devices), the NRC staff used the cost of the dominant dispositioning pathway.

The advantage of this alternative is that it creates a simple, risk-informed regulation that would require predictable, easy-to-determine DFA amounts. This alternative is risk-informed because the required amounts of DFA are determined by the quantity of radioactive material in the device that meets or exceeds threshold categories (i.e., Category 1, 2, or 3), and those categories are based on radiological risk. However, this alternative would result in DFA requirements that do not directly account for several of the main cost drivers associated with source dispositioning (e.g., need for a Type B transportation cask, need for crane rental and other operations to remove a device from a building). Consequently, this alternative will significantly over- or under-estimate DFA requirements for many types of devices and disposition scenarios. In cases where DFA amounts are significantly underestimated, there is increased regulatory risk that the amount will be inadequate to provide for device disposition. If DFA amounts are significantly overestimated, the associated financial burden on licensees is higher than necessary and licensees may instead opt to prepare a DFP<sup>39</sup> (which also adds additional burden on licensees and regulators). For the cost estimates discussed in section 8.2, the NRC staff assumed that 25 percent of licensees would elect to submit a DFP instead of providing the fixed DFA amounts in table 2. The NRC staff is not recommending this approach due to the significant disadvantages discussed above and noted in table 3; however, the NRC staff is recommending certain aspects of this alternative, such as the use of fixed DFA amounts where possible, as part of a hybrid approach (see Alternative 6b).

# Table 2: Financial Assurance Requirements for Alternative 3(per Source or Device), in 2023 Dollars

Source (or Device) Category	DFA Amount
Category 1	\$1,000,000
Category 2	\$300,000
Category 3	\$20,000

Table 3 lists the advantages and disadvantages considered by the NRC for this alternative.

<sup>&</sup>lt;sup>38</sup> The activity may be considered for a single source if the source can safely be removed from the device; however, if sources cannot safely be removed from the device, the source activity in the device should be summed.

<sup>&</sup>lt;sup>39</sup> The requirements for preparing DFPs currently in 10 CFR 30.35 and the associated guidance in NUREG-1757,

### Table 3: Advantages and Disadvantages of Alternative 3

	Advantages
•	Ties DFA requirements directly to radiological risk, as represented by the 10 CFR Part 37 and IAEA Code of Conduct risk-based categories.
•	Simple implementation.
•	For licensees electing to use the fixed DFA amounts in table 2, would result in less regulatory burden for both licensees and regulatory staff.
	Disadvantages
•	Does not link DFA requirements directly to the cost of source dispositioning, so the specified DFA amounts will significantly over- or under-estimate actual costs for many disposition scenarios.
•	Would expect many licensees to opt for a DFP in instances where the DFA amount is overestimated, increasing burden on licensees and regulators.
•	Increased regulatory risk that the DFA amount will be inadequate to provide for device disposition (in cases where the fixed DFA value is an underestimate).
•	Includes fixed DFA amounts that would become outdated over time and require

## 4.4 Alternative 4—Financial Assurance Determined by a Parametric Formula

periodic updates.

The NRC developed an alternative based upon a method employed by the State of Florida that assigns risk factors to several facility attributes to determine costs for license decommissioning in the event of abandonment or insolvency.<sup>40</sup> The NRC methodology is based on parametric factors for the disposition of Category 1–3 RSSs and devices. This alternative involves establishing a new framework for determining DFA amounts for the final disposition of each individual source or device. It would provide licensees with an updated, risk-informed approach for determining DFA requirements for source disposition based on certain characteristics of the sources, devices, and available dispositioning options. This approach would be flexible enough to be modified as needed to address potential changes associated with a licensee's business interests while the license remains in effect. Radionuclides with a half-life of 120 days or less would be exempt as these radionuclides are not currently considered when developing DFA.

The parametric factors consider the activity of the source or device, labor, packaging and transportation requirements, disposal costs, and final disposition pathway for assessing DFA requirements for source/device disposition. Parametric factors are assigned for each of these categories based on 2023 cost estimates obtained from waste brokers and disposal facilities (see appendix D). The parametric factors are then multiplied together. The product of this calculation is the required DFA amount for a given source or device.

<sup>&</sup>lt;sup>40</sup> See "Bond Risk Factors Calculation Worksheet—March 2014," Rule 64E-5.217, Florida Administrative Code, Bureau of Radiation Control, Florida Department of Health, available at <u>https://www.flrules.org/gateway/reference.asp?No=Ref-05470</u>.

If the licensee believes that the resulting DFA amount is excessive or does not accurately reflect their circumstances, it may present evidence (i.e., a DFP that is unique to its license) for an alternative DFA amount.

The advantage of this alternative is that it provides a risk-informed regulation based on a methodology that is relatively simple to use and relies on source activity and disposal options provided by the applicant or licensee. This alternative is risk-informed because the required amounts of DFA are determined, in part, by the quantity of radioactive material in the device that meets or exceeds threshold categories (i.e., Category 1, 2, or 3), and those categories are based on radiological risk. NRC or Agreement State regulators will need to review the parametric factors periodically to account for increases or decreases in costs. Periodically updating the parametric factors and revising (as necessary) will place an additional burden on both the regulators and the licensee.

In developing this alternative, the NRC staff incorporated information regarding device characteristics, disposition methods and pathways, and disposal costs. The intent was to develop a simple formula to estimate DFA amounts that would not require most licensees to prepare a DFP. The advantage of this alternative is that it tailors DFA requirements to major cost contributors while causing less burden on licensees and regulatory staff compared to some other alternatives, such as Alternative 5, which requires a DFP from each licensee. However, this alternative would result in a more complex regulation and additional implementation effort compared to the staff-recommended option (Alternative 6b). In addition, the parameter values were selected based on a limited data set for devices, disposition scenarios, and costs. The population of devices using Category 1–3 byproduct material RSSs is very diverse, and disposition data for many device types are limited or unavailable for a variety of reasons (some devices are typically kept in storage upon becoming disused, commercial disposal is unavailable or cost prohibitive, etc.). Consequently, the NRC staff was unable to validate the parametric model for device types dissimilar from those used to develop the model, and, as a consequence, the formula could significantly over-or under-estimate disposition costs for some types of devices. For these reasons, the NRC staff is not recommending this alternative.

Table 4 lists the advantages and disadvantages considered by the NRC for this alternative.

## Table 4: Advantages and Disadvantages of Alternative 4

# **Advantages** Ties DFA requirements to radiological risk, as represented by the 10 CFR Part 37 and IAEA Code of Conduct risk-based categories. Increases parametric factors for sealed sources with increasing radiological risk. Has parametric factors based on key variables that drive disposal costs. Methodology is relatively simple to use and relies on source activity and disposal options provided by the applicant or licensee. Has parametric factors based on recent (2023) disposal cost estimates (albeit for a limited group of Category 1–3 RSSs and devices). DFA requirements are adjustable over time by adjusting the parametric factors (e.g., parameters can be adjusted to reflect increased disposition costs based on changes in the consumer price index (CPI) or disposal rate schedules). Disadvantages Selection of parameter values was based on a limited data set and the NRC staff was unable to validate the parametric model for device types dissimilar from those used to develop the model. Consequently, the parametric formula could significantly over- or under-estimate disposition costs for some types of devices. Has greater complexity than other alternatives and would result in greater regulatory costs for NRC, Agreement States, and licensees compared to the staff's recommended alternative (Alternative 6b). Requires periodic review and update of parametric factors by the regulator (e.g., labor, transportation, and disposal costs may change frequently), which would result in

- Requires periodic review and update of parametric factors by the regulator (e.g., fabor, transportation, and disposal costs may change frequently), which would result in increased burden on licensees and regulators, as resources would be needed to periodically review each license, update the DFA calculation, and adjust the associated DFA amounts.
- Would require additional education and training efforts during initial implementation.
- Parameter values based on commercial disposal estimates and limited actual device disposal experience.

# 4.5 Alternative 5—Financial Assurance Based on a Decommissioning Funding Plan

The amount of DFA required to ensure adequate funding for source/device disposition may vary between licensees and involve unique circumstances. This alternative would require all licensees possessing Category 1–3 byproduct material RSSs to develop a case-specific DFP to determine the amount of DFA required to support disposition.

A cost estimate for the DFP should include a substantial level of detail to allow the NRC staff to fully evaluate the adequacy of the estimate. The requirements for preparing DFPs currently in 10 CFR 30.35 and the associated guidance in NUREG-1757, Volume 3, would be

supplemented to clarify that DFPs for licensees that possess Category 1–3 byproduct material RSSs must contain the following:

- A detailed cost estimate for the disposition of Category 1--3 byproduct material RSSs or devices, in an amount reflecting the following:
  - The isotope and source/device activity (initial and current) that will be transported and dispositioned.
  - Any agreements with manufacturers or suppliers for the return of the radioactive source or device.
  - The cost for an independent contractor to perform all source disposition activities.
  - The cost of reciprocity fees (if applicable), rigging, packaging, loading, transportation, and source storage/disposition at an appropriate end destination facility that can accept the material under its license.
- Identification of and justification for the key assumptions contained in the source disposition cost estimate:
  - A description of the method of providing assurance of funds for source/device disposition, including means for adjusting cost estimates and associated funding levels periodically over the life of the facility.
  - A certification by the licensee that financial assurance for source/device disposition has been provided in the amount of the cost estimate for source disposition.
  - A signed original of the financial instrument obtained to satisfy the financial assurance requirements (unless a previously submitted and accepted financial instrument continues to cover the cost estimate for source/device disposition).

At the time of license renewal and at intervals not to exceed 3 years, the DFP must be resubmitted with adjustments as necessary to account for changes in costs. Approval of an updated DFP is needed prior to adjusting the amount of financial assurance downward. The DFP must update the information submitted with the original or prior approved plan and must specifically consider the effect of the following events on disposition costs:

- Changes in the disposition pathway(s) for the Category 1–3 RSSs included in the DFP.
- Availability and costs to rent or otherwise procure transportation casks.
- Facility modifications required for source/device removal.
- Changes in authorized possession limits, sources, or devices.
- Cost estimates obtained from LLW brokers, commercial disposal sites, or other entities that differ from previous estimates.

Licensees that already meet the threshold for preparing a DFP under the current 10 CFR 30.35 requirements (see section 2.2.1) and that possess Category 1–3 byproduct material RSSs would need to update their DFPs to address the new requirements.

The advantage of this alternative is that it provides a risk-informed, customized approach for determining the DFA amount needed to ensure adequate funding for RSS/device disposition. Further, it allows for added flexibility to address differences among licensees and changes over time. However, a significant disadvantage is that the preparation, review, and approval of the DFP may be resource intensive for both the licensee and the NRC or Agreement State regulator. This approach would place additional burden on the NRC, particularly regional staff, and the Agreement States that would review and approve each licensee's initial DFP and DFP renewals every 3 years. However, this approach could result in long-term cost savings for some licensees as costs for developing and maintaining a DFP could be less than the default costs determined by certain other alternatives NRC considered, such as the fixed amounts proposed in Alternative 3.

For these reasons, the NRC is recommending this alternative as part of a hybrid approach (see Alternative 6b).

Table 5 lists the advantages and disadvantages considered by the NRC for this alternative.

### Table 5: Advantages and Disadvantages of Alternative 5

	Advantages
•	Provides an accurate assessment of DFA requirements for source/device disposition
	that considers a licensee's unique circumstances.
•	Adaptable to the diverse types of licensees/uses for Category 1–3 byproduct material RSSs.
•	Adjustable over time and can be updated as licensees add or remove sources/devices
	from the license, or to account for changing disposition costs.
•	May provide a cost savings for some licensees (e.g., if a fixed DFA amount specified
	by the NRC represents an overestimate).
	Disadvantages
•	Would result in the highest implementation costs for the NRC, Agreement States, and
	licensees compared to the other alternatives, due to the need for initial
	preparation/review and periodic updates to DFPs for all affected licensees.
• 🔍	Imposes unnecessary burden on licensees and regulators if RSS/device disposition
	costs can be adequately estimated through another method, such as a fixed DFA
	amount.

# 4.6 Alternatives 6a, 6b (NRC Selected) and 6c—Hybrid Approach (Combines Alternatives 2, 3 and 5)

This alternative considers combining Alternatives 2, 3, and 5 into a hybrid approach in which fixed DFA amounts are provided for many common source and device types, while in other instances licensees are required to prepare a DFP. The staff considered three variations of this alternative: "Alternative 6a" applies to all licensees possessing Category 1–3 byproduct material RSSs; "Alternative 6b" only applies to Category 1–3 licensees that are subject to the physical protection requirements in 10 CFR Part 37<sup>41</sup> (includes all Category 1 and 2 licensees and a limited number of Category 3 licensees); and "Alternative 6c" applies to licensees possessing only Category 1 or 2 byproduct material RSSs that are subject to the physical protection requirements in 10 CFR Part 37.

For these three alternatives, licensees possessing the byproduct material RSSs and devices shown in table 6 could determine the required DFA amount by using the fixed values provided in the table. For example, a licensee with a stereotactic radiosurgery device and a Category 2 self-shielded irradiator would be required to provide DFA in the amount of \$1,300,000 based on the values for these devices in table 6 (i.e., \$1,000,000 for the stereotactic irradiator and \$300,000 for the Category 2 self-shielded irradiator). For device or source types not specifically listed in table 6, such as panoramic irradiators, licensees would be required to prepare a DFP.

As shown in table 6, sources or devices containing Am-241 (including Am/Be sources) are excluded from using the fixed DFA amounts for some categories because the limited disposal pathways for RSSs containing Am-241 (as discussed in section 3.1) make the disposal costs too variable to establish a fixed DFA amount. However, some categories where Am-241 sources are more common have established disposition pathways through which licensees typically can return Am-241 sources or devices to the manufacturer. For those device categories (i.e., where the column in table 6 titled "Includes Am-241" shows "yes"), Am-241 and Am/Be sources can use the fixed DFA amounts in table 6.

In addition to licensees that possess sources or devices not found in table 6, certain categories of licensees expected to have a relatively large RSS inventory would be required to prepare a DFP, such as manufacturers, distributors, and waste collectors of Category 1–3 byproduct material RSSs. For these licensee types, the costs associated with source disposition are expected to be high and to vary considerably depending on each licensee's circumstances. All licensees would have the option to prepare a DFP instead of using table 6 to determine the DFA amount, at their discretion.

<sup>&</sup>lt;sup>41</sup> 10 CFR Part 37 applies to any licensee that possesses an aggregated Category 1 or Category 2 quantity of radioactive material listed in 10 CFR Part 37, Appendix A. It includes specific requirements for access to material, use of material, transfer of material, and transport of material.

# Table 6: Financial Assurance Requirements for Alternatives6a, 6b, and 6c (per Source or Device), in 2023 Dollars

Source or Device Category*	Includes Am-241	Category 1–3 Byproduct Material Source or Device Type	DFA Amount
1, 2	No	Stereotactic radiosurgery device	\$1,000,000
1	No	Self-shielded irradiator	\$500,000
2	No	Self-shielded irradiator	\$300,000
2	No	Calibrator	\$200,000
2	No	Fixed-gauge or portable gamma camera requiring rental of a Type B shipping container	\$140,000
2	No	Cs-137 or Co-60 source not in a device, requiring rental of a Type B shipping container	\$140,000
2	No	Fixed gauge not requiring rental Type B shipping container	\$40,000
2	No	Portable gamma camera not requiring rental of Type B shipping container	\$20,000
2, 3	Yes	Well-logging device	\$20,000
3	Yes	Portable gauge	\$10,000
3	No	<ul> <li>Other Category 3 sources or devices <u>except</u>:</li> <li>items requiring rental of a Type B shipping container (DFP required)</li> <li>items requiring building modification, forklift, or crane to remove from site (DFP required)</li> </ul>	\$10,000

\* The activity may be considered for a single source if the source can safely be removed from the device; however, if sources cannot safely be removed from the device, the source activity in the device should be summed.

Similar to Alternative 3, the DFA requirements in table 6 are based on estimates for a representative sample of devices in each category. The estimates were based on information from LLW brokers, disposal sites, device manufacturers, and the NNSA OSRP and SCATR programs. In general, the estimates are based on a mixture of dispositioning pathways. For some device types that could have multiple possible dispositioning pathways (e.g., either commercial disposal or dispositioning by the NNSA for eligible devices), the NRC staff averaged estimated costs for viable pathways. For other devices with one dominant pathway (e.g., return-to-manufacturer agreements for stereotactic radiosurgery devices) the NRC staff used the cost of the dominant dispositioning pathway.

For Alternatives 6a, 6b and 6c, the NRC would supplement the requirements for preparing DFPs currently in 10 CFR 30.35 and the associated guidance in NUREG-1757, Volume 3, to include the attributes discussed in the description of Alternative 5 above. Licensees that already meet the threshold for preparing a DFP under the current 10 CFR 30.35 requirements (see section 2.2.1) and that possess byproduct material RSSs would need to update their DFPs as appropriate to address the new requirements.

Alternatives 6a, 6b, and 6c balance incorporating the NRC staff's efforts to develop tailored DFA amounts through collection and analysis of available data with the need to control regulatory costs for licensees, NRC staff, and Agreement State staff. These alternatives are risk-informed for three reasons. First, they are informed by radiological risk because they use the 10 CFR Part 37 and IAEA Code of Conduct sealed source risk categorization system to define some of the DFA categories and, in general, require more DFA for devices with higher risk sources. Second, they are informed by financial risks because the staff used the best available

information to set DFA amounts that limited risk for the regulators of licensees providing insufficient financial assurance and the risk to licensees of providing excessive DFA. Finally, these alternatives are risk-informed because they limit the implementation costs for the regulators and most licensees by making fixed DFA amounts available without the need for calculations or triennial updates, as required for a DFP. For example, although Alternative 5, in which each licensee develops a DFP, results in more site-specific DFA requirements than Alternatives 6a, 6b, or 6c, the NRC staff determined that the risk of modest over- or under-funding of DFA does not justify the Alternative 5 regulatory burden of requiring each licensee to submit a DFP.

Alternatives 6a, 6b, and 6c would provide a simple, risk-informed regulation that requires predictable, easy-to-determine DFA amounts for most licensees. The only difference between these alternatives is the affected group of licensees. As previously discussed, all of the alternatives apply only to licensees possessing byproduct material RSSs with half-lives greater than 120 days. Within that group, Alternative 6a would apply to all licensees possessing Category 1–3 RSSs, Alternative 6b would only apply to licensees that are subject to the physical protection requirements in 10 CFR Part 37 (i.e., primarily Category 1 and 2 licensees with a limited number of Category 3 licensees), and Alternative 6c would apply only to licensees possessing Category 1 and 2 RSSs that are subject to the physical protection requirements in 10 CFR Part 37.

Alternative 6a would apply to a larger group of licensees than Alternatives 6b or 6c. Excluding licensees that only possess radionuclides with a half-life less than 120 days and those that already prepare DFPs, the NRC staff expects Alternative 6a to apply to approximately 4,600 licensees. Alternative 6b would apply to a smaller group of licensees. In 2016, the NRC reported to Congress that there were approximately 1,400 licensees subject to 10 CFR Part 37 requirements.<sup>42</sup> Alternative 6c would apply to the smallest number of licensees because it does not include any Category 3 sources. Accounting for licensees that only have short-lived radionuclides and those that already prepare DFPs, the NRC staff expects that Alternative 6c would apply to approximately 990 licensees that have Category 1 or 2 byproduct material RSSs.

The reduced number of affected licensees in Alternatives 6b and 6c would result in reduced regulatory burden on industry, NRC, and Agreement State resources compared to Alternative 6a. This can be seen by comparing the costs shown in table ES-1 of the Executive Summary of this regulatory basis. Alternative 6a would result in a projected cost totaling \$63.5 million using a 7 percent discount factor. Alternative 6b would result in a projected cost totaling \$44 million using a 7 percent discount factor. For Alternative 6c, the cost is further reduced to \$42.1 million due to the additional reduction in the number of affected licensees.

The fixed amounts provided in table 6 are based on the NRC staff's analysis of the major cost drivers associated with disposition of many common source and device types. For more complex situations, such as source manufacturers and distributors or devices for which disposition costs are expected to vary significantly, a DFP is required to ensure an accurate determination of the required DFA amount. The NRC staff attempted to limit the need for licensees to prepare a DFP where possible, given the additional burden associated with preparing, reviewing, and updating DFPs on both licensee and regulatory staff. Based on available data regarding the number of different types of licensed devices, the NRC staff

<sup>&</sup>lt;sup>42</sup> ML16347A398. For consistency with the report to Congress, the NRC did not make any adjustments to the approximate number of licensees. Although the staff expects the number to have increased slightly from 2016 to the present, the staff expects that increase to be offset by the number of licensees that only have radionuclides with half-lives less than 120 days and would be excluded from the current rulemaking.

estimates that, under Alternative 6a, approximately 97 percent of licensees affected by the rule could use table 6 and approximately 3 percent would be required to develop DFPs. For both Alternatives 6b and 6c, the NRC staff estimates that approximately 90 percent of affected licensees could use table 6 and approximately 10 percent would be required to develop a DFP. The NRC staff expects a larger fraction of affected licensees to be able to use table 6 under Alternative 6a (as compared to Alternatives 6b or 6c) because Alternative 6a applies to more Category 3 sources or devices, which are more likely to be included in table 6. The fraction of affected licensees that can use table 6 is the same under Alternatives 6b and 6c because both alternatives are dominated by Category 1 or 2 sources, and the relatively small number of Category 3 licensees affected by Alternative 6b does not change the expected use of table 6 appreciably compared to Alternative 6c.

Table 7 lists the advantages and disadvantages the NRC considered for Alternatives 6a, 6b, and 6c.

# Table 7: Advantages and Disadvantages of Alternatives 6a, 6b, and 6c

#### Advantages

- For all variations, leverages extensive information collected and analyzed by the NRC staff to assign realistic fixed DFA amounts for many common RSSs and devices.
- All variations link DFA requirements to radiological risk, as represented by the 10 CFR Part 37 and IAEA Code of Conduct risk-based categories.
- All variations provide a simple approach using fixed DFA amounts for most affected licensees, while requiring DFPs in more complex scenarios in which disposition costs are expected to vary significantly.
- All variations result in lower costs for licensees, the NRC, and Agreement States compared to Alternatives 2 through 5 (i.e., Alternative 6c has the lowest costs, followed by Alternative 6b and Alternative 6a).
- Alternative 6b is informed by radiological risk by focusing on sources subject to 10 CFR Part 37 physical protection requirements.
- All variations provide licensees that are eligible to use the fixed DFA values with the flexibility to prepare a DFP if they so choose.

#### Disadvantages

- Uses fixed DFA amounts that would become outdated over time and require periodic updates.
- Does not include some features of Alternative 2, such as a DFA estimate tailored to the final disposition scenario for some devices (i.e., disposal through the DOE/NNSA or a commercial LLW disposal facility).
- Bases fixed DFA amounts on averages for groups of devices that may not accurately represent the dispositioning cost for all individual cases.
The NRC staff recommends Alternative 6b as the method to pursue for this rulemaking. The staff chose this alternative because it provides the best balance between ensuring funds are available for RSS disposition and the associated regulatory burden borne by the NRC, Agreement States, and industry. As shown in table ES-1, the NRC staff expects that all versions of Alternative 6 would impose less cost and regulatory burden than other alternatives. The staff achieved this by distilling the available information on the key factors driving RSS dispositioning costs into an easy-to-use table of DFA amounts that are expected to cover most licensees. The staff developed table 6 based on the best information it could gather from waste brokers, disposal sites, device and source manufacturers, and the DOE/NNSA on the key components of the costs to disposition various types of sources and devices. The staff developed "best estimate" DFA requirements to ensure adequate funding would be available to disposition sources without placing unnecessary burden on licensees.

Among the variations of Alternative 6, the NRC staff determined that Alternative 6b provides the most risk-informed choice because it focuses on higher risk RSSs (i.e., Category 1, Category 2, and certain Category 3 sources) while minimizing costs and regulatory burden for the NRC, Agreement States, and industry. By including only those Category 3 sources that aggregate<sup>43</sup> to a Category 2 quantity in a single location, Alternative 6b is responsive both to recommendations from the GAO, the Task Force, and other intragovernmental and external groups who advocated including Category 3 sources and to the Commission's direction in SRM-SECY-16-0115 to mitigate potential adverse impacts on existing and future licensees, particularly medical users. Only one alternative (Alternative 6c) had a lower expected cost than the staff's selected alternative, Alternative 6b. The NRC staff chose Alternative 6b instead of the lower cost Alternative 6c as the staff found the difference in cost between the two alternatives (approximately \$1.9 million using a 7 percent discount factor) to be reasonable because Alternative 6b would provide an overall greater benefit by applying to the Category 3 sources that could be aggregated to Category 2 quantities of radioactive material.

Alternative 6b would result in an updated, risk-informed approach that best addresses the direction provided by the Commission in SRM-SECY-16-0115. The NRC staff collected and analyzed extensive data on Category 1–3 device characteristics, disposition pathways, and costs to develop this approach, which addresses the regulatory concerns noted in section 3. In selecting this alternative, the NRC staff is considering the associated regulatory burden and implementation costs, and addressing Commission direction to mitigate potential adverse impacts on existing and future licensees. The staff will seek and consider comments from stakeholders and the public on all the alternatives presented in this regulatory basis, as noted in section 7.

# 5. Basis for Proposed Changes

This section explains the proposed changes to NRC regulations and discusses the rationale used to support those changes. This section also discusses how the proposed changes could resolve the issues identified in section 3 of this regulatory basis.

<sup>&</sup>lt;sup>43</sup> This term is used consistently with the definition of aggregation in 10 CFR 37.5, "Definitions": "accessible by the breach of a single physical barrier that would allow access to radioactive material in any form, including any devices that contain the radioactive material, when the total activity equals or exceeds a category 2 quantity of radioactive material."

#### 5.1 Proposed Changes

Under the proposed rulemaking described in Alternative 6b, the NRC would establish DFA requirements in 10 CFR 30.35 for the dispositioning of Category 1–3 byproduct material RSSs with a half-life of greater than 120 days. The proposed rulemaking in Alternative 6b would only apply to licensees that are subject to the requirements in 10 CFR Part 37. This includes licensees that possess Category 1 and 2 byproduct material sealed sources, and Category 3 sources that could, in aggregate, exceed a Category 2 quantity of radioactive material. The proposed changes would provide fixed DFA amounts for many common source and device types, while in other instances licensees would be required to prepare a DFP.

Licensees subject to 10 CFR Parts 50, 52, 72, 76 and 10 CFR Part 70, Subpart H, would be exempt from this rulemaking for the facilities and activities covered under those licenses. These licensees are already required to prepare a decommissioning plan and demonstrate sufficient financial assurance for decommissioning these facilities, including the disposition of any Category 1-3 byproduct material RSSs. In addition, for Alternatives 6b and 6c, licensees not subject to the requirements in 10 CFR Part 37 would be exempt from this rulemaking.

Category 3 quantities of radioactive material are not defined in NRC regulations. NRC would revise 10 CFR 30.4, "Definitions", to include a definition for Category 3 quantities of radioactive material. This definition would be consistent with the IAEA Code of Conduct.<sup>17</sup> A new "Appendix F to Part 30 – Category 3 Radioactive Material" would include a table of radionuclides and activities corresponding to Category 3 thresholds for radioactive material. The table would refer to the same 16 radioactive materials (14 single radionuclides and 2 combinations) that make up category 1 and category 2 material, as defined in Appendix A to 10 CFR Part 37.

The rulemaking would align with the existing criteria in 10 CFR 30.35 that only require DFA for radionuclides with a half-life greater than 120 days. The requirements for preparing DFPs currently in 10 CFR 30.35 and the associated guidance in NUREG-1757, Volume 3, would be supplemented to include the attributes discussed in the description of Alternative 5 above. Affected licensees that already meet the threshold for preparing a DFP under the current 10 CFR 30.35 requirements (see section 2.2.1) and that are subject to the new DFA requirements would need to update their DFPs as appropriate to address the new requirements.

The rulemaking would not change the existing fixed DFA amounts in 10 CFR 30.35, discussed in section 2.2.1, for licensees that meet the applicable thresholds for sealed and unsealed byproduct material. These fixed amounts are intended to support overall site decommissioning, not the disposition of individual Category 1–3 RSSs or devices. Consequently, a small number of licensees may be subject to the existing fixed DFA amounts (e.g., \$113,000 for sealed byproduct material) and the new DFA requirements for their Category 1–3 byproduct material RSSs. As with any licensee, these licensees have the option to prepare a DFP if they determine a DFP would result in a lower total DFA requirement.

#### 5.2 Benefits of the Rulemaking

#### 5.2.1 A More Risk-Informed Regulation

A risk-informed approach to regulatory decision-making represents a philosophy whereby risk insights are considered, together with other factors, to establish requirements that better focus licensee and regulatory attention on issues commensurate with their importance to public health and safety. This approach reduces unnecessary conservatism in regulation. The rulemaking

would advance the NRC's commitment to maintain up-to-date regulations by updating the financial assurance requirements currently in 10 CFR 30.35, which the NRC has found are not commensurate with anticipated dispositioning costs for Category 1–3 byproduct material RSSs. Thus, a rulemaking would ensure that the DFA requirements reflect more realistic dispositioning costs for affected licensees that possess these RSSs.

The alternatives described in this regulatory basis document consider radiological, financial, and regulatory risks. All of the alternatives considered by the NRC staff link DFA requirements to radiological risk, as represented by the 10 CFR Part 37 and IAEA Code of Conduct risk-based categories. In general, these alternatives require more DFA for devices with higher category sources (i.e., sources posing greater radiological risk).

The working group also considered the financial risks to licensees and regulatory authorities if the rule required significantly more or less DFA than a realistic assessment of the source disposition costs. In SRM-SECY-16-0115, the Commission specifically directed the staff to "carefully explore options to mitigate potential adverse impacts on existing and future licensees, particularly medical users, and those who benefit from the use of these radioactive materials." The rule could cause financial risks for licensees if it required too much DFA because that money would be unavailable to the licensee for other purposes. In contrast, requiring less DFA than needed could have financial risks for regulators that could need to draw on the DFA funds to disposition sealed sources. Alternatives 2, 4, 5, and 6 would provide more realistic cost estimates for some licensees than Alternative 3, which bases DFA requirements solely on the source category, by incorporating information about the main cost drivers for sealed source dispositioning (e.g., source preparation, packaging, transportation, and disposal costs).

In addition, the NRC staff considered the regulatory risk of imposing a burden on licensee, Agreement State, and NRC resources that is not needed to achieve the regulatory objectives. While Alternative 5 would result in the DFA requirements most tailored to each licensee's situation, the alternative would create significant regulatory burden for licensees that must develop the plans, and regulators that must review the plans.

The NRC staff recommends Alternative 6b because the staff determined that it provides the best balance of managing these radiological, financial, and regulatory risks. As described in section 4.6, the staff estimates that under Alternative 6b, approximately 90 percent of licensees would be able to use a table of fixed DFA amounts, which would limit the regulatory burden for both licensees and regulatory staff. As explained in further detail in section 4.6, the NRC staff developed those fixed DFA amounts based on multiple sources of information to ensure adequate funding would be available to disposition sources without imposing an unnecessary burden on licensees. Because the staff sought to develop best estimates of the disposal costs, the staff expects Alternative 6b should limit financial risks for both regulators and licensees that could result from significant variation between DFA amounts and actual disposition costs.

The NRC staff further risk-informed Alternative 6b by limiting the new DFA requirements to those licensees that are subject to 10 CFR Part 37 requirements. By limiting the applicability to those licensees, the NRC staff projects a significant reduction in regulatory burden for the NRC, Agreement States, and licensees as compared to Alternative 6a. As explained in greater detail in section 4.6, the staff determined Alternative 6b was the most risk-informed choice because it has significantly lower costs than all but one other alternative (Alternative 6c), while focusing DFA requirements on the sources with the greatest potential radiological risk (i.e., all Category 1 and 2 sources, and Category 3 sources that could, in aggregate, exceed a Category 2 quantity of radioactive material). In addition, Alternative 6b avoids the need for licensees or regulatory

staff to perform any additional determination of whether the DFA requirements would apply, beyond what they already do to determine whether 10 CFR Part 37 requirements apply.

The NRC staff determined Alternative 6b was the most risk-informed choice because it is the lowest cost alternative that still addresses the most risk-significant Category 3 sources. In addition, the NRC staff determined that by including Category 1, Category 2, and the most risk-significant subset of Category 3 sources, Alternative 6b was the most responsive to recommendations from the GAO, the Task Force, and other intragovernmental and external groups, as well as to Commission direction in SRM-SECY-16-0115. For all those reasons, the NRC staff selected Alternative 6b as its recommended rulemaking alternative.

# 5.2.2 Helps Ensure Licensees Are Prepared for Radioactive Sealed Source Disposition and Provides Protection for Unforeseen Circumstances

The rulemaking would increase the likelihood that licensees subject to the expanded DFA requirements will be prepared for end-of-life disposition costs of risk significant sources. As noted in section 3.1, end-of-life costs for dispositioning Category 1–3 byproduct material RSSs can be significant and may represent a significant financial burden if not anticipated by licensees. Requiring DFA for the disposition of these RSSs would help ensure that affected licensees appropriately consider and plan for the costs associated with disposition. In addition, the expanded DFA requirements would ensure that funds are available for RSS disposition in the event of licensee bankruptcy or other unforeseen circumstances. This would help ensure that Category 1–3 byproduct material RSSs are promptly and effectively managed in these types of scenarios.

#### 5.2.3 Facilitates Timely Disposition of Disused Category 1–3 Sources

The rulemaking would help facilitate timely disposition of disused Category 1–3 byproduct material RSSs and reduce the reliance by some licensees on indefinite long-term storage. The rulemaking would require affected licensees to provide an appropriate amount of DFA, based on the devices they possess, to support disposal at a commercial LLW facility, transfer to the NNSA for management through the OSRP, or return to an authorized recipient. While requirements for DFA cannot force licensees to disposition Category 1–3 RSSs prior to decommissioning, the requirements can provide an incentive for prompt disposition. If licensees elect to disposition their RSSs promptly, they may be able to reduce or eliminate DFA requirements once some or all of their RSSs are dispositioned. If licensees elect to wait until decommissioning, they should be able to efficiently and promptly disposition their RSSs as a plan for disposition will have already been considered.

By requiring affected licensees to consider and plan for RSS disposition and the associated costs, the rulemaking may help reduce the use of long-term storage as a management option, supporting the Commission's policy that disposal is preferred to storage.<sup>44</sup>

#### 5.2.4 Helps Ensure Dispositioning Costs for Category 1–3 Sources Are Borne by Those That Receive the Associated Economic Benefits

The rulemaking would help ensure that disposition costs related to the use of Category 1–3 byproduct material RSSs are borne by those that receive the associated economic benefits, reducing the reliance by some licensees on programs such as the OSRP administered by the

<sup>&</sup>lt;sup>44</sup> "Low-Level Radioactive Waste Management and Volume Reduction" (77 FR 25760 at 25781; May 1, 2012).

NNSA. As noted in section 5.2.3, the rulemaking would require licensees subject to the new requirements to provide an appropriate amount of DFA for the devices they possess to support disposal at a commercial LLW facility, transfer to the NNSA for management through the OSRP, or return to an authorized recipient for reuse or recycling. In cases where the OSRP may represent the only disposition option, such as for certain devices that would be classified as GTCC waste, the rulemaking would require a fixed DFA amount or a DFP that is based on the OSRP's self-ship option.<sup>45</sup> The rulemaking would not exempt licensees from providing DFA based on an assumption that disposition costs will be covered by the OSRP or other government programs. By requiring affected licensees to provide DFA to support disposition of their Category 1–3 byproduct material RSSs, even for sources that are likely to be disposed through the OSRP, the rulemaking would help ensure these licensees plan appropriately for the full life-cycle costs associated with using Category 1–3 sources.

The GAO's 2023 report on improving the security of certain disused sources<sup>46</sup> noted that "according to NNSA officials, the [OSRP] could be streamlined if the private sector was able to take on more financial responsibility for disposition." For fiscal year (FY) 2023, the NNSA estimated costs of \$26 million to package, transport, and disposition risk-significant RSSs through the OSRP and SCATR programs. As a result of this rulemaking, the NRC expects the NNSA will benefit from an averted cost due to reduced resources needed for their OSRP and SCATR programs. This averted cost is based on two assumptions: (1) the need for these programs will be reduced as affected licensees plan for the disposition of Category 1–3 RSSs to meet the new DFA requirements, including increased use of commercial disposal options when available, and (2) more licensees will use the self-ship option for sources disposed through the OSRP, which will transfer a significant portion of OSRP costs from the NNSA to licensees for these disposals. Section 8.1 contains further discussion of the calculation of averted costs.

# 5.2.5 Responsive to Government Accountability Office, Radiation Source Protection and Security Task Force, and Other Recommendations

This rulemaking would address recommendations from the GAO, the Task Force, and other intragovernmental and external groups to expand the NRC's financial assurance requirements for RSSs. The GAO's 2023 report identified financial assurance requirements as a leading worldwide practice that could help address some disposal challenges. The report noted that "the NRC has taken a step to promote the disposal of high-risk radioactive sources by initiating a rulemaking to revise its financial assurance rules to cover more radioactive sources." The GAO further recommended that the NRC "comprehensively assess leading practices that, if implemented, would minimize the time that disused sources are in a licensee's possession. These practices include financial assurances for all category 1, 2, and 3 sources," Consistent with the Commission's direction in SRM-SECY-16-0115, the NRC has assessed in this regulatory basis several alternatives for expanding financial assurance requirements for Category 1–3 byproduct material RSSs. The staff's recommended alternative would establish DFA requirements in 10 CFR 30.35 for the dispositioning of Category 1–3 byproduct material RSSs with a half-life of greater than 120 days. The recommended alternative would only apply to licensees that are subject to the physical protection requirements in 10 CFR Part 37. This includes licensees that possess Category 1 and 2 byproduct material sealed sources, and

<sup>&</sup>lt;sup>45</sup> The NNSA maintains a self-ship option in which licensees fund the cost of removing and transporting a device to the NNSA or its contractors, for subsequent management under the OSRP.

<sup>&</sup>lt;sup>46</sup> GAO-24-105998.

Category 3 sources that could, in aggregate, exceed a Category 2 quantity of radioactive material.

This rulemaking also addresses the recommendation made by the Task Force in its 2014 Report<sup>47</sup> related to financial planning for disposal of sealed sources. Specifically, the Task Force recommended "that the NRC evaluate the need for sealed source licensees to address the eventual disposition/disposal costs of Category 1 and 2 quantities of radioactive sources through source disposition/disposal financial planning or other mechanisms." The NRC completed the actions associated with this recommendation as noted in the 2018 Task Force report<sup>48</sup> by completing the scoping study discussed in section 2.4.1 and providing recommendations to the Commission as discussed in section 2.4.2. However, the Task Force continues to follow this issue and has requested periodic updates from the NRC following the Commission's direction in SRM-SECY-16-0115 to proceed with rulemaking.

As noted in section 2.4.1, the rulemaking is also responsive to recommendations from other groups to expand the NRC's financial assurance requirements for Category 1–3 RSSs, including recommendations in the 2010 report of an interagency working group led by the NRC<sup>49</sup> and a 2014 report issued by the LLW Forum Disused Sources Working Group.<sup>50</sup> Finally, the rulemaking addresses guidance in the IAEA Code of Conduct, paragraph 22(b), that every Member State's regulatory body "ensures that arrangements are made for the safe management and secure protection of radioactive sources, including financial provisions where appropriate, once they have become disused."

# 6. Backfitting and Issue Finality Assessment

There are no backfitting or issue finality provisions in 10 CFR Part 30. Facilities and activities subject to Parts 50, 52, 72, 76, and Subpart H to Part 70 would be exempt from this rulemaking. As a result, all alternatives considered in this regulatory basis would not impact any entities' activities authorized under Parts 50, 52, 72, and 76 and Subpart H of Part 70. Therefore, the alternative(s) would not meet the definition of "backfitting" under Part 50, Subpart H of Part 70, Part 72, and Part 76, so they would not constitute backfitting, nor would they affect the issue finality of a Part 52 approval.

## 7. Stakeholder Involvement

During the development of this regulatory basis, the NRC conducted outreach to certain stakeholders, including the CRCPD, the Advisory Committee on the Medical Uses of Isotopes, LLW disposal facility operators, LLW brokers, and sealed source/device manufacturers and distributors. The NRC also coordinated with the NNSA and the CRCPD to discuss costs associated with the OSRP and SCATR programs, respectively. The purpose of these meetings was to help the NRC develop and receive feedback on the alternatives presented in this regulatory basis.

In addition, the Agreement States participated in the development of this regulatory basis. In accordance with Management Directive 5.3, "Agreement State Participation in Working Groups,"

<sup>&</sup>lt;sup>47</sup> ML14219A642.

<sup>&</sup>lt;sup>48</sup> ML18276A155.

<sup>&</sup>lt;sup>49</sup> ML100050105.

<sup>&</sup>lt;sup>50</sup> ML14084A394.

dated June 22, 2016,<sup>51</sup> the staff provided early opportunities for Agreement State engagement on this rulemaking. A representative from the OAS served on the working group that prepared the regulatory basis. Additionally, the Agreement States had an opportunity to review a draft of this regulatory basis and provide comments. The OAS Board, as well as the Agreement States of \_\_\_\_\_\_ and \_\_\_\_\_\_, provided specific comments. The NRC considered these comments in developing this regulatory basis, as described below: Pending OAS review.

• XXXXXX

The rulemaking process will provide opportunities for broader public engagement. The NRC is issuing this regulatory basis for public comment. The staff will consider comments provided by stakeholders and the public on the regulatory basis when preparing the proposed rule, which will also be issued for public comment. The NRC staff plans to hold public meetings during the comment periods for both the regulatory basis and the proposed rule to provide information on these products and describe the process for submitting public comments. During the public engagement process, the NRC will specifically seek and consider public comments in the areas directed by the Commission in SRM-SECY-16-0115.

# 8. Cost/Impact Considerations

In this rulemaking, the NRC considers the potential costs for the industry, the NRC, Agreement States, and other external stakeholders resulting from alternative methods to address the identified issues. The regulatory basis stage of the rulemaking process provides an initial evaluation of these proposed impacts. The NRC will provide a more detailed evaluation of the benefits and costs with the proposed rule.

This section discusses cost and other impacts related to the rulemaking to establish DFA requirements for Category 1–3 byproduct material RSSs. This section discusses potential impacts on the four impacted entities: (1) the NRC, (2) the Agreement States, (3) licensees, and (4) the DOE/NNSA. The analyses presented in this section are based on the NRC staff's preliminary assessment. The staff will carry out a more detailed cost/impact evaluation as part of the regulatory analysis developed in accordance with NUREG/BR-0058, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission, Draft Report for Comment," during the proposed rule phase of the rulemaking.

#### 8.1 Analytical Methodology and Analysis Assumptions

In this rulemaking, the NRC is examining the potential costs and benefits for licensees, external stakeholders, Agreement States, and the NRC concerning the expanded financial assurance requirements for the disposition of Category 1–3 byproduct material RSSs. This section explains the process used to evaluate the expected costs and benefits of each alternative compared to the regulatory baseline (Alternative 1), which reflects the expected outcome if the NRC takes no regulatory action. Whenever possible, all costs and benefits are expressed in monetary terms. The total costs and benefits are then calculated to determine whether the difference between them results in a net positive benefit. Sometimes, it is not possible to express costs and benefits in monetary terms, so they are not monetized. To clarify, this analysis uses specific sign conventions. The benefits of the chosen alternative are denoted as positive, while its costs are negative. Negative results are shown in parentheses (e.g., a negative \$500 is represented by the symbol (\$500)). All monetized costs are expressed in 2024 dollars to agree with the NRC's

<sup>&</sup>lt;sup>51</sup> ML18073A142.

current annual labor rates for all rulemaking activities. The NRC staff assumes publication of the final rule in calendar year 2027.

In accordance with NUREG/BR-0058, net present value (NPV) calculations are used to determine how much society will need to invest today to ensure that the designated dollar amount is available in a given year in the future. By using NPVs, costs and benefits are valued to a reference year for comparison, regardless of when the cost or benefit is incurred in time. Based on U.S. Office of Management and Budget Circular A-4, "Regulatory Analysis," dated November 9, 2023, and consistent with NRC past practice and guidance, present-worth calculations in this analysis use 3 percent and 7 percent real discount rates. A 3 percent discount rate approximates the real rate of return on long-term government debt, which serves as a proxy for the real rate of return on savings to reflect reliance on a social rate of time preference concept. A 7 percent discount rate approximates the marginal pretax real rate of return on an average investment in the private sector and 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 an opportunity cost of capital concept to reflect the time value of resources directed to meet regulatory requirements.

The cost analysis time horizon after the rule is active is from 2028 through 2043 (15 years). For the NRC and its impacted licensees, the analysis period is 15 years, based on the standard licensing period for 10 CFR Part 30 licensees. The Agreement States can take up to 3 years to implement the rule (i.e., 2028 through 2030).

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

The staff used the 2023 U.S. Bureau of Labor Statistics (BLS) Occupational Employment and Wages data (<u>www.bls.gov</u>), which provide labor categories and the mean hourly wage rate by job type. The labor rates used in the analysis reflect total hourly compensation, which includes wages and nonwage benefits (using a burden factor of 2.4, which is applicable for contract labor and conservative for regular utility employees). The staff used the BLS data tables to select appropriate hourly labor rates for the estimated procedural, licensing, and utility-related work necessary during and after implementation of the proposed alternative. The table in appendix A summarizes the BLS labor categories the staff used to estimate industry labor costs to implement this proposed rule and lists the industry labor rates used in the analysis.

During its research, the NRC staff found that disposition costs for devices containing Category 1–3 RSSs vary widely based on numerous factors such as the source activity (curies), size and weight of the device, difficulty of removing the device from the facility (e.g., potential crane, rigging and labor charges), type of transportation container required, LLW class for commercial disposal, and permitting and reciprocity fees, among other variables. The descriptions of Alternatives 2 and 4 above contain further discussion of these factors. In general, Category 1 devices tend to be the most expensive to disposition, with some costs exceeding \$1 million dollars. Disposition costs for Category 2 devices can range from \$40,000 to over \$1 million dollars, while costs for dispositioning most Category 3 devices are typically less than \$20,000.

This analysis makes the following assumptions:

- The NRC assumes that impacted licensees will continue to be responsible for funding disposition costs for their Category 1–3 byproduct material RSSs either at or before decommissioning. Therefore, the costs of the rule do not include the costs of device dispositioning except for the small fraction of devices that are dispositioned by the NNSA/OSRP program. The NRC staff assumes that, as a result of this rule, half of the number of devices currently recovered from U.S. licensees and dispositioned annually by the OSRP will instead be funded by licensees using the OSRP self-ship option, which will result in an averted cost of \$7.5 million per year to the DOE/NNSA and an increased industry cost of \$7.5 million per year.
- Impacted licensees will incur the cost of acquiring and maintaining a financial assurance instrument. The NRC staff assumed a 3 percent initiation fee to secure the financial instrument. In addition, the annual maintenance costs on the various DFA instruments available to licensees can vary from 0.75 to 3.0 percent. This analysis is using a blended weight of 1.25 percent.
- The estimated compliance date for the rule is 2028, by which time NRC licensees must comply.
- Agreement States will have 3 years to promulgate the rule. The NRC assumes implementation to be spread evenly over the period 2028–2030 (one-third of total Agreement State licensees will implement the rule in each of the years 2028, 2029, and 2030). The NRC staff estimates that each Agreement State will take 444 full-time equivalent (FTE) labor hours to update its regulations and guidance to complete the rulemaking.
- The NRC staff estimates a 1 percent annual growth rate in the number of new licensees that the rule will impact.
- As part of the industry implementation cost, licensees may need to prepare an initial DFP or DFA estimate in the first year of compliance. The NRC staff estimates a cost of 40–80 labor hours per licensee, depending on the alternative for the licensee to generate the initial DFP or DFA estimate. The NRC staff estimates that regulatory officials will need 60–100 hours to review the initial DFP or DFA estimates for licensees.
- Each alternative will have some licensees needing to submit an update to their DFPs every 3 years, at an estimated cost of 40 labor hours per licensee. In addition, regulatory officials will need 30 hours to review these updates.
- The NRC assumes that the DOE/NNSA will benefit from an averted cost of \$7.5 million annually due to reduced resources needed for its OSRP and SCATR programs. This averted cost is based on two assumptions: (1) the need for these programs will be reduced as affected licensees plan for the disposition of Category 1–3 RSSs as part of meeting the new DFA requirements, including increased use of commercial disposal options when available, and (2) more licensees will use the self-ship option for sources

disposed through the OSRP, which will transfer a significant portion of OSRP costs from the NNSA to licensees for these disposals.

• For Alternatives 2–5 and Alternative 6a, the NRC assumes that 4,600 licensees will be impacted (NRC and Agreement State licensees combined). That number is based on the estimated total number of licensees possessing Category 1–3 byproduct material RSSs, adjusted downward for licensees that already submit DFPs and licensees that only have radionuclides with a half-life less than 120 days. Fewer licensees will be impacted by Alternative 6b (1,400 licensees) and Alternative 6c (990 licensees), as discussed in section 4.6.

Affected attributes for the NRC, the Agreement States, industry, and the DOE/NNSA are identified in sections 8.1.1 - 8.1.7.

#### 8.1.1 NRC Implementation

The NRC will incur the cost of implementing the proposed and final rules and developing and issuing licensing guidance to comply with the new requirements.

#### 8.1.2 NRC Operations

The NRC will incur the cost of reviewing licensee submittals to meet the DFA requirements (i.e., DFPs or estimates based on a table of fixed DFA amounts). Licensees that prepare DFPs will be required to submit updates to their DFPs every 3 years.

#### 8.1.3 Agreement States Implementation

The Agreement States will have 3 years to adopt the regulatory changes. The Agreement States will incur the cost of implementing the rule and developing and issuing licensing guidance to comply with the new requirements.

#### 8.1.4 Agreement States Operations

Agreement States will incur the cost of reviewing licensee submittals to meet the DFA requirements. Licensees that prepare DFPs will be required to submit updates to their DFPs every 3 years.

#### 8.1.5 Industry Implementation

The industry (NRC and Agreement State licensees) will incur implementation costs on the initiation fees associated with their chosen financial assurance instrument. In addition, licensees will incur the cost of determining their DFA requirements based on a table of fixed DFA amounts (by device) or through developing an initial DFP in the first year of compliance.

#### 8.1.6 Industry Operations

Industry will incur annual maintenance costs on their chosen financial assurance instrument. In addition, licensees that prepare DFPs will need to update their DFPs every 3 years. The

industry will also incur the costs associated with the self-ship option for sources or devices that are dispositioned through the OSRP.

#### 8.1.7 Other Government (DOE/NNSA) Operations

As noted in section 3.4, the DOE/NNSA Office of Radiological Security (ORS) has borne the substantial cost of disposition of risk-significant disused sources. The NRC staff reached out to ORS officials, who provided estimated costs of \$26 million for the OSRP and SCATR programs in FY 2023. This included FY 2023 costs of approximately \$15 million for 88 domestic removals under the OSRP. The NRC staff projects that \$7.5 million in DOE/NNSA funds can be saved annually over the course of the analysis period. This estimate is based on the assumption that, as a result of this rule, half of the number of devices currently recovered from U.S. licensees and dispositioned annually by the OSRP will instead be funded by licensees using the OSRP self-ship option, which will result in an averted cost of \$7.5 million per year to the DOE/NNSA and an increased industry cost of \$7.5 million per year.

The ORS staff noted that its experience and stakeholder engagements suggest that adopting financial assurance requirements would benefit national security and public health and safety as licensees would be disincentivized from storing sources for longer than needed at their facilities, and the requirements would help reduce significant pressure on Federal resources into the future. This rulemaking would facilitate the transition from the DOE/NNSA taxpayer expense to the commercial sector as more commercial disposition options become available and encourage improved end-of-life management requirements of Category 1–3 RSSs.

#### 8.2 Summary of Evaluated Alternatives and Cost

#### 8.2.1 Alternative 1: No Action—The Status Quo

This alternative would maintain the current regulatory framework. It would avoid the costs that the final rule provisions would impose. This alternative is equivalent to the status quo and serves as a baseline against which other alternatives can be measured.

# 8.2.2 Alternative 2: Financial Assurance Based on Device Type and Disposition Pathway

This alternative would establish DFA requirements based on the methods described in appendix C (i.e., table of fixed DFA amounts, use of an equation, or preparation of a DFP). This alternative was not cost effective, with an overall cost of a 7 percent NPV of \$81.1 million.

#### 8.2.3 Alternative 3: Fixed Financial Assurance Based on Source Category

This alternative would establish fixed DFA requirements corresponding to the source category. Alternatively, licensees would have the option of preparing a DFP. This alternative was not cost effective, with an overall cost of a 7 percent NPV of \$99.0 million.

#### 8.2.4 Alternative 4: Financial Assurance Determined by a Parametric Formula

This alternative would use a parametric equation to determine the DFA amount. Alternatively, licensees would have the option of preparing a DFP. This alternative was not cost effective, with an overall cost of a 7 percent NPV of \$86.2 million.

#### 8.2.5 Alternative 5: Financial Assurance Based on a Decommissioning Funding Plan

This alternative would require all applicants or licensees to prepare a case-specific DFP. This alternative was not cost effective, with an overall cost of a 7 percent NPV of \$258.9 million.

# 8.2.6 Alternative 6: Hybrid Approach (Combines Alternatives 2, 3, and 5) (includes NRC Selected Alternative 6b)

This alternative would establish fixed DFA requirements corresponding to the device type for many common devices. Licensees with other types of devices would be required to prepare a DFP. The staff considered three variations of this alternative: "Alternative 6a" applies to all licensees possessing Category 1–3 byproduct material RSSs; "Alternative 6b" only applies to Category 1–3 licensees subject to the physical protection requirements in 10 CFR Part 37 (includes all Category 1 and 2 licensees, and a limited number of Category 3 licensees); "Alternative 6c" only applies to licensees possessing Category 1 or 2 byproduct material RSSs that are subject to the physical protection requirements in 10 CFR Part 37. As discussed in section 4.6, the staff selected Alternative 6b as its recommended approach.

Alternative 6a ("Hybrid Approach for All Category 1–3 Licensees") resulted in an overall cost of \$63.4 million with a 7 percent NPV over the 15-year analysis period. Industry cost was primarily driven by an industry self-ship cost of (\$52.1 million), which in turn was offset by the DOE subsidy. The three other main cost contributors were industry implementation (with a cost of \$38.2 million), Agreement States implementation (\$12.7 million), and industry operation (\$8.4 million).

Alternative 6b ("Hybrid Approach Limited to Category 1–3 Licensees Subject to 10 CFR Part 37") had a negative value of \$44.0 million. The three main cost contributors were industry self-ship (\$52.1 million), industry implementation (\$29.9 million), and industry operation (\$5.6 million).

Alternative 6c ("Hybrid Approach Limited to Category 1 and 2 Licensees") had a negative value of \$42.1 million. The three main cost contributors were industry self-ship (\$52.1 million), industry implementation (\$29.8 million), and Agreement States implementation (\$4.1 million).

Costs and benefits for each alternative are provided in table 8 below. As shown in table 8, the staff's recommended alternative (Alternative 6b) to establish DFA requirements for Category 1– 3 byproduct material RSS licensees subject to the physical protection requirements in 10 CFR Part 37 would have a projected cost of approximately (\$44.0 million) over 15 years with a 7 percent NPV. Most of the costs incurred by the NRC, Agreement States, and industry would be during the first 3 years of implementing the final rule. The costs to the industry would include affected licensees having to review their current DFA requirements, including DFPs as applicable, for any needed revisions to comply with the final rule. Affected licensees would also incur costs associated with their chosen financial assurance instrument, and licensees with DFPs would incur costs associated with periodic updates. Benefits result from an averted cost of \$7.5 million per year to the DOE/NNSA due to reduced funding needs for the OSRP and SCATR programs, as described in section 8.1.7.

	Net Benef	fits (Costs) in 202	23 Dollars
DESCRIPTION	Undiscounted	7% NPV	3% NPV
Alternative 1—Status	Quo (No Action 7	Γaken)	
	\$0	\$0	\$0
Alternative 2—Financial Assurance Base	d on Device Type	and Disposition	Pathway
NRC Implementation	(\$3,831,900)	(\$2,883,300)	(\$3,381,800)
NRC Operation	(\$2,066,300)	(\$824,800)	(\$1,369,600)
NRC Totals	(\$5,898,200)	(\$3,708,100)	(\$4,751,300)
Agreement State Implementation	(\$22,468,900)	(\$14,989,900)	(\$18,820,100)
Agreement State Operation	(\$17,333,400)	(\$6,919,200)	(\$11,488,900)
Agreement States Totals	(\$39,802,300)	(\$21,909,100)	(\$30,309,000)
Industry Implementation	(\$58,455,900)	(\$40,749,800)	(\$49,918,300)
Industry Operation	(\$34,399,700)	(\$14,692,400)	(\$23,465,200)
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)
Industry Totals	(\$205,355,600)	(\$107,555,200)	(\$152,933,700)
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300
Alternative 2 Total Net Benefits (Cost)	(\$138,556,100)	(\$81,059,500)	(\$108,443,800)
Alternative 3—Fixed Financial As	surance Based or	n Source Catego	ry
NRC Implementation	(\$4,115,500)	(\$3,085,500)	(\$3,626,500)
NRC Operation	(\$3,438,000)	(\$1,372,400)	(\$2,278,700)
NRC Totals	(\$7,553,500)	(\$4,457,900)	(\$5,905,200)
Agreement State Implementation	(\$46,160,700)	(\$30,794,300)	(\$38,663,800)
Agreement State Operation	(\$3,438,000)	(\$1,372,400)	(\$2,278,700)
Agreement States Totals	(\$49,598,700)	(\$32,166,700)	(\$40,942,600)
Industry Implementation	(\$61,125,700)	(\$42,543,000)	(\$52,161,100)
Industry Operation	(\$47,277,800)	(\$19,833,200)	(\$32,001,000)
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)
Industry Totals	(\$220,903,500)	(\$114,489,100)	(\$163,712,300)
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300
Alternative 3 Total Net Benefits (Cost)	(\$165,555,700)	(\$99,000,800)	(\$131,009,800)
Alternative 4—Financial Assurance	Determined by a	Parametric Form	nula
NRC Implementation	(\$4,209,800)	(\$3,152,700)	(\$3,707,700)
NRC Operation	(\$1,375,200)	(\$549,000)	(\$911,500)
NRC Totals	(\$5,585,000)	(\$3,701,600)	(\$4,619,200)
Agreement State Implementation	(\$25,670,800)	(\$17,126,300)	(\$21,502,200)
Agreement State Operation	(\$11,535,900)	(\$4,605,000)	(\$7,646,200)

### Table 8: Summary Table of Alternatives and Benefits (Costs)

	Net Benef	fits (Costs) in 202	23 Dollars				
DESCRIPTION	Undiscounted	7% NPV	3% NPV				
Agreement States Totals	(\$37,206,700)	(\$21,731,300)	(\$29,148,400)				
Industry Implementation	(\$70,291,800)	(\$48,650,600)	(\$59,834,600)				
Industry Operation	(\$27,911,100)	(\$12,102,300)	(\$19,164,400)				
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)				
Industry Totals	(\$210,703,000)	(\$112,865,800)	(\$158,549,300)				
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300				
Alternative 4 Total Net Benefits (Cost)	(\$140,994,600)	(\$86,185,800)	(\$112,766,700)				
Alternative 5—Financial Assurance Ba	sed on a Decomm	nissioning Fundi	ng Plan				
NRC Implementation	(\$6,471,100)	(\$4,765,000)	(\$5,658,300)				
NRC Operation	(\$13,751,900)	(\$5,489,500)	(\$9,115,000)				
NRC Totals	(\$20,222,900)	(\$10,254,500)	(\$14,773,300)				
Agreement State Implementation	(\$44,830,200)	(\$29,906,800)	(\$37,549,400)				
Agreement State Operation	(\$115,359,300)	(\$46,049,600)	(\$76,462,100)				
Agreement States Totals	(\$160,189,400)	(\$75,956,400)	(\$114,011,500)				
Industry Implementation	(\$168,448,300)	(\$114,235,200)	(\$142,106,000)				
Industry Operation	(\$144,111,100)	(\$58,487,500)	(\$96,183,800)				
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)				
Industry Totals	(\$425,059,400)	(\$224,835,600)	(\$317,840,000)				
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300				
Alternative 5 Total Net Benefits (Cost)	(\$492,971,800)	(\$258,933,600)	(\$367,074,600)				
Alternative 6a—Hybrid Approach for All Category 1-3 Licensees (Combines Alternatives 2, 3, and 5)							
NRC Implementation	(\$3,435,500)	(\$2,600,700)	(\$3,039,900)				
NRC Operation	(\$388,600)	(\$155,100)	(\$257,600)				
NRC Totals	(\$3,824,200)	(\$2,755,800)	(\$3,297,500)				
Agreement State Implementation	(\$19,110,800)	(\$12,750,400)	(\$16,007,800)				
Agreement State Operation	(\$3,260,200)	(\$1,301,400)	(\$2,160,900)				
Agreement States Totals	(\$22,371,000)	(\$14,051,800)	(\$18,168,700)				
Industry Implementation	(\$54,725,400)	(\$38,244,300)	(\$46,784,400)				
Industry Operation	(\$18,648,800)	(\$8,404,900)	(\$13,025,200)				
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)				
Industry Totals	(\$185,874,200)	(\$98,762,100)	(\$139,359,900)				
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300				
Alternative 6a Total Net Benefits (Cost)	(\$99,569,300)	(\$63,456,800)	(\$81,275,800)				
Alternative 6b—Hybrid Approach Limited to C (Combines Alternatives	ategory 1-3 Licen 2, 3, and 5) (NRC	sees Subject to <sup>,</sup> Selected)	10 CFR Part 37				
NRC Implementation	(\$2,115,100)	(\$1,659,200)	(\$1,900,800)				
NRC Operation	(\$418,500)	(\$167,100)	(\$277,400)				

	Net Benef	its (Costs) in 202	23 Dollars
DESCRIPTION	Undiscounted	7% NPV	3% NPV
NRC Totals	(\$2,533,600)	(\$1,826,300)	(\$2,178,200)
Agreement State Implementation	(\$7,922,900)	(\$5,287,400)	(\$6,637,200)
Agreement State Operation	(\$3,510,900)	(\$1,401,500)	(\$2,327,100)
Agreement States Totals	(\$11,433,900)	(\$6,688,900)	(\$8,964,400)
Industry Implementation	(\$42,297,500)	(\$29,897,200)	(\$36,344,200)
Industry Operation	(\$12,679,500)	(\$5,621,800)	(\$8,791,800)
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)
Industry Totals	(\$167,477,000)	(\$87,631,900)	(\$124,686,200)
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300
Alternative 6b Total Net Benefits (Cost)	(\$68,944,400)	(\$44,034,200)	(\$56,278,600)

Alternative 6c—Hybrid Approach L (Combines Alter)	imited to Categor natives 2, 3, and §	y 1 and 2 Licens 5)	ees
NRC Implementation	(\$1,919,700)	(\$1,519,900)	(\$1,732,300)
NRC Operation	(\$298,500)	(\$119,200)	(\$197,900)
NRC Totals	(\$2,218,200)	(\$1,639,100)	(\$1,930,200)
Agreement State Implementation	(\$6,267,600)	(\$4,183,200)	(\$5,250,800)
Agreement State Operation	(\$2,504,300)	(\$999,700)	(\$1,659,900)
Agreement States Totals	(\$8,771,900)	(\$5,182,900)	(\$6,910,700)
Industry Implementation	(\$42,297,500)	(\$29,897,200)	(\$36,344,200)
Industry Operation	(\$12,179,500)	(\$5,390,200)	(\$8,438,200)
Industry Self-Ship Cost	(\$112,500,000)	(\$52,112,900)	(\$79,550,300)
Industry Totals	(\$166,977,000)	(\$87,400,200)	(\$124,332,700)
Other Government (DOE)	\$112,500,000	\$52,112,900	\$79,550,300
Alternative 6c Total Net Benefits (Cost)	(\$65,467,100)	(\$42,109,400)	(\$53,623,300)

Note: Values are rounded to the nearest hundred. Values in parentheses, e.g., "()", denote a cost of negative value. DOE = U.S. Department of Energy; NPV = net present value.

As a result of this rulemaking, some licensees would need to provide DFA that have not been required to do so in the past. Other licensees would be required to increase their DFA amount or prepare a DFP, or both. The NRC and Agreement State resources will be needed to review the new or revised DFA estimates or DFPs associated with this rulemaking. The NRC is requesting feedback from the public on this document to assist in identifying the overall cost that may result from the proposed rule to amend 10 CFR Part 30.

### 9. Uncertainty Analysis

The NRC completed a Monte Carlo sensitivity analysis using the specialty software @Risk<sup>®</sup>. The Monte Carlo approach answers the question, "What distribution of net benefits results from multiple draws of the probability distribution assigned to key variables?"

#### 9.1 Uncertainty Analysis Assumptions

The cost/impact consideration section uses estimates of values that are sensitive to licensees' unique situations. The staff analyzed the variables that have the greatest amount of uncertainty. To perform this analysis, the staff used a Monte Carlo simulation analysis using the @Risk<sup>®</sup> software program. This was done to determine the robustness of the costs and net benefits of the rulemaking. The NRC examined how anticipated savings change due to uncertainties associated with the NRC's analytical assumptions and input data shown in appendix B to this document.

#### 9.2 Uncertainty Analysis Inputs

The probability distributions chosen to represent the different variables in the analysis were bounded by the range-referenced input and the NRC staff's professional judgment. When defining the probability distributions for use in a Monte Carlo simulation, summary statistics are used to characterize the distributions. These summary statistics include the minimum, most likely, and maximum values of a program evaluation and review technique (PERT) distribution. The staff used the PERT distribution to reflect the relative spread and skewness of the distribution defined by the three estimates—the minimum, most likely, and maximum. Figure 1 provides the probability distribution function and the descriptive statistics of the inputs used in the uncertainty analysis. Appendix B to this document shows the inputs.

#### 9.3 Uncertainty Analysis Results

Figure 1 depicts the results of the uncertainty analysis of Alternative 6b net costs using a 7 percent discount rate. This figure displays the histogram of the incremental net cost for rulemaking to resolve the identified issues. The uncertainty analysis graph shows that the Alternative 6b mean net cost is (\$44.0 million) in 2023 dollars with a 90 percent confidence level that the costs are between (\$49.8 million) and (\$40.1 million) using a 7 percent discount rate. Note that there will be differences in totals due to the software used to perform the uncertainty analysis.



Figure 1: Incremental net costs for Alternative 6b (7 percent discount rate)

Uncertainty		Incren	nental Cost-Be	nefit (2023 d	lollars)	
Result	Minimum	Maximum	Mean	Std Dev	0.05	0.95
Total Industry Cost	(\$93,901,977)	(\$85,107,193)	(\$87,632,166)	\$1,330,039	(\$90,201,776)	(\$85,883,480)
Total NRC Costs	(\$2,084,786)	(\$1,574,944)	(\$1,826,280)	\$77,364	(\$1,954,787)	(\$1,699,135)
Total Agreement States Cost	(\$13,765,133)	(\$3,735,313)	(\$6,688,888)	\$1,658,862	(\$9,892,367)	(\$4,541,352)
Total Costs	(\$57,361,619)	(\$38,559,405)	(\$44,034,455)	\$2,976,714	(\$49,780,468)	(\$40,143,202)

Table 9: Uncertainty Results Descriptive Statistics—7 Percent NPV

Examining the range of the resulting output distribution provided in table 9 makes it possible to discuss the potential incremental costs and benefits of the regulatory basis more confidently.

Figure 2 shows a tornado diagram for Alternative 6b that identifies the key variables whose uncertainty has the most significant impact on total costs for this proposed rule. This figure ranks the variables based on their contribution to cost uncertainty. Three variables—
(1) Agreement State licensees' staff weighted labor rate, (2) Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements, and (3) Agreement State rulemaking working group support—drive the most uncertainty in the costs. The remaining key variables show diminishing variation.



Figure 2: Tornado diagram—total net costs—7 percent NPV (Alternative 6b)

# 10. Rulemaking Cost Justification

This regulatory basis supports a rulemaking to revise 10 CFR 30.35 to establish new financial assurance requirements for the disposition of Category 1–3 byproduct material RSSs with a half-life of greater than 120 days. The staff's recommended alternative would only apply to licensees subject to the physical protection requirements in 10 CFR Part 37. This includes licensees that possess Category 1 and 2 byproduct material sealed sources, and Category 3 sources that could, in aggregate, exceed a Category 2 quantity of radioactive material. The proposed changes would provide fixed DFA amounts for many common source and device types, while in other instances licensees would be required to prepare a DFP.

The staff's recommended alternative (Alternative 6b) would have a projected cost of approximately \$44.0 million over 15 years with a 7 percent NPV. Most of the costs incurred by the NRC, Agreement States, and industry would be during the first 3 years of implementing the final rule. The costs to industry would include affected licensees reviewing their inventory of Category 1–3 byproduct material RSSs to determine the applicable DFA requirements to comply with the final rule, including revising their existing DFPs as appropriate, and obtaining a financial assurance instrument for the required DFA amount.

This rulemaking, in the NRC staff's view, would have a number of benefits. The proposed changes to 10 CFR 30.35 would provide a risk-informed method for determining DFA amounts for affected licensees that possess Category 1–3 byproduct material RSSs. In addition, the new DFA requirements should: (1) help ensure these licensees are prepared for RSS disposition and facilitate timely disposition of disused RSSs, (2) ensure adequate financial resources are available to support RSS disposition in the event of unforeseen circumstances, such as licensee bankruptcy, (3) help ensure dispositioning costs for Category 1–3 RSSs are borne by those who receive the associated economic benefits, and (4) address recommendations on this issue provided by the GAO, the Task Force, and other groups. The rulemaking would also help address concerns raised by the DOE/NNSA, which, since 2003, has implemented a program to remove excess RSSs that posed a potential threat to public health, safety, and national security. The DOE/NNSA has stated that additional financial planning requirements could encourage the use of available commercial disposal options, or defray the cost of packaging and transportation, thereby reducing the funding required for NNSA-sponsored RSS recovery and management programs. Finally, the new requirements may help reduce the use of long-term storage as a management option, supporting the Commission's policy that disposal is preferred to storage.

# 11. Cumulative Effects of Regulation

The NRC has implemented a program to address the possible cumulative effects of regulation in the development of regulatory bases for rulemakings. The cumulative effects of regulation are an organizational effectiveness challenge that results from licensees implementing several complex positions, programs, or requirements within a prescribed implementation period and with limited available resources. The NRC interacts with outside stakeholders throughout the rulemaking process in order to resolve issues that can lead to implementation challenges and contribute to the cumulative effects of regulation. Feedback from stakeholders is important to help the NRC make better informed decisions on mitigating the impact of the cumulative effects of regulation.

# 12. Regulatory Flexibility Act

The Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act, requires the NRC to consider the impact of its rulemakings on small entities and evaluate alternatives that would accomplish regulatory objectives without unduly burdening small entities or erecting barriers to competition. In developing the proposed rule, the staff will evaluate how many small entities it anticipates this rulemaking would affect and what steps the NRC can take to mitigate the economic impacts on small entities. The staff will use public comments received on this document to inform this analysis.

## 13. Environmental Analysis

This rulemaking would revise 10 CFR 30.35 to establish new financial assurance requirements for the disposition of Category 1–3 byproduct material RSSs with a half-life of greater than 120 days. Pursuant to 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments," the NRC will develop an environmental assessment along with this rulemaking to determine whether issuing this rule would result in any significant impacts.

## 14. NRC Strategic Plan

The recommended rulemaking would support the NRC's 2022-2026 Strategic Plan (NUREG-1614, Volume 8, issued April 2022)<sup>52</sup> in relation to the strategic goal of ensuring the safe and secure use of radioactive materials and the strategic goal of inspiring stakeholder confidence in the NRC. The rulemaking would support Safety and Security Strategy 1.2.1, "Maintain and further risk-inform the current regulatory framework using information gained from operating experience, lessons learned, external and internal assessments, technology advances, research activities, and changes in the threat environment." As discussed in section 2.4, this rulemaking was proposed based on an internal assessment documented in SECY-16-0046 and after considering recommendations from the interagency Radiation Source Protection and Security Task Force as well as other external groups. The changes that are proposed to 10 CFR 30.35 are risk-informed compared to the current regulatory framework, as discussed in section 5.2.1. In addition, the planned rulemaking would support the strategic goal of inspiring stakeholder confidence in the NRC through Stakeholder Confidence Strategy 3.1.2, "Provide a fair and timely process to allow public involvement in NRC decision-making." As discussed in section 7, the rulemaking process will provide several opportunities for public engagement, including public comment periods for this regulatory basis and the subsequent proposed rule. Public meetings will take place during the comment periods for both the regulatory basis and the proposed rule to facilitate public involvement in the rulemaking process.

# 15. Conclusion

The NRC staff finds that there is sufficient regulatory basis to proceed with rulemaking to establish new DFA requirements for the disposition of Category 1–3 byproduct material RSSs. Specifically, the proposed rulemaking in Alternative 6b, which would affect licensees subject to 10 CFR Part 37 requirements, would result in an updated, risk-informed approach that best addresses the direction provided by the Commission in SRM-SECY-16-0115 and the regulatory

<sup>&</sup>lt;sup>52</sup> ML22067A170.

concerns identified by the NRC staff. The NRC staff collected and analyzed extensive data on Category 1–3 device characteristics, disposition pathways, and costs to develop this approach, which would require predictable, fixed DFA amounts for many affected licensees while requiring DFPs in more complex scenarios. In selecting this alternative, the NRC staff is considering the associated regulatory burden and implementation costs, and addressing Commission direction to mitigate potential adverse impacts on existing and future licensees.

At this stage, the staff holds that the qualitative benefits from conducting the rulemaking would justify the potential cost impacts to licensees, Agreement States, and the NRC. The staff will seek and consider comments from stakeholders and the public on all the alternatives presented in this regulatory basis. In addition, the staff will prepare a regulatory analysis of the qualitative and quantitative costs and benefits that considers public comments received on this regulatory basis for the proposed rule, consistent with NUREG/BR-0058.

### 16. References

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10 CFR Part 30. *U.S. Code of Federal Regulations*, "Rules of General Applicability to Domestic Licensing of Byproduct Material," Part 30, Chapter I, Title 10, "Energy."

10 CFR Part 31. *U.S. Code of Federal Regulations*, "General Domestic Licenses for Byproduct Material," Part 31, Chapter I, Title 10, "Energy."

10 CFR Part 32. *U.S. Code of Federal Regulations*, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material, Part 32, Chapter I, Title 10, "Energy."

10 CFR Part 37. *U.S. Code of Federal Regulations*, "Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material," Part 37, Chapter I, Title 10, "Energy."

10 CFR Part 40. *U.S. Code of Federal Regulations*, "Domestic Licensing of Source Material," Part 40, Chapter I, Title 10, "Energy."

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

10 CFR Part 51. *U.S. Code of Federal Regulations*, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Part 51, Chapter I, Title 10, "Energy."

10 CFR Part 52. *U.S. Code of Federal Regulations*, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Part 52, Chapter I, Title 10, "Energy."

10 CFR Part 61. *U.S. Code of Federal Regulations*, "Licensing Requirements for Land Disposal of Radioactive Waste," Part 61, Chapter I, Title 10, "Energy."

10 CFR Part 70. *U.S. Code of Federal Regulations*, "Domestic Licensing of Special Nuclear Material," Part 70, Chapter I, Title 10, "Energy."

10 CFR Part 72. *U.S. Code of Federal Regulations*, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste," Part 72, Chapter I, Title 10, "Energy."

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Regulatory Flexibility Act (5 U.S.C. 601 et seq.).

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U.S. Government Accountability Office, GAO-24-105998, "High-Risk Radioactive Material: Opportunities Exist to Improve the Security of Sources No Longer in Use," November 30, 2023.

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U.S. Nuclear Regulatory Commission, "Interagency Working Group Report on Financial Assurance for Disposition of Category 1, 2, and 3 Radioactive Sealed Sources," March 3, 2010 (ML100050105).

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	st High Comments/Data Source		Final rule to be published in 2027, and the betimplemented in 3 years.		NRC input	15 years after the rule becomes effectiv (2031–2046); it will be published in 2027		NUREG/BR-0058	NUREG/BR-0058	Calculated based on data from <u>https://www.statista.com/statistics/2449</u> <u>3/projected-consumer-price-index-in-the</u> <u>united-states/</u> .	NUREG/BR-0058	Percentage of the financial instrument charged in the first year of implementation.		Annual averted cost for NNSA source disposition programs as discussed in section 8.1.7.		Annual industry costs to utilize NNSA source disposition programs as discussed in section 8.1.7.		
	Be																	
	Low Estimate																	
	Distribution																	
ladies	Information Column	Scope	2028	2031	2023	15 years	and Labor Rate	%L	3%	105%	2.40	0.03		\$7,500,000		(\$7,500,000)		
Appendix A—Data	Inputs	Rule—Effective Date and	Year the rule is effective for NRC licensees	Year the rule is effective for Agreement State licensees	Analysis base year	Analysis horizon	Discount Rates, Inflators, Multiplier	Primary discount rate	Alternative discount rate	CPI inflator (2022–2023)	Labor rate multiplier	Initiation fee	DOE/NNSA	Annual reduction in NNSA disposition costs	Transfer Industry	Annual industry self-ship costs	Hourly Wage Rates	

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
NRC staff	\$152.00		-	-		Calculated based on the previous year's actuals.
Agreement State licensees' staff weighted labor rate	125.85	PERT	\$88.17	\$120.17	\$183.07	The Agreement States' licensing staff weighted labor rate calculated based on the BLS data for State Government, excluding schools and hospital industry hourly wages for health and safety engineers, except mining safety engineers, except mining safety engineers, except mining safety engineers, except mining safety engineers, and inspectors (17-2111), physical scientist, all other (19-2099), and lawyers (23-1011). A distribution for these three occupational classifications was created using the BLS 10 <sup>th</sup> , 25 <sup>th</sup> , 50 <sup>th</sup> , 75 <sup>th</sup> , and 90 <sup>th</sup> percentile wages. The means of these distributions were averaged to acquire the Agreement States blended mean wage (\$51.49). A labor multiplier of 2.4 and an inflation factor of 1.05 were then applied, which resulted in the mean labor rate.
NRC licensees' staff weighted labor rate	142.74	PERT	\$96.04	\$144.60	\$183.07	The industry radiation safety officer labor rate calculated based on the BLS national hourly wages for health and safety engineers, except mining safety engineers and inspectors (17-2111) and physical scientist, all other (19-2099). A distribution for these two occupational classifications was created using the BLS 10 <sup>th</sup> , 25 <sup>th</sup> , 50 <sup>th</sup> , 75 <sup>th</sup> , and 90 <sup>th</sup> percentile wages. The means of these distributions were averaged to acquire the industry blended mean wage (\$51.49). A labor multiplier of 2.4 and an inflation factor of 1.05 were then applied, which resulted in the mean labor rate.
Agreement States Data						

igh Comments/Data Source	NRC website https://www.nrc.gov/agreement- states.html	NRC estimate. Assumes a low estimat of 0.2 FTE and a high estimate of 0.3 FTE.		<ul> <li>488 Obtained from the FY 2025 Budget. St</li> <li>488 hours are 2.1 FTEs. Each FTE has 1,5</li> <li>5 hours.</li> </ul>	NSTS and WBL data, modified by NR( staff adjustments to account for licensees affected by the rule.	Number of licensees affected by the ruusing an assumption of 1% growth per year.		7.5 Regional employee research.	0 Regional employee research.
e Esti	-	533		ho ho				ю 	
Best Estimate		444 hours		3,171 hours				30	0
Low Estimate		355 hours		2,854 hours				22.5	0
Distribution		PERT		PERT				PERT	PERT
Information Column	41	444		3,171	413	480	(2	30	1°
Inputs	Number of Agreement States	Agreement State rulemaking working group support	NRC Data	NRC hours to prepare and publish final rule per FY	Initial estimated number of NRC licensees affected by the rule for Alternatives 2 though 6a	Ending number (year 15) of NRC licensees affected by the rule	Rulemaking (Alternative 2	Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees that use table C-1 or C-2	Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees that use table C-1 or C-2

	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees that use an equation	40	PERT	30	40	20	Regional employee research.
Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees that use an equation	0	PERT	o	0	0	Regional employee research.
Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees that prepare a DFP due to the rule	80	PERT	60	80	100	Regional employee research.
Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees that prepare a DFP due to the rule	40	PERT	30	40	50	Regional employee research.
Financial instrument fee	0.0125					Assumption of 1.125% per year to maintain the financial instrument for the required DFA amount.
Total device dispositioning cost for licensees that use table C-1 or C-2	\$580,000,000)					Calculated by the NRC staff based on the estimated number of licensees eligible to use each device category in tables C-1 and C-2, multiplied by the staff's estimated dispositioning cost for each device type.

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
Total device dispositioning cost for licensees that use an equation	(\$270,000,000)					Calculated by the NRC staff based on the estimated number of licensees that use an equation as described in Appendix C. The staff estimated the number of licensees with various device types, multiplied by the staff's estimated dispositioning cost for each device type.
Total device dispositioning cost for licensees that prepare a DFP due to the rule	(\$350,000,000)					Calculated by the NRC staff based on the estimated number of licensees that are required to prepare a DFP, multiplied by the staff's estimated dispositioning cost for each device type.
Number of NRC licensees that use table C-1 or C-2	332					Calculated by the NRC staff by multiplying the known number of licensees by the fraction of licensees with each type of device in the tables. The staff then estimated the number of NRC licensees by multiplying by the ratio of NRC licensees to the total number of (i.e., NRC + Adreement State) licensees.
Number of NRC licensees that use an equation	6					Calculated by the NRC staff based on the estimated number of licensees that use an equation as described in Appendix C. The staff used the known number of licensees and NNSA database information to determine the fraction of licensees with each device type in certain activity ranges. The staff then estimated the number of NRC licensees by multiplying by the ratio of NRC licensees to the total number of
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Comments/Data Source	Calculated by the NRC staff based on the estimated number of licensees in categories specified by the alternative that would need to prepare a DFP, less the number already using DFPs. The staff then used the known number of licensees and NNSA database information to determine the fraction of licensees with each device type in certain activity ranges and estimated the number of NRC licensees by multiplying by the ratio of NRC licensees to total (i.e., NRC + Agreement State) licensees.	Total number of licensees in this category, as described in the rows above, multiplied by the ratio of Agreement State licensees to NRC licensees.	Total number of licensees in this category, as described in the rows above, multiplied by the ratio of Agreement State licensees to NRC licensees.	Total number of licensees in this category, as described in the rows above, multiplied by the ratio of Agreement State licensees to NRC licensees.		Regional employee research.
High Estimate						37.5
Best Estimate						30
Low Estimate						22.5
Distribution						PERT
Information Column	62	3,360	197	629	()	30
Inputs	Number of NRC licensees that prepare a DFP due to the rule	Number of Agreement State licensees that use table C-1 or C-2	Number of Agreement State licensees that use an equation	Number of Agreement State licensees that prepare a DFP due to the rule	Rulemaking (Alternative 3	Initial hours for NRC, Agreement States, and licensees to implement the new DFA requirements for licensees using a table of fixed DFA amounts

e Comments/Data Source	Regional employee research.	Regional employee research.	Regional employee research.	Assumption of 1.125% per year to maintain the financial instrument for the required DFA amount.	Calculated by the NRC staff by multiplying the known number of licensees by the fraction of licensees with each type of device in the tables. The staff then multiplied by the estimated dispositioning cost for each type of device.	
High Estimate	0	00	50			
Best Estimate	0	80	40			
Low Estimate	o	09	30			
Distribution	PERT	PERT	PERT			
Information Column	O	80	40	0.0125	(000'000'006\$)	
Inputs	Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees using a table of fixed DFA amounts	Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees that prepare a DFP due to the rule	Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees that prepare a DFP due to the rule	Financial instrument fee	Total device dispositioning cost for licensees that use a table of fixed DFA amounts	

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
Total device dispositioning cost for licensees that prepare a DFP due to the rule	(\$300,000,000)					Calculated by the NRC staff based on the known number of licensees and NNSA database information to determine the fraction of licensees in categories required by the alternative to prepare a DFP. The staff then multiplied by the estimated dispositioning cost for each type of device.
NRC Number of licensees that use a table of fixed DFA amounts	310					Calculated by the NRC staff by multiplying the known number of licensees by the fraction of licensees with each type of device in the tables. The staff then estimated the number of NRC licenses by multiplying by the ratio of NRC licensees to the total number of (i.e., NRC + Agreement State) licensees.
Number of Agreement State licensees that use a table of fixed DFA amounts	3,140					Calculated by the staff using the total number of licensees in this category, as described in the rows above, multiplied by the ratio of Agreement State licensees to NRC licensees.
Number of NRC licensees that need to prepare a DFP due to the rule	103					Calculated by the NRC staff based on the known number of licensees and NNSA database information to determine the fraction of licensees in the categories required by the alternative to prepare a DFP.
Number of Agreement State licensees that need to prepare a DFP due to the rule	1,047					Calculated by the staff using the total number of licensees in this category, as described in the rows above, multiplied

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
		-	_	-		by the ratio of Agreement State licensees to NRC licensees.
Rulemaking (Alternative 4	(1					
Initial hours for the NRC, Agreement States, and licensees that would use a parametric equation	40	РЕКТ	30	40	50	Regional employee research.
Recurring hours for the NRC, Agreement States, and licensees that would use a parametric equation	0	PERT	0	0	0	Regional employee research.
Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees that prepare a DFP due to the rule	80	PERT	00	80	100	Regional employee research.
Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees that prepare a DFP due to the rule	40	PERT	30	40	50	Regional employee research.
Financial instrument fee	0.0125					Assumption of 1.125% per year to maintain the financial instrument for the required DFA amount.

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
Total device dispositioning cost for licensees that use a parametric equation	(\$1,080,000,000)		-	-		Calculated by the NRC staff based on the estimated number of licensees that use the parametric equation as described in Appendix D. The staff estimated the number of licensees with various device types and multiplied by the staff's estimated dispositioning cost for each device type.
Total device dispositioning cost for licensees that prepare a DFP due to the rule	(\$120,000,000)					Calculated by the NRC staff based on the estimated number of licensees that are required to prepare a DFP, multiplied by the staff's estimated dispositioning cost for each device type.
Number of NRC licensees that use a parametric equation	372					The staff used the known number of licensees and NNSA database information to determine the fraction of licensees with each device type in certain activity ranges. The staff then estimated the number of NRC licensees by multiplying by the ratio of NRC licensees to the total number of (i.e., NRC + Agreement State) licensees.

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
Number of NRC licensees that prepare a DFP due to the rule	41					Calculated by the NRC staff based on the known number of licensees and NNSA database information to determine the fraction of licensees in categories required by the alternative to prepare a DFP. The staff then estimated the number of NRC licensees by multiplying by the ratio of NRC licensees to the total number of (i.e., NRC + Agreement State) licensees.
Number of Agreement State licensees that use a parametric equation	3,768					Calculated by the staff using the total number of licensees in this category, as described in the rows above, multiplied by the ratio of Agreement State licensees to NRC licensees.
Number of Agreement State licensees that prepare a DFP due to the rule	419					Calculated by the staff using the total number of licensees in this category, as described in the rows above, multiplied by the ratio of Agreement State licensees to NRC licensees.
Rulemaking (Alternative	5)					
Initial hours for the NRC and Agreement States to assess compliance for licensees that need to prepare a DFP due to the rule	80	PERT	60	8	100	Regional employee research.
Recurring hours for the NRC and Agreement States to assess compliance for licensees that need to prepare a DFP due to the rule	40	PERT	30	40	50	Regional employee research.
Financial instrument fee	0.0125					Assumption of 1.125% per year to maintain the financial instrument for the required DFA amount.

Comments/Data Source	Calculated by the NRC staff using an estimate of the number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.	Calculated by the NRC using the known number of licensees (all licensees prepare a DFP in this alternative).	Calculated by the NRC staff using the ratio of Agreement State licensees to NRC licensees.		Regional employee research.	Regional employee research.	Regional employee research.
High Estimate					37.5	o	100
Best Estimate					30	0	80
Low Estimate					22.5	o	60
Distribution					BERI	PERT	PERT
Information Column	(\$1,200,000,000)	413	4,187	3a)	30	0	80
Inputs	Total device dispositioning cost for licensees that prepare a DFP due to the rule	Number of NRC licensees that prepare a DFP due to the rule	Number of Agreement State licensees that prepare a DFP due to the rule	Rulemaking (Alternative t	Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees using a table of fixed DFA amounts	Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees using a table of fixed DFA amounts	Initial hours for the NRC and Agreement States to assess compliance for licensees that need to

Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
prepare a DFP due to the rule					<i>A</i>	
Recurring hours for the NRC and Agreement States to assess compliance for licensees that need to prepare a DFP due to the rule	40	PERT	30	40	20	Regional employee research.
Licensees that can use a table of fixed DFA amounts	4,480					Calculated by the NRC staff by multiplying the known number of licensees by the fraction of licensees with each type of device in the table.
Licensees that need to prepare a DFP due to the rule	120					Calculated by the NRC staff based on the known number of licensees and NNSA database information to determine the fraction of licensees in the categories required by the alternative to prepare a DFP.
Total cost for licensees that use a table of fixed DFA amounts	(\$1,090,000,000)					Calculated by the NRC staff using the estimated number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.
Total cost for licensees that need to prepare a DFP due to the rule	(\$110,000,000)					Calculated by the NRC staff using the estimated number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.
Rulemaking (Alternative 6	(di					
Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
---	-----------------------	--------------	-----------------	------------------	------------------	--
Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees using a table of fixed DFA amounts	30	PERT	22.5	30	37.5	Regional employee research.
Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees using a table of fixed DFA amounts	o	PERT	o	0	0	Regional employee research.
Initial hours for the NRC and Agreement States to assess compliance for licensees that need to prepare a DFP due to the rule	80	PERT	09	80	100	Regional employee research.
Recurring hours for the NRC and Agreement States to assess compliance for licensees that need to prepare a DFP due to the rule	40	PERT	30	40	50	Regional employee research.
Licensees that can use a table of fixed DFA amounts	1260					Calculated by the NRC staff by multiplying the known number of licensees by the fraction of licensees with each type of device in the table.

Comments/Data Source	Calculated by the NRC staff based on the known number of licensees and NNSA database information to determine the fraction of licensees in the categories required by the alternative to prepare a DFP.	Calculated by the NRC staff using an estimate of the number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.	Calculated by the NRC staff using an estimate of the number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.		Regional employee research.	Regional employee research.	Regional employee research.
High Estimate					37.5	0	100
Best Estimate					30	0	80
Low Estimate					22.5	0	60
Distribution					PERT	PERT	PERT
Information Column	140	(\$580,000,000)	(\$120,000,000)	ic)	30	0	80
Inputs	Licensees that need to prepare a DFP due to the rule	Total cost for licensees that use a table of fixed DFA amounts	Total cost for licensees that need to prepare a DFP due to the rule	Rulemaking (Alternative 6	Initial hours for the NRC, Agreement States, and licensees to implement the new DFA requirements for licensees using a table of fixed DFA amounts	Recurring hours for the NRC, Agreement States, and licensees to assess compliance/comply for licensees using a table of fixed DFA amounts	Initial hours for the NRC and Agreement States to assess compliance for licensees that need to

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Inputs	Information Column	Distribution	Low Estimate	Best Estimate	High Estimate	Comments/Data Source
prepare a DFP due to the rule					4	
Recurring hours for the NRC and Agreement States to assess compliance for licensees that need to prepare a DFP due to the rule	40	PERT	30	40	20	Regional employee research.
Licensees that can use a table of fixed DFA amounts	890					Calculated by the NRC staff by multiplying the known number of licensees by the fraction of licensees with each type of device in the table.
Licensees that need to prepare a DFP due to the rule	100					Calculated by the NRC staff based on the known number of licensees and NNSA database information to determine the fraction of licensees in the categories required by the alternative to prepare a DFP.
Total cost for licensees that use a table of fixed DFA amounts	(\$540,000,000)					Calculated by the NRC staff using an estimate of the number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.
Total cost for licensees that need to prepare a DFP due to the rule	(\$120,000,000)					Calculated by the NRC staff using an estimate of the number of licensees with each device type, multiplied by the estimated cost of dispositioning each type of device.

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# Appendix B—Summary and Tables of Costs for Alternative 6b by the NRC, Agreement States, and Industry

#### Table B-1 NRC Implementation

	Net	Benefits (Cost	s)
Activity	Undiscounted	7% NPV	3% NPV
Costs associated with research, public hearings, stakeholder engagement, and legal proceedings	(\$1,446,000)	(\$1,182,100)	(\$1,323,700)
NRC review of its licensees' financial assurance for licensees that use a table of fixed DFA amounts	(\$516,200)	(\$368,000)	(\$445,200)
NRC review of its licensees' financial assurance for licensees that prepare a DFP due to the rule	(\$152,900)	(\$109,000)	(\$131,900)
Total	(\$2,115,100)	(\$1,659,100)	(\$1,900,800)

# Table B-2 NRC Operation

	Net E	Benefits (Cost	s)
Activity	Undiscounted	7% NPV	3% NPV
NRC review of its licensees' financial assurance for licensees that prepare a DFP due to the rule (i.e., recurring updates to DFPs)	(\$418,500)	(\$167,100)	(\$277,400)
Total	(\$418,500)	(\$167,100)	(\$277,400)

# Table B-3 Agreement State Implementation

	Ne	t Benefits (Cost	s)
Activity	Undiscounted	7% NPV	3% NPV
Costs associated with research, public hearings, stakeholder engagement, and legal proceedings	(\$2,253,800)	(\$1,505,700)	(\$1,889,000)
Agreement States' review of their licensees' financial assurance for licensees that use a table of fixed DFA amounts	(\$4,373,300)	(\$2,917,300)	(\$3,662,900)
Agreement States' review of their licensees' financial assurance for licensees that prepare a DFP due to the rule	(\$1,295,800)	(\$864,400)	(\$1,085,300)
Total	(\$7,922,900)	(\$5,287,400)	(\$6,637,200)

#### Table B-4 Agreement State Operation

	Ne	et Benefits (Cost	s)
Activity	Undiscounted	7% NPV	3% NPV
Agreement States' review of their licensees' financial assurance for licensees that prepare a DFP due to the rule (i.e., recurring updates to DFPs)	(\$3,510,900)	(\$1,401,500)	(\$2,327,100)
Total	(\$3,510,900)	(\$1,401,500)	(\$2,327,100)
Table B-5 Indu	ustry Implementa	ition	

#### Table B-5 Industry Implementation

A 44++ik++4=	Total I	ndustry Costs (	Costs)
Auribule	Undiscounted	7% NPV	3% NPV
NRC licensees' labor expenditure incurred to determine the required DFA, using the table of fixed DFA amounts or by preparing a DFP	(\$628,400)	(\$448,000)	(\$542,000)
Financial assurance instrument initiation fee for NRC licensees	(\$3,234,100)	(\$2,305,900)	(\$2,789,800)
Agreement State licensees' labor expenditure incurred to determine the required DFA, using the table of fixed DFA amounts or by preparing a DFP	(\$5,669,100)	(\$3,781,700)	(\$4,748,300)
Financial assurance instrument initiation fee for Agreement State licensees	(\$32,765,900)	(\$23,361,600)	(\$28,264,200)
Industry Totals	(\$42,297,500)	(\$29,897,200)	(\$36,344,200)

#### Table B-6 Industry Operation

Catalogu	Total Inc	dustry Costs (	Costs)
Category	Undiscounted	7% NPV	3% NPV
Cost for maintaining a financial instrument for NRC and Agreement State licensees that use the table of fixed DFA amounts	(7,250,000)	(3,358,400)	(5,126,600)
Cost for maintaining a financial instrument for NRC and Agreement State licensees that prepare a DFP due to the rule	(1,500,000)	(694,800)	(1,060,700)
Cost for NRC licensees to revise a DFP every 3 years due to the rule	(418,500)	(167,100)	(277,400)
Cost for Agreement State licensees to revise a DFP every 3 years due to the rule	(3,510,900)	(1,401,500)	(2,327,100)
Total	(12,679,500)	(5,621,800)	(8,791,800)

Voor	Activity	Ne	t Benefits (Costs	)
Tear	Activity	Undiscounted	7% NPV	3% NPV
2028	NNSA Subsidy	7,500,000	\$5,347,396	\$6,469,566
2029	NNSA Subsidy	7,500,000	\$4,997,567	\$6,281,132
2030	NNSA Subsidy	7,500,000	\$4,670,623	\$6,098,186
2031	NNSA Subsidy	7,500,000	\$4,365,068	\$5,920,569
2032	NNSA Subsidy	7,500,000	\$4,079,503	\$5,748,125
2033	NNSA Subsidy	7,500,000	\$3,812,620	\$5,580,704
2034	NNSA Subsidy	7,500,000	\$3,563,196	\$5,418,160
2035	NNSA Subsidy	7,500,000	\$3,330,090	\$5,260,349
2036	NNSA Subsidy	7,500,000	\$3,112,233	\$5,107,135
2037	NNSA Subsidy	7,500,000	\$2,908,629	\$4,958,384
2038	NNSA Subsidy	7,500,000	\$2,718,345	\$4,813,965
2039	NNSA Subsidy	7,500,000	\$2,540,509	\$4,673,752
2040	NNSA Subsidy	7,500,000	\$2,374,308	\$4,537,623
2041	NNSA Subsidy	7,500,000	\$2,218,979	\$4,405,460
2042	NNSA Subsidy	7,500,000	\$2,073,812	\$4,277,145
Total		112,500,000	52,112,880	79,550,255

#### Table B-7 DOE/NNSA Subsidy

#### Table B-8 Industry Self-Ship Cost

Yoar Activity		Net Benefits (Costs)				
rear	Activity	Undiscounted	7% NPV	3% NPV		
2028	Industry Self-Ship Cost	(7,500,000)	(\$5,347,396)	(\$6,469,566)		
2029	Industry Self-Ship Cost	(7,500,000)	(\$4,997,567)	(\$6,281,132)		
2030	Industry Self-Ship Cost	(7,500,000)	(\$4,670,623)	(\$6,098,186)		
2031	Industry Self-Ship Cost	(7,500,000)	(\$4,365,068)	(\$5,920,569)		
2032	Industry Self-Ship Cost	(7,500,000)	(\$4,079,503)	(\$5,748,125)		
2033	Industry Self-Ship Cost	(7,500,000)	(\$3,812,620)	(\$5,580,704)		
2034	Industry Self-Ship Cost	(7,500,000)	(\$3,563,196)	(\$5,418,160)		
2035	Industry Self-Ship Cost	(7,500,000)	(\$3,330,090)	(\$5,260,349)		
2036	Industry Self-Ship Cost	(7,500,000)	(\$3,112,233)	(\$5,107,135)		
2037	Industry Self-Ship Cost	(7,500,000)	(\$2,908,629)	(\$4,958,384)		
2038	Industry Self-Ship Cost	(7,500,000)	(\$2,718,345)	(\$4,813,965)		
2039	Industry Self-Ship Cost	(7,500,000)	(\$2,540,509)	(\$4,673,752)		
2040	Industry Self-Ship Cost	(7,500,000)	(\$2,374,308)	(\$4,537,623)		
2041	Industry Self-Ship Cost	(7,500,000)	(\$2,218,979)	(\$4,405,460)		
2042	Industry Self-Ship Cost	(7,500,000)	(\$2,073,812)	(\$4,277,145)		
Total		(112,500,000)	(52,112,880)	(79,550,255)		

#### Appendix C—Detailed Description of Alternative 2

This appendix provides additional information about the approach described in section 4.2 for Alternative 2. That alternative would be implemented with a series of decision steps to determine which financial assurance requirement would apply. The decision steps would be applied sequentially until the decommissioning final assurance (DFA) requirement is determined (i.e., a licensee would stop following the decision steps once arriving at an applicable category).

- (1) Licensees of the following types would be required to submit a DFP:
  - manufacturers
  - distributors
  - waste collectors
  - licensees possessing a panoramic irradiator
  - licensees possessing a Category 1 or Category 2 sealed source or device<sup>53</sup> containing a radionuclide other than cobalt (Co)-60 or cesium (Cs)-137
  - licensees possessing a Category 3 source that meets any of the following criteria:
    - contains americium (Am)-241
    - will be dispositioned<sup>54</sup> in a device weighing more than 23 kilograms<sup>55</sup>
    - requires transportation in a Type B shipping container weighing more than 23 kilograms
- 2. Licensees that choose to self-ship eligible devices to the National Nuclear Security Administration (NNSA) for disposal would consult a table of DFA requirements based on information from the NNSA (table C-1):

#### Table C-1: DFA Requirements for Licensees Choosing to Send an Eligible Source or Device to the NNSA for Disposal

Radionuclide	Requires Device Disassembly	Requires Rental <sup>(a)</sup> of a Large <sup>(b)</sup> Type B Transportation Package	Financial Assurance Amount (2023 dollars)	Basis

<sup>&</sup>lt;sup>53</sup> The activity may be considered for a single source if the source can safely be removed from the device; however, if sources cannot safely be removed from the device, the source activity in the device should be summed.

<sup>&</sup>lt;sup>54</sup> Sources that will be removed from the device before shipping and disposal do not meet this criterion.

<sup>&</sup>lt;sup>55</sup> This is the maximum weight in the National Institute for Occupational Safety and Health (NIOSH) lifting equation.

Transuranic	No	No	1,000	\$1,000 packaging and transportation for a Type A container
		Yes <sup>(c)</sup>	230,000	\$130,000 container rental \$50,000 crane, rigging, labor \$50,000 transportation for a large Type B container
	Yes	No <sup>(c)</sup>	31,000	\$30,000 device disassembly \$1,000 packaging and transportation for a Type A container
		Yes	Yes <sup>(c)</sup>	260,000
Non-transuranic	No	No	20,000	Estimated transportation cost for a small Type B container
		Yes	230,000	\$130,000 container rental \$50,000 crane, rigging, labor \$50,000 transportation for a large Type B container
	Yes	No	50,000	\$30,000 device disassembly \$20,000 transportation for a small Type B container
		Yes	260,000	\$30,000 device disassembly \$130,000 container rental \$50,000 crane, rigging, labor \$50,000 transportation for a large Type B container

(a) This column pertains only to rental of a Type B transportation package. Licensees that have access to an appropriate transportation package (i.e., they own the container or borrow it from the device manufacturer) would use a "no" row in this table.

(b) For the purposes of this table, a large Type B transportation package is a package weighing more than 23 kilograms.

- (c) It is unusual for transuranic sealed sources to require either device disassembly or rental of a large Type B container.
- Licensees possessing the following types of sources or devices would consult a table of DFA requirements based on information from waste brokers and device manufacturers (table C-2):

stereotactic irradiator

portable gamma camera in the manufacturer's designated shipping container (either Type A or Type B, as required)

- Category 3 source that meets each of the following three criteria:
  - does not contain Am-241
  - does not require rental of a Type B shipping package weighing more than 23 kilograms

• will be disposed of either without a device or in a device weighing less than 23 kilograms

#### Table C-2: DFA Requirements for Licensees with Listed Sources or Devices

Source or Device Type	Financial Assurance (2023 Dollars)
Category 3 source meeting the three listed criteria	20,000
Portable gamma cameras in the manufacturer's shipping container	20,000
Stereotactic irradiator	1,000,000

4. Licensees possessing Category 1 or 2 cobalt-60 (Co-60) or Cs-137 sources in a device not specifically mentioned in steps 1 and 2 would use the equations in table C-3 to calculate DFA requirements.

### Table C-3: DFA Requirements for Category 1 or 2 Co-60 or Cs-137Sources or Devices Not Specifically Listed in Steps 1 and 2

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Device	Disposal Site	Location	DFA Calculation (2023 dollars)	Basis
	wcs	Texas Compact	\$230,000 + 1.1 × curies × \$50	\$230,000 includes \$130,000 container rental \$50,000 crane, rigging, labor \$50,000 transportation for a large Type B container
Requires rental of a large <sup>(a)</sup> Type B diapagal		Outside Texas Compact	\$230,000 + 1.3 × curies × \$50	Disposal approximated by WCS activity fee and different percentage fees for in- versus out-of-compact disposal
cask	U.S. Ecology	Northwest or Rocky Mountain Compact	\$280,000 + cubic feet ×\$200	<ul> <li>\$280,000 includes</li> <li>\$130,000 container rental</li> <li>\$50,000 crane, rigging, labor</li> <li>\$50,000 transportation for a large</li> <li>Type B container</li> <li>\$50,000 U.S. Ecology shipment</li> <li>fee, container fee, and ECB fee</li> </ul>
Does not	WCS	Texas Compact	\$20,000 + 1.1 × curies × \$50	\$20,000 fee based on transportation of a small <sup>(a)</sup> Type B shipping container <sup>(b)</sup>
require rental of a large <sup>(a)</sup> Type B		Outside Texas Compact	\$20,000 + 1.3 × curies × \$50	activity fee and different percentage fees for in- versus out-of-compact disposal
disposal cask	U.S. Ecology	Northwest or Rocky Mountain Compact	\$70,000 + cubic feet ×\$200	\$70,000 includes \$20,000 transportation for a small <sup>(a)</sup> Type B container <sup>(b)</sup> \$50,000 U.S. Ecology shipment fee, container fee, and ECB fee

Device	Disposal Site	Location	DFA Calculation (2023 dollars)	Basis
<ul> <li>(a) In this</li> <li>23 kilo</li> <li>maxim</li> <li>(b) Source</li> <li>assum</li> <li>corresp</li> <li>undere</li> <li>devices</li> </ul>	context, "large grams or less um weight in es or devices t ed not to requ conds to the r estimate dispo s in self-owne	e" containers we . Packages unde the NIOSH lifting that do not requi uire crane rental, nore common ca sitioning costs fo d Type B shippi	igh more than 23 kilograms er 23 kilograms were consig g equation. re rental of a large Type B rigging, or labor to remove ase of licensees disposition or a relatively small numbe ng containers.	s and "small" containers weigh dered portable based on the transportation cask were also the device from the building. T ing smaller devices and could of licensees that disposition la
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# Appendix D—Sealed Source/Device Disposition Funding Parametric Calculation Worksheet—Alternative 4

For Category 1–3 byproduct material sealed sources or devices with a half-life greater than 120 days, assign a cost factor for each section (A through E) based on planned source disposition.

Α.

Activity <sup>1</sup>	Cost Multiplier	Multiplier Used
A < Category 3	0	
Category 3 < A < Category 2	50	
Category 2 < A < 20x Category 2	150	
20x Category 2 < A < Category 1	450	
Category 1 < A < 10x Category 1	600	
10x Category 1 < A	DFP	

<sup>1</sup> Source/device activity values as a function of Category 1–3 thresholds based upon the International Atomic Energy Agency (IAEA) values (IAEA TECDOC-1344, "Categorization of Radioactive Sources," July 2003).

AF

Packaging	Cost Multiplier	Multiplier Used
Type A Shipping Container Needed	4	
Type B Shipping Container Needed	20	

Β.

Labor and Rigging	Cost Multiplier	Multiplier Used	
- Labor Only	2		
- Labor and Forklift	3		
- Labor and Crane	4		

D.

Destination	Cost Multiplier	Multiplier Used
- Manufacturer/NNSA	5	
- Commercial Disposal Facility	20	
- No Disposal Pathway	DFP required	

Ε.

<b>L</b> .			
	Transportation	Cost Multiplier	Multiplier Used
	- < 200 miles	1.05	
	- 200–1,000 miles	1.1	
	- > 1,000 miles	1.4	
	R		

#### C.

Calculate using Assigned Cost Multipliers:

Α.	Activity	x	
В.	Packaging	<u>x</u>	
C.	Labor and Rigging	<u>x</u>	
D.	Destination	<u>x</u>	4
E.	Transportation	<u>x</u>	
	<u>Subtotal</u>		
	Contingency Fee	<u>x</u>	
	Product Total		

If the Product Total is greater than 30,000, then DFA for sealed source/device disposition is required. The dollar value of the financial assurance is the product of the risk factors plus a contingency fee, if desired.