

Financial Planning for Radioactive Byproduct Material – Scoping Report

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## 1 Introduction

This enclosure provides the results of the U.S. Nuclear Regulatory Commission (NRC) staff's scoping study to evaluate whether financial planning requirements for decommissioning and end-of-life management for some radioactive byproduct material are necessary. It presents and analyzes various aspects of financial planning for radioactive byproduct material and summarizes stakeholder feedback received on this topic. This enclosure is intended to help inform future decision-making regarding whether the NRC should develop new or modified requirements and/or guidance in this area.

For the purposes of this scoping study, financial planning refers broadly to activities undertaken by a licensee to evaluate options and make decisions regarding the use of financial resources to safely and securely manage licensed radioactive material. Financial assurance refers to a financial instrument, or other financial arrangement, provided by or on behalf of a licensee that funds for end-of-life management of licensed radioactive material will be available when needed.

## 2 Background

### 2.1 General Background

End-of-life costs for the management of byproduct material, including Radioactive Sealed Sources (RSS), can be significant and unpredictable. The costs may include steps such as interim storage, packaging and conditioning, transportation, and costs associated with the selected disposition option. Disposition may include options such as return to the manufacturer or supplier for reuse or recycling, transfer to another licensee, disposal as Low-Level radioactive Waste (LLW), or, for some short half-life material, decay in storage for subsequent management and disposal. While the overall cost of disposition may be substantial and subject to considerable uncertainty, licensees are responsible for the safe and secure end-of-life management of their licensed material regardless of cost.

The NRC regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) 30.35, "Financial Assurance and Recordkeeping for Decommissioning," require a fixed dollar amount financial assurance or a Decommissioning Funding Plan (DFP) for licensees who possess byproduct material with a half-life greater than 120 days and at activity levels above certain thresholds. Activity thresholds are provided in 10 CFR 30.35 for both unsealed and sealed radioactive byproduct material. The sealed byproduct material thresholds in 10 CFR 30.35 for which financial assurance is required are seven orders of magnitude higher than for unsealed material and only affect a subset of Category 1 and 2 RSSs.<sup>1</sup> As a result, many licensees that possess Category 1 and 2 RSSs are not required to provide financial assurance for decommissioning. 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. Table 1 identifies

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<sup>1</sup> The International Atomic Energy Agency (IAEA) Safety Guide No. RS-G-1.9, Categorization of Radioactive Sources, identifies five categories of RSSs. The categorization system is based upon the relative health hazard a RSS would present if not kept under adequate controls. Category 1 and 2 RSSs present the greatest health hazard and are considered the most risk significant (RS-G-1.9 at 32).

the financial assurance thresholds in 10 CFR 30.35 that apply to byproduct material RSSs tracked in NRC's National Source Tracking System (NSTS) and the associated Category 1 and 2 thresholds.

**Table 1: Relationship of 10 CFR 30.35 Financial Assurance Requirements for Nationally Tracked Byproduct Material Radioactive Sealed Sources (*adapted with permission from comments provided by M. Klebe, the NRC Agencywide Documents Access and Management System [ADAMS] Accession No. ML15300A256*)**

Nationally Tracked Byproduct Material Sealed Sources	10 CFR 30 App. B	10 CFR 30.35 Sealed Source Possession Threshold for Financial Assurance		10 CFR 20 Appendix E Thresholds	
		Quantity Requiring Labeling $\mu\text{Ci}$ ( $10^{-6}$ Ci)	Fixed \$113,000 $10^{10}$ times App. B limit (Ci)	Cost Estimate Based $10^{12}$ times App. B limit (Ci)	Category 1 (Ci)
Actinium-227	0.1	1,000	100,000	540	5.4
Americium-241	0.01	100	10,000	1,600	16
Americium-241/Be	0.01	100	10,000	1,600	16
Californium-252	0.01	100	10,000	540	5.4
Cobalt-60	1	10,000	1,000,000	810	8.1
Curium-244	0.01	100	10,000	1,400	14
Cesium-137	10	100,000	10,000,000	2,700	27
Gadolinium-153	10	100,000	10,000,000	27,000	270
Iridium-192 <sup>1</sup>	10	n/a	n/a	2,200	22
Polonium-210	0.1	1,000	100,000	1,600	16
Promethium-147	10	100,000	10,000,000	1,100,000	11,000
Radium-226	0.01	100	10,000	1,100	11
Selenium-75 <sup>1</sup>	10	n/a	n/a	5,400	54
Strontium-90	0.1	1,000	100,000	27,000	270
Thorium-229	0.01	100	10,000	540	5.4
Thulium-170	10	100,000	10,000,000	540,000	5,400
Ytterbium-169 <sup>1</sup>	0.1	n/a	n/a	8,100	81

<sup>1</sup>Financial assurance not required for these isotopes, as their half-lives are not greater than 120 days as specified in 10 CFR 30.35.

A DFP would not be required for any of the radionuclides listed in Table 1 at the threshold level for a Category 1 radioactive source. A fixed dollar amount financial assurance of \$113,000 would be required for 10 of the radionuclides listed in Table 1 at the threshold level for a Category 1 radioactive source. No financial assurance would be required for seven of the radionuclides listed in Table 1 at the threshold level for a Category 1 radioactive source (including Cobalt-60 and Cesium-137, two of the most widely used RSSs), nor for any of the radionuclides listed at the threshold level for a Category 2 radioactive source. For licensees possessing multiple sources, the “sum of fractions” rule applies<sup>2</sup> when determining whether financial assurance is required under 10 CFR 30.35.

Licensees are not required to declare when RSSs in their possession are disused, nor are they required to provide for prompt disposition. If a licensee has not anticipated and planned for the cost of disposition, this may represent a significant financial burden. For some RSSs, including some Category 1 and 2 sources, disposal may not be a viable option for a variety of reasons, including lack of access to a LLW disposal facility that can accept the material and/or lack of a certified shipping container to transport the material. As a result, licensees may choose indefinite long-term secure storage as the most practical management option.

Adequacy of financial mechanisms for end-of-life management of disused Category 1 and 2 sealed sources was raised in a 2006 Radiation Source Protection and Security Task Force (Task Force) Report (ADAMS Accession No. ML062190349). The Task Force, comprised of 14 Federal agencies and the Organization of Agreement States (OAS), was created by the Energy Policy Act of 2005 to evaluate the status of various factors affecting the security of Category 1 and 2 sealed sources. This resulted in the 2006 Task Force report recommendation 9-2 that the NRC “evaluate the financial assurance required for possession of Category 1 and 2 radioactive sources to assure that funding is available for final disposition of the sources.” To address this recommendation, the NRC established an Interagency Working Group (IWG) on Financial Assurance for Disposition of Category 1, 2, and 3 Radioactive Sealed Sources in December 2008. The IWG’s final report and associated recommendations are discussed further in Section 2.3.

In the NRC staff’s 2007 “Strategic Assessment of the U.S. Nuclear Regulatory Commission’s Low-Level Radioactive Waste Regulatory Program” (ADAMS Accession No. ML071350291) (Strategic Assessment), financial assurance scoping for byproduct material was identified as one of seven high priorities. The Strategic Assessment identified the issue more broadly than the Task Force, whose charter was to focus on security related to Category 1 and 2 sources. In fact, the NRC staff proposed to also review the adequacy of financial assurance requirements for radioactive sources not addressed by the Task Force.

The 2010 Task Force Report (ADAMS Accession No. ML102230141) and a report by the Government Accountability Office (GAO-05-967, “DOE Needs Better Information to Guide Its Expanded Recovery of Sealed Radiological Sources”) noted that prolonged storage may

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<sup>2</sup> For example, a fixed financial assurance amount of \$113,000 applies to 10 CFR Part 30 licensees who are authorized to possess or use a combination of sealed sources with a half-life greater than 120 days if  $R$  divided by  $10^{10}$  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).

increase the chances that RSSs will become unsecured or abandoned. The 2010 Task Force Report also noted the completion of an evaluation in response to the 2006 Recommendation 9-2 that included a number of options such as the development of risk-based financial assurance requirements and lower financial assurance thresholds in 10 CFR 30.35. The report noted that the NRC would have to decide whether and when to pursue rulemaking to implement these regulatory changes.<sup>3</sup>

Two more recent drivers that prompted the NRC staff to initiate this financial scoping study were specific recommendations related to financial planning in the 2014 Task Force report (ADAMS Accession No. ML14219A642) and recommendations related to financial assurance in a March 2014 report issued by the LLW Forum Disused Sources Working Group (ADAMS Accession No. ML14084A394) (2014 Disused Sources Working Group report). These recommendations are discussed in detail in Section 2.3 of this enclosure.

During a September 18, 2014, Commission briefing on management of LLW, high-level waste, and spent nuclear fuel, the Director of the Division of Waste Management and Environmental Protection (now the Division of Decommissioning, Uranium Recovery, and Waste Programs) stressed the timeliness of a scoping study related to financial requirements for end-of-life management of byproduct material, in particular disused RSSs (transcript of "Briefing on Management of Low-Level Waste, High Level Waste and Spent Nuclear Fuel" is available at ADAMS Accession No. ML14265A396):

The 2007 programmatic assessment [i.e., the Strategic Assessment of the U.S. Nuclear Regulatory Commission's Low-Level Radioactive Waste Regulatory Program] included an activity to perform a scoping study of the need to revise or expand byproduct material financial assurance. Resource constraints unfortunately delayed that initiative. However, it has become more important and timely based upon the recommendation of the 2014 Radiation Source Protection and Security Task Force report as well as a report prepared by the Low-Level Waste Forum Task Group on disused cell [sealed] sources. And the staff now intends to focus on this important and emerging issue.

In its September 24, 2014, Staff Requirements Memorandum (SRM) (ADAMS Accession No. ML14267A365) in response to the briefing, the Commission stated that "[t]he staff should provide the Commission with the results of the byproduct financial scoping study and provide recommendations on next steps." The staff received subsequent administrative instructions to report the results of the scoping study and recommendations by April 13, 2015. The staff initially formed an internal working group of subject matter experts to complete the scoping study based on information that was readily available. However, upon further consideration, the staff determined that additional input from a broader spectrum of stakeholders would help in providing a fully informed Commission paper on the topic. Consequently, the staff requested extra time to engage stakeholders and the Commission granted that request

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<sup>3</sup> 2010 Task Force Report at 36.

## 2.2 Stakeholder Engagement

To help solicit broad stakeholder input, the staff issued a *Federal Register* notice (FRN) on August 3, 2015 (80 FR 46057, ADAMS Accession No. ML15120A342). The FRN stated that the NRC was conducting a scoping study to determine if financial planning requirements for decommissioning and end-of-life management for some radioactive byproduct material are necessary. The FRN noted that recent reports addressing this topic had been generated by a limited group of Federal and State stakeholders, and that the views and perspectives of important external stakeholders such as industry, users groups, and current licensees were needed to fully inform the scoping study and any subsequent NRC staff recommendations. In requesting feedback on the staff's scoping study, the FRN asked stakeholders to consider:

1. Recommendations from recent studies such as the reports by the Task Force and the LLW Forum Disused Sources Working Group (DSWG) mentioned above. These studies are discussed further in Section 2.3.
2. Relevant domestic activities. For example, developments such as the availability of additional LLW disposal capacity in Texas, experience in implementing initiatives such as the U.S. Department of Energy's (DOE) Off-Site Source Recovery Program and the Conference of Radiation Control Program Directors' (CRCPD) Source Collection and Threat Reduction (SCATR) program, and progress in addressing the shortage of certified Type B shipping containers. These activities are discussed further in Section 4.2.
3. Relevant international activities. For example, the International Atomic Energy Agency's (IAEA) efforts to develop guidance for managing disused sources as part of the Code of Conduct on the Safety and Security of Radioactive Sources. These activities are discussed further in Section 4.4.
4. Specific questions posed by the NRC staff in a number of topical areas relevant to financial planning. These included topics such as establishing funding requirements for dispositioning, timeliness in declaring disused sources, compatibility with Agreement State requirements, applicability to General Licensees (GL), and tracking. These topical areas, including a summary of the feedback received from stakeholders in each area, are discussed in various sections of Chapter 3 in this enclosure.

Staff also convened a public meeting and webinar at the NRC headquarters on October 7, 2015, to obtain stakeholder input on the NRC staff's scoping study. The meeting summary can be found in ADAMS at Accession No. ML15310A369. Approximately 44 individuals participated in the meeting, including 13 attendees at NRC headquarters and 31 participating remotely via webinar. Of the 44 participants, 9 were NRC staff members. Other meeting participants included representatives of the DOE, the National Institutes of Health, the Low-Level Radioactive Waste Forum (LLW Forum), several state regulatory agencies, the nuclear industry, public advocacy groups, and members of the public.

In addition to issuing an FRN and holding the public meeting noted above, staff conducted outreach activities to certain stakeholder groups with a known interest in this matter. On



August 21, 2015, staff issued a letter (STC-15-065, ADAMS Accession No. ML15219A465) to State Liaison Officers of all Agreement and Non-Agreement States to notify them of the staff's scoping study and the associated FRN. Staff attended meetings of the LLW Forum, CRCPD, the Health Physics Society, and the Radiation Source Protection and Security Task Force in 2015 to raise awareness of the scoping study and FRN. In addition, staff reached out to other stakeholders to promote awareness of the FRN including the OAS, DOE's National Nuclear Security Administration (NNSA), the Nuclear Energy Institute and other industry representatives, radioactive materials user groups, and prior attendees of certain NRC public meetings with a related focus.

The FRN comment period closed on October 19, 2015. Eleven commenters responded with significant sets of comments on a variety of relevant issues. A listing of comments received with the respective ADAMS accession numbers is provided in Section 7.1. These comments were used to inform the appropriate topical discussions in this enclosure. Stakeholder comments are specifically referenced as appropriate in the subsequent sections.

Most commenters were generally supportive of some type of increased financial planning requirements for RSSs. Opinions differed regarding the range of sources that should be covered, the appropriate time frame for disposition of unwanted sources, whether or not generally-licensed sources should be subject to financial planning, and what types of financial planning mechanisms would be appropriate under various licensing circumstances.

### **2.3 Key Reports and Recommendations**

In its FRN, the NRC staff highlighted three reports and their associated recommendations for respondents to consider when developing their comments. These reports are particularly relevant to the staff's scoping study and are briefly summarized below. These reports will be further referenced in subsequent sections of this enclosure as appropriate.

#### **A. The 2010 final report by the IWG on Financial Assurance for Disposition of Category 1, 2, and 3 Radioactive Sealed Sources (ADAMS Accession No. ML100050105).**

To address the financial assurance concerns raised in the 2006 Task Force Report, the IWG on Financial Assurance for Disposition of Category 1, 2, and 3 Radioactive Sealed Sources was established by the NRC in December 2008. The group, which included staff from the NRC, DOE, the U.S. Department of State, the U.S. Environmental Protection Agency, and three states, was tasked with proposing a comprehensive list of viable financial assurance solutions to increase the likelihood that Category 1, 2, and 3 RSSs would be disposed of in a safe, appropriate and timely manner. The IWG identified three main areas of concern:

1. Lack of disposal capacity for sources;
2. An inadequate supply of containers for transportation of these sources for final disposition/disposal; and
3. Storage of these sources by licensees for extended periods of time.

The IWG recognized that certain financial assurance options may mitigate, but not resolve, these concerns. In March 2010, the working group issued its final report (referred to throughout this enclosure as the IWG Report), which contained numerous recommendations including:

1. Develop risk-based financial assurance requirements and lower financial assurance thresholds in 10 CFR 30.35 to capture all Category 1, 2, and 3 RSSs;
2. Assess a universal surcharge on all licensees to cover the cost of disposal; and
3. Assess an up-front surcharge on all new Category 1, 2, and 3 sources to cover the entire anticipated cost of packaging and disposal.

The IWG Report was not made publicly available until 2015. However, similar recommendations, informed by the IWG Report, were articulated in the 2010 Task Force report. The IWG Report noted that each of these recommendations would require rulemaking, and that an alternative would be to focus directly on the main area of concern at the time – lack of disposal capacity. The report also noted that, as an unintended consequence, implementation of additional financial assurance requirements could discourage beneficial use of radioactive materials due to the increased financial burden.

B. The 2014 Task Force Report (ADAMS Accession No. ML14219A642).

The 2014 Task Force report highlighted that significant progress has been made to address the commercial sealed source management and disposal challenges identified in the 2006 and 2010 Task Force reports. In particular, disposal options for many commercial Class A, B, and C sealed sources are now available to LLW generators in all 50 states, including the 36 states which had been without such an option when the 2010 Task Force report was published. The 2014 Task Force report further stated that progress has also been made in addressing ongoing challenges regarding both the transportation and disposal of the highest activity sealed sources. The report noted that although disposal options for many sealed sources are now available, there are currently few incentives for generators to dispose of their disused sealed sources in a timely fashion. In addition, commercial disposal options are still unavailable for many Category 1 and 2 sources, and challenges remain regarding the availability of certified Type B shipping containers required for transport of these sources. Consequently, the 2014 Task Force report contained a specific recommendation, Recommendation 2, related to financial planning:

The Task Force recommends 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. Disposition costs should include the cost of packaging, transport, and disposal (when available) of these sources.

C. The 2014 DSWG Report (ADAMS Accession No. ML14084A394).

The DSWG – comprised of representatives from the DOE/NNSA, LLW Forum, Agreement States with LLW disposal sites, radioactive waste compacts, and industry – was formed to develop recommendations for improving the management of disused sealed sources that pose a threat to national security. The DSWG issued its final report and recommendations in March 2014. The report cites numerous factors that have contributed to the large number of disused radioactive sources that remain in storage, including a lack of financial incentives for disused sources to be dispositioned in a timely manner, underutilization of opportunities for recycling and reuse, and the fact that the full life-cycle costs of managing and ultimately disposing of sealed sources are not reflected in the purchase price. The report contains several recommendations for the NRC including the following:

1. To encourage timely disposal, the NRC should develop robust financial assurance requirements for all licensees with sources that pose a threat to national security (Categories 1 through 3). The financial assurance requirements should be adequate to cover the entire cost of packaging, transport, and disposal;
2. The NRC should amend its regulations to require a Specific License for all Category 3 sources; and
3. The NRC should expand the National Source Tracking System to track Category 3 sources.

In addition, the DSWG report provided other recommendations for the NRC to encourage reuse or disposal versus extended storage, adequately fund disposition of orphaned and abandoned sources, and prevent the accumulation of an excessive number of sources by manufacturers and suppliers.

## **2.4 Scope**

This enclosure provides a high-level, broad analysis of the major factors that may influence decision-making regarding whether the NRC should develop new or modified requirements and/or guidance for byproduct material financial planning. Discussion of these factors is informed by applicable NRC regulations, guidance, relevant stakeholder reports, and other stakeholder input. This analysis is not intended to provide the level of technical detail or regulatory analysis required to support rulemaking. If directed by the Commission to initiate rulemaking, the staff could use this analysis as a starting point to assist in developing the regulatory basis for a proposed rule.

While more than 99 percent of Category 1 and 2 RSSs tracked in the NSTS are byproduct material, a small percentage are special nuclear material or source material.<sup>4</sup> Financial assurance requirements for special nuclear material are provided in 10 CFR 70.25. Financial assurance requirements for source material are provided in 10 CFR 40.36. In conducting its

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<sup>4</sup> Plutonium-238 and Plutonium-239 sources are tracked in the NSTS and are special nuclear material. Thorium-228 sources are tracked in the NSTS and are source material.

analysis, the staff focused solely on byproduct material and the associated financial assurance requirements in 10 CFR 30.35.

After initial consideration, unsealed byproduct material was not evaluated further in this scoping study. Due to the significantly lower threshold for unsealed byproduct material financial assurance in 10 CFR 30.35, the staff concluded that these requirements did not need to be revisited at this time. In addition, stakeholder feedback as well as the recommendations of internal and external reports reviewed by the staff focused almost exclusively on financial assurance for RSSs. Stakeholders generally did not express concerns about financial assurance for unsealed byproduct material.

### **3 Technical Considerations**

#### **3.1 Decommissioning Financial Assurance Requirements and Funding Plans**

This enclosure is focused on dispositioning of disused or unwanted radioactive byproduct material, not site decommissioning. However, the basic concepts regarding implementation of financial assurance are the same.

In general, decommissioning refers to the safe removal of a facility or site from service with a reduction in residual radioactivity 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. Licensees that are required to provide financial assurance must do so in either a predetermined amount or an amount sufficient to cover the estimated cost of decommissioning before receiving the radioactive materials. Regulatory requirements for a DFP can be found in 10 CFR 30.35(e) and guidance for DFPs is provided in NUREG-1757, *Consolidated Decommissioning Guidance: Financial Assurance, Recordkeeping, and Timeliness*. 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 DFPs should be based on the costs required for an independent contractor to meet the criteria for unrestricted or restricted use and should include key assumptions used to develop the cost estimate; the method for assuring funds for decommissioning; the volume of material containing residual radioactivity that will require remediation; and 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 that is often associated with contamination levels, waste disposal costs, and other associated decommissioning costs. As noted in NUREG-1757, licensees who 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 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 NRC's decommissioning Timeliness Rule in 10 CFR 30.36 establishes requirements for notifying the NRC of pending decommissioning actions, submitting decommissioning plans, and completing decommissioning activities. As noted in NUREG-1757, the Timeliness Rule applies to situations when: (1) the licensee has decided to permanently cease principal activities at the entire site; or (2) no principal activities have been conducted for a period of 24 months, even if no decision has been made to permanently cease principal activities. NUREG-1757 states that the purpose of the Timeliness Rule is to avoid future problems and reduce potential risk, to the public and environment that may result from delayed decommissioning of inactive facilities and sites. Decommissioning must be completed as soon as practicable, but no later than 24 months after the initiation of decommissioning, unless a delay or postponement has been granted by the NRC.

As noted in Section 2.1, based on the current requirements in 10 CFR 30.35, a DFP would not be required for any of the radionuclides listed in Table 1 at the threshold level for a Category 1 radioactive source. A fixed dollar amount financial assurance of \$113,000 would be required for 10 of the radionuclides listed in Table 1 at the threshold level for a Category 1 radioactive source. No financial assurance would be required for seven of the radionuclides listed in Table 1 at the threshold level for a Category 1 radioactive source (including Cobalt-60 and Cesium-137, two of the most widely used RSSs), nor for any of the radionuclides listed at the threshold level for a Category 2 radioactive source.

### **3.2 Financial assurance methods and funding mechanisms**

There are three primary methods by which financial assurance for end-of-life management of radioactive material is typically assessed:

1. Assessing a fixed dollar amount based on quantity thresholds or other criteria, as is done in 10 CFR 30.35 for sealed and unsealed byproduct material not exceeding certain quantity thresholds;
2. Using a funding plan, such as the DFP required by 10 CFR 30.35 in some instances, that includes cost factors (e.g., storage, transportation, and disposal) based on a licensee's unique circumstances; and
3. Using a risk-based algorithm that takes into consideration factors such as isotope, half-life, activity, and other factors contributing to risk. Such a model is used in Florida and discussed further in Section 4.3.

NRC regulations in 10 CFR 30.35 establish financial assurance requirements for licensees to provide a fixed dollar amount at prescribed thresholds for certain types of byproduct material (i.e., at activity levels below the threshold for which a DFP is required). While having some advantages, such as providing regulatory certainty, fixed dollar amounts do not readily allow for changing conditions and may substantially underestimate the financial burden associated with dispositioning radioactive material. Further, if the fixed dollar amount is codified, a rule change would be required to modify it.

DFPs are an example of funding plans that include cost factors based on a licensee's unique circumstances. While such funding plans are more complex and resource intensive for both licensees to prepare and regulators to oversee, they are more likely to approximate the actual costs of end-of-life disposition (assuming a disposition path is available) and, thus, to ensure that licensees are adequately prepared for the associated financial burden.

A variety of financial assurance mechanisms may be used to meet the requirements in 10 CFR 30.35. These include, but are not limited to, prepayment, a surety method or insurance, letters of credit, self or parent company guarantees, and sinking funds. Prepayment is the deposit, prior to operations, into an account segregated from the licensee's assets and outside the licensee's administrative control of cash or liquid assets such that the amount of funds would be sufficient to pay decommissioning costs. A surety method may be in the form of a surety bond, letter of credit, or line of credit. A parent company guarantee of funds or guarantee of funds by the applicant/licensee for decommissioning costs based on a financial test may be used if the guarantee and test meet NRC requirements.

An external sinking fund is a fund established and maintained by setting aside funds periodically in an account segregated from licensee assets and outside the licensee's administrative control in which the total amount of funds would be sufficient to pay decommissioning costs at the time termination of operation is expected. An external sinking fund may be used in which deposits are made at least annually, coupled with a surety method, insurance, or other guarantee method, the value of which may decrease by the amount being accumulated in the sinking fund.

In the case of Federal, State, or local government licensees, a statement of intent may be used that contains a cost estimate for decommissioning and indicates that funds for decommissioning will be obtained when necessary.

NUREG-1757 provides extensive guidance for utilizing each of these mechanisms. While intended to support decommissioning, these mechanisms are likely transferrable to the development of financial plans for dispositioning RSSs. Some of the mechanisms allow the financial burden to be spread over long time periods and possibly a number of benefitting entities, which could be advantageous for some licensees.

In responding to the staff's FRN, some stakeholders commented on the potential attributes of financial plans for dispositioning RSSs. For example, the CRCPD Committee for Suggested Regulations for Bonding and Surety suggested that, "...[s]ealed sources/devices should require a modified decommissioning funding plan that would list the source identity, a method of disposal/transfer and a vendor quote for the cost of transport and disposal. Surety should also include the 25 percent contingency in between 3-year updates for the plan."

In his comments on this topic, Mr. Michael Klebe noted:

Instead of a two-threshold system and a fixed dollar amount, the NRC should establish a system where licensees must address the decommissioning expense for their radioactive material and facility at the time of licensing. Licensees should prepare a decommissioning funding plan and submit it for approval. The

NRC and Agreement States can then establish a minimum dollar threshold above which financial assurance is required.

### **3.3 Consideration of disposition paths other than disposal**

Disposition pathways other than disposal may be available and appropriate for some RSSs. These potential pathways include reuse, recycling, and the return of a source to the manufacturer or supplier. Financial planning considerations for these disposition pathways may be significantly different from those associated with disposal. For example, return of a source to the manufacturer or supplier may require a prior arrangement with the user, and in some cases may require a “one-for-one” exchange whereby the user returns a disused source and concurrently purchases a new source. There may be a need to revisit the terms and conditions of such relationships periodically, based on business needs and other factors.

There are commercial brokers/processors in the U.S. who are licensed to process some sources for recycling. In some cases, radioactive material can be harvested from one or more disused sources and reconstituted into a source that can be redeployed. Also, there are organizations such as CRCPD and commercial entities that can facilitate the transfer and reuse of some sources from one licensee to another.

In its FRN, the NRC staff asked stakeholders to comment on disposition options that may be available to various licensee types beyond the traditional disposal pathway and how such pathways should be considered in any potential new financial planning requirements. In response, several stakeholders noted that, while pathways other than disposal may be available, the most conservative approach is to base financial planning requirements on the assumption that disposal will be necessary. For example, the DSWG stated in its comments that:

Due to the age, activity, packaging, expired certifications and condition most sources cannot be recycled, so in general financial planning should not be based on the unlikely possibility of an alternative disposal pathway. Financial planning must always take into account the possibility that a governmental agency will have to step in and arrange for disposal and in such situations there must be financial resources in place to cover the full disposal costs.

Likewise, a respondent from the Wisconsin Department of Health Services noted that, “Our experience is that disposition pathways other than traditional disposal occasionally surface, but they are not reliable. Wisconsin is not aware of any alternate disposition pathways that should be considered when developing financial planning requirements.”

OAS noted in its comments that:

While reuse through donation/resale to another (licensed) facility could be considered as a possible alternate disposition pathway, a financial warranty for the entity originally purchasing the source would still be required. The possibility of donation is unlikely to be known at the time of source acquisition (or may

change with use of source over time), and therefore a pre-licensing/pre-amendment financial surety would still be needed.

In its comments on this topic, CRCPD's Committee for Suggested Regulations for Bonding and Surety noted that manufacturers and distributors could consider options such as leasing RSSs (with the lease agreement including provisions for financial surety), and that source recycling/transfers could potentially be facilitated through an exchange program using the CRCPD as the clearinghouse. The CRCPD Committee's comments also noted the importance of ensuring an adequate supply of approved transportation casks so that the return to manufacturer/distributor option would be available to any licensee.

One stakeholder noted that, as a broker/processor, it provides recycling cost estimates based on transportation packages that are currently available, transportation security measures, and other transportation costs. These costs vary depending upon the applicable regulations, fuel costs, available packaging, and recycling value.

### **3.4 Establishing Funding Requirements for Dispositioning**

Determining the appropriate amount of funding sufficient for the disposition of one or more RSSs can be a significant challenge. In doing so, one must estimate the costs associated with steps such as interim storage, conditioning and packaging for transportation and disposal, transportation, as well as the cost of disposal itself. As noted in stakeholder comments provided by Mr. Michael Klebe, other factors may include costs associated with removal of the device from service, removal of the source from the device, leak testing, site modifications necessary to access the source (e.g., building modifications needed to bring in a shielded cask), on-site security, shipping container rental or purchase, and a variety of other factors. In many cases it is difficult to establish accurate estimates for each of these elements, even with the most current information. In some instances the information simply is not available (e.g., for sources that do not have a viable disposal option or for which an approved transportation container is not available). Further, the marketplace is dynamic and there may be significant uncertainty regarding the stability of cost estimates, and thus the adequacy of financial surety over time. Some sealed sources have a service life of decades and can be extended even longer with re-encapsulation, when viable. Consequently, a funding amount for end-of-life disposition established up front will need to be periodically re-evaluated to ensure it remains adequate over time. In addition, changes in the marketplace regarding packaging, transportation and disposal options (among other factors) will need to be factored into updated financial planning estimates.

The cost of disposal for RSSs can be significant. As noted in the IWG Report, disposal costs at commercial facilities are generally based on complex formulas taking into account (among other factors) volume, weight, and radioactivity. Special fees, taxes, and surcharges also add to the cost. Disposal criteria often require that RSSs be encapsulated in an inert, stable medium such as concrete, which significantly increases disposal weight and volume. The resulting high disposal costs may pose a disincentive for licensees to promptly dispose of disused sources.



In some cases, it may be easier to estimate disposition costs for IAEA Category 3 and lower radioactive sources than for Category 1 and 2 sources, as disposal access is more readily available for Category 3 and lower sources.

For sources without a commercial disposal pathway, planning for end-of-life disposition and the associated funding estimates may involve coordination with source manufacturers, suppliers, and processors, and consideration of other options such as storage, reuse, or recycling. Again, the disposition options and related costs may be uncertain and may change over time.

In its FRN, the staff asked stakeholders to comment on what factors should be the primary considerations in establishing and imposing appropriate and equitable financial planning requirements for byproduct material. Numerous stakeholders commented that protection of human health and safety should be the primary concern in establishing financial assurance requirements. Several stakeholders observed that, absent a firm commitment for a less expensive disposition alternative, funding requirements should be based on the full cost of permanent disposal (including any related costs due to storage, conditioning, packaging, transportation, etc.). In addition, numerous stakeholders noted that financial planning estimates need to be periodically updated and reevaluated due to changing assumptions and costs associated with various disposition options.

The OAS noted in its comments on this topic that current comprehensive costs for disposal should be a primary consideration. OAS further stated that, "...[f]unds for continued security monitoring pending final disposal should also be included in financial planning. A bankrupt licensee may be unwilling or unable...to afford and uphold the necessary security requirements for Cat 1 and 2 sources." OAS also recommended that the required surety amount be adjusted annually for inflation and that licensees perform a 5-year review or resubmittal of cost estimates to demonstrate the validity of the surety amount.

The CRCPD's Committee for Suggested Regulations for Bonding and Surety opined in its comments that the state or Federal government should not be "...the 'collector' of any pooled or other funding. The least impact on licensees and regulators is best." In addition, the CRCPD Committee suggested that "...perhaps the business community will see this as an opportunity to provide a service to insure proper eventual disposal for all radioactive materials. Regulators would only need to verify proof of current bonding/insurance and beneficiary, instead of having to process complex financial paperwork for which we receive no training."

In its response to the staff's FRN, the DOE/NNSA noted that "...even when commercial disposal is unavailable, financial planning and financial assurances may still include processing, packaging, and transportation costs related to storage, recycle, or return to the manufacturer."

Finally, the DSWG noted the following in its comments on this topic:

All licensees including most currently under [general licenses] must be able to show that they understand their financial obligations and have a financial plan in place to cover disposal costs. If the disposal costs exceed available monthly discretionary funds, the licensee needs to have a funding instrument of some type in place. All licensees in possession of Category 1, 2 and 3 sources must

have a written financial plan and funding instrument such as a bond or letter of credit, with the possible exceptions of isotopes with <120 day half life, and sources possessed by government entities...

### **3.5 Life-Cycle Issues**

Implementation of any new or modified financial planning requirements for RSSs may need to address where a particular source is in its life cycle. For example, there may be different considerations in establishing requirements for the acquisition of new sources versus requirements for existing sources. For new sources, an up-front surcharge could be used, as described in the IWG Report, which recommended such a surcharge on all new Category 1, 2, and 3 sources to cover the entire anticipated costs of packaging and disposal. As stated in the IWG report, funds not used to cover disposition costs when the source becomes disused or unwanted would be returned to the source owner. If no disposition pathway exists, the source owner could access the funds for storage costs.

Licensees and applicants would have an opportunity to factor any costs related to end-of-life financial planning requirements into their business decisions prior to acquiring new sources. However, for existing sources that are already licensed, the licensee may or may not have conducted planning (and set aside appropriate funds) for end-of-life disposition. Some licensees may not have considered the full cost of disposition in making their business decision to acquire the source, or the cost of disposition may be difficult to estimate based on the uncertainties discussed in Section 3.4. Licensees may wish to consider (or reconsider) certain disposition options (e.g., return to supplier, reuse, recycling, transfer to another licensee, etc.) as part of the financial planning process. For all of these reasons, implementation of new financial planning requirements for existing licensees may be more complex than requirements for the acquisition of new sources. The potential financial impacts to existing licensees, as well as potential impacts on beneficial uses of radioactive materials due to the additional regulatory burden, will need to be carefully considered.

In their responses to the NRC staff's FRN, several stakeholders noted the potential benefits of additional financial planning requirements in ensuring that users consider disposition options and costs prior to acquiring a source. For example, the DOE/NNSA commented that:

Financial planning at the time of purchase promotes sealed source licensees to assess the full lifecycle cost and benefits of the sealed sources they are considering for use, including costs related to source disposition at the end of its use-life. For example, financial planning requirements could encourage both the seller and potential purchaser of sealed sources to clarify the conditions under which a device may be accepted for return to the manufacturer, including the costs to each party, and those under which it must be disposed by the licensee prior to completing the transaction. Similarly, such requirements could encourage licensees assessing costs related to sources that remain without commercial disposal pathways to be aware of any reuse or recycle options, including the transportation, processing, or other related costs.

### **3.6 Orphaned Sources**

As defined in the 2010 Task Force report, an orphan source is a radioactive source that is not under regulatory control, either because it has never been under regulatory control, or because it has been abandoned, lost, misplaced, stolen, or transferred without proper authorization. In order to provide financial assurance for orphan sources, a mechanism such as a “universal surcharge” could be employed. This option was discussed in the IWG Report and would involve assessing a small surcharge on a broad group of radioactive material licensees (i.e., not necessarily limited to RSS licensees) to cover the costs of disposal. As described in the IWG Report, the monies raised via this program would be held in a trust fund in order to prevent or mitigate the adverse effects of abandonment of radioactive materials, default on a lawful obligation, insolvency, or other inability by the possessors or users of radioactive material to manage its proper disposition. Such a solution would address a broad range of problematic disposition situations, but would have the disadvantage of spreading the cost burden to licensees who would not specifically benefit from the program.

Some states have established financial surety necessary for the proper disposition of abandoned or orphan sources. For example, the IWG Report noted that the state of Texas administers the Texas Radiation and Perpetual Care Fund for this purpose, as follows:

Monies for the Fund are from an additional fee assessed on the State’s radioactive materials licensees and administrative penalties collected by the enforcement program (from radioactive materials licensees as well as from the registrants of machine produced radiation)...Texas utilizes the monies in the Fund to pay for unexpected costs that fall outside of costs covered by a licensee’s primary financial assurance. These monies may be used to pay for the disposal of abandoned sources and to cover sites that have inadequate financial assurance.

The IWG Report recommended that, similar to the program in Texas, the Federal Government implement a universal disposal surcharge. However, the report noted that there were significant authority and implementation questions associated with this option that were unresolved. Establishing an equitable and appropriate surcharge would be challenging given numerous uncertainties. As noted in the IWG Report, there would also be significant challenges associated with the management and administration of the fund at the federal level. The number and characteristics of sources that would require disposition in any given year utilizing the resultant fund could be difficult to estimate, and the appropriate surcharge for various classes of licensees may need to be revisited periodically as conditions change. The experience of Agreement States in implementing similar programs would be highly valuable in further exploring the feasibility of a universal disposal surcharge system at the Federal level.

### **3.7 Characteristics and Qualifications of the Fund Custodian**

The NRC regulations in 10 CFR 30.35 allow the use of a variety of financial instruments and methods to satisfy financial assurance requirements for decommissioning, as discussed in Section 3.2. The NRC guidance in NUREG-1757 provides recommended wording and checklists to help ensure that the financial assurance mechanism chosen

by a licensee or applicant will be acceptable to the NRC. NUREG-1757 also contains evaluation criteria to be used by the NRC staff in reviewing the various financial assurance mechanisms. For example, in the case of a trust fund, the trustee should be an appropriate Federal or State government agency, or a financial institution whose trust operations are regulated and examined by a Federal or State agency. In addition, NUREG-1757 notes that the trustee should be able to access the full amount of coverage to conduct all decommissioning and/or site control and maintenance activities, among other criteria.

In its FRN, the NRC staff asked stakeholders to comment on the ideal characteristics and qualifications for an entity that will act as the custodian for any funds earmarked for long-term management of disused RSSs. For instance, the staff asked for comments on characteristics that should be taken into consideration regarding the custodian's relationship to the licensee (e.g., the ability of the custodian to access the funds, or the custodian's independent financial viability).

In response, comments provided by EnergySolutions noted that, "The NRC has an appropriate model for how best to manage funds in its existing regulations. EnergySolutions proposes that the approach to funding assurance contained in 10 CFR 30.35 is suitable...." Another industry stakeholder, JL Shepherd & Associates, expressed skepticism regarding the effectiveness of financial surety planning methods, and questioned whether the insurance industry would be willing to offer coverage for radioactive material incidents if such coverage was required for an expanded group of licensees. That commenter suggested one potential solution would be to amend the Price Anderson Act to include all radioactive materials licensees, or to create a new Federal funding vehicle.

The CRCPD's Committee for Suggested Regulations for Bonding and Surety provided the following response on this topic:

A preferable approach is for a 'trustworthy and reliable' third party bank, insurance provider, bonding agent, or other financial services organization willing to underwrite the surety or oversee the safekeeping of the funds.... If a joint fund, it must be a third party (not licensee) capable of providing the services required by the agreement. A plan something like the Price Anderson Nuclear Industries Indemnity Act...could work if a bank or financial institution were to oversee it. To maintain the level playing field, each contributor would never pay more than their appropriate share based on the amount of licensed material (via approved plan and cost estimate). The joint fund could be implemented on a federal or state by state level....

Comments from the OAS noted that the characteristics and qualifications of financial warranty arrangements for disused sources should be the same as for other financial warranty arrangements. The OAS agreed with the prevailing view among commenters that any residual funds should be returned to the licensee. The OAS further noted that funds for disposal and return of sealed sources could be included in the purchase price, and could be maintained by sealed source manufacturers or distributors.

### 3.8 Timeliness in Declaring and Dispositioning Disused Sources

Licensees may choose to store disused sources indefinitely due to the cost of disposal, lack of a viable disposal pathway, possibility of future reuse, ease of storage, or other factors. This issue was addressed in the 2014 Task Force report, which stated that current regulations provide only limited incentive for LLW generators to dispose quickly of sealed source waste. The report noted that disused RSSs require only limited storage space or in-storage maintenance and, in addition, commercial disposal of sealed source waste is costly. The report further acknowledged that, with commercial Class A, B, and C disposal options now widely available for many disused RSSs, a significant remaining challenge is to encourage generators to dispose of these sources in a timely fashion. In recommending that the NRC evaluate the need for Category 1 and 2 RSS licensees to address disposition/disposal financial planning, the Task Force noted that financial planning or similar requirements would likely decrease the time that these sources remain in storage.

The NSTS, a secure, web-based database designed to track Category 1 and 2 radioactive sources regulated by the NRC and the Agreement States, requires that licensees possessing Category 1 and 2 sources provide an annual accounting of such sources (i.e., whether each source is in the licensee's possession, has been transferred to another licensee, or has been disposed of). Licensees are encouraged, but not required, to declare the "use status" of sealed sources (whether a source is currently in-use or has become disused). On May 12, 2014, the NRC issued Regulatory Issue Summary (RIS) 2014-04 entitled "National Source Tracking System Long-Term Storage Indicator" (ADAMS Accession No. ML14100A152) to encourage licensees on a voluntary basis to provide the use status of their sealed sources that are in long-term storage. The 2014 Task Force report noted that providing use status information would benefit both licensees and regulators, in terms of improving the quality and efficiency of sealed source management and facilitating timely disposition.

In its March 2014 report, the DSWG noted that "...the current regulatory system and Federal/State programs do not promote prompt reuse, recycle, or disposal, and in some cases actually provide incentives for users to delay disposal of disused sources." The DSWG report also stated that current government programs, such as the DOE's Off-Site Source Recovery Project (OSRP) and CRCPD's SCATR program, may provide a safety net to assist with source collection and disposition but may also "provide an unintended disincentive for licensees to routinely plan and budget for disposal." In discussing factors that contribute to the extended storage of many RSSs, the DSWG cited the cost of disposition and lack of regulatory incentives for disposal. Among its recommendations to address this issue, the DSWG noted that:

Now that disposal access is available for most sources in the U.S., the NRC and the Agreement States should expand and make enforceable the [general license] storage limit regulation to address all Category 1 through 3 sources in storage for more than two years unless the licensee can make a clear demonstration of future use. There should be clear regulatory authority to direct the disposition (reuse, recycle, or disposal) of Category 1 through 3 sources after they have been stored for two years.

The DSWG also recommended that annual fees be imposed for each source in a licensee's possession to help incentivize prompt disposition rather than storage.

In its FRN, the NRC staff asked stakeholders to comment on whether licensees should be required to specifically declare disused sources and, if so, what an appropriate time frame would be for doing this. In their responses, a majority of stakeholders felt that NRC should require licensees to declare sources as disused, particularly Category 1 and 2 sources, and should place some time limits on doing so. Many stakeholders advocated for a 2-year limit, whereby a licensee would be required to declare a source as disused if it had not been used in the past 2 years and make plans for its disposition. Such a time frame would be consistent with the decommissioning timeliness requirements in 10 CFR 30.36, as noted by multiple commenters.

Some stakeholders also suggested that, once a source is identified as disused, a specific time frame should be established for its disposition. This would address the issue of licensees storing disused sources indefinitely to avoid further disposition costs. In its comments, the OAS stated that, "Unless the declaration of a source as 'disused' is tied to an obligation to have the source disposed of within a specified timeframe, having a licensee make such formal declaration would be of little benefit." Comments from the DSWG noted that "licensees should have a 2-year regulatory window from the time that sources become disused until they must be disposed of or an alternative disposition found."

However, a commenter from industry noted that in some fields – such as certain applications in the defense, aerospace, agricultural and medical industries – use of sealed sources is situational and not amenable to a fixed time frame for declaring a source as disused. Some activities involve sporadic source use coupled with long periods of disuse, and while the associated sources may be "disused" for long time periods they are essential to the activity. Forcing these types of licensees to divest themselves of useful sources to accommodate a regulatory requirement would be costly and inefficient. This commenter also noted that other factors, such as limited availability of Type B shipping containers, might make disposition within a 2-year period unrealistic.

This suggests the need for flexibility and situational awareness in establishing any new or modified financial planning requirements. Any initiative to impose a required time frame for use status declaration and disposition should allow accommodation of gaps in use that are associated with normal circumstances in a source's life cycle. For example, in the decommissioning area, there are provisions in 10 CFR 30.36 to extend the time period for initiating decommissioning if a licensee can demonstrate that the extension is not detrimental to public health and safety and is otherwise in the public interest. In addition, challenges related to transportation, availability of disposal options, and other potential barriers to timely disposal would need to be considered.

Multiple commenters noted that the voluntary request in RIS 2014-04 for licensees to provide the use status in the NSTS of their Category 1 and 2 sealed sources in long-term storage should be made mandatory. On this issue, the DSWG noted that "In its March 2014 report, the DSWG advocated that NRC and Agreement States should enhance the NSTS to include as a

*required* field the date last used of all sealed sources of concern and that these data should be validated during routine inspections.”

### 3.9 Source Characteristics that are Germane to Funding Considerations

Current financial assurance requirements in 10 CFR 30.35 are based on the types and quantities of licensed material possessed by a licensee. For example, financial assurance in the amount of \$113,000 is required for licensees that possess greater than  $10^{10}$  but less than or equal to  $10^{12}$  times the applicable quantities of Appendix B to Part 30 in sealed sources or plated foils. Aside from the type and quantity of radioactive material, source characteristics such as physical form, half-life, type of use, and remaining useful life may also be considered in developing financial planning requirements. For example, decay-in-storage may be an appropriate management strategy for some RSSs with a relatively short half-life. The equitable application (and removal) of financial planning requirements should be considered for sources that may decay below the quantities of concern.

As discussed in Section 4.3, the State of Florida employs a risk-based model that accounts for various source characteristics and calculates a financial assurance amount based on a licensee’s sources, in aggregate.

In its FRN, the NRC staff asked stakeholders to comment on how source characteristics should be factored into establishing equitable financial planning requirements for end-of-life management.

The CRCPD’s Committee for Suggested Regulations for Bonding and Surety has developed draft criteria for financial surety based on half-life, activity, type of material, and form (sealed sources, foil sources, unsealed material, etc.). As noted in their response to the NRC staff’s FRN, CRCPD’s Committee suggests the following approach:

There should be a requirement for financial surety on all sealed, electro-plated and foil sources of nuclides with a **half-life greater than or equal to 120 days**, and aggregate values greater than:

1. 10 mCi for alpha.
2.  $\geq 100$  mCi for non-portable/mobile Beta/gamma Sources. Includes Generally Licensed sources and devices.
3. All portable and mobile sources.
4. Category 1, 2, and 3 sources.

A table containing additional details regarding these proposed criteria is provided in the comments submitted by Ms. Anine Grumbles on behalf of the CRCPD Committee (ADAMS Accession No. ML15300A259).

In its response to the staff's FRN, EnergySolutions noted that, "...[r]isk can increase over time due to changes in licensee financial conditions even if the radiological risk is diminishing.... Licensees should be motivated to classify sources as disused and arrange for their proper disposal as soon as feasible, rather than relying on unreasonable assumptions regarding potential reuse."

In their comments on this topic, the DSWG noted that:

With the exception of short half-life isotopes, financial planning should cover the full disposal costs based on the activity at the time the financial planning is established. For <120 day half-life sources (ex. Ir-192), allowances can be made so that sources can decay to Class A waste levels while being properly managed prior to disposal...Management of waste that was initially Category 1 or 2 should be a licensed activity performed by a manufacturer, distributor or licensed waste management company that has appropriate security in place for larger quantities of material.

In its comments on this topic, OAS noted that financial surety amounts should be based on the full activity of a RSS, and may be adjusted downward during the periodic review process as the source decays. OAS also noted that even materials with relatively short half-lives will require safe storage, in some cases for many months, before decaying below quantity of concern levels or to background levels.

### **3.10 Tracking**

As noted in Section 3.8, the NSTS requires that licensees possessing Category 1 and 2 sources provide an annual accounting of such sources (i.e., whether each source is in the licensee's possession, has been transferred to another licensee, or has been disposed of). The NSTS tracks more than 76,000 sources held by about 1,400 NRC and Agreement State licensees. Of those sources, about 46 percent are Category 1 sources and 54 percent are Category 2. Tracking in NSTS spans the life cycle of the source from manufacture through shipment receipt, decay and burial. The NRC requires licensees who manufacture, transfer, receive, disassemble, or dispose of a nationally tracked source to complete and submit a National Source Tracking Transaction Report (see 10 CFR 20.2207). The NSTS enhances the ability of the NRC and Agreement States to conduct inspections and investigations, communicate information to other government agencies, and verify legitimate possession and use of nationally tracked sources.

One of the action items from the 2006 Task Force report (Action 11-3) was to conduct a comprehensive analysis on the inclusion of Category 3 sources in the NSTS. The action was closed in the 2010 Task Force report, which noted that the NRC had prepared a draft final rule that "...contained a comprehensive analysis of inclusion of Category 3 sources into the NSTS...After consideration of the public comments and deliberation, the Commission did not proceed with issuance of the final rule to expand the NSTS."

In its March 2014 report, the DSWG noted that the NSTS only includes a small percentage (approximately four percent) of the sealed sources licensed in the U.S. The DSWG noted that



“A comprehensive, mandatory system is needed for tracking the number, type, location, and date last used of all such sealed sources” and recommended that the NRC expand the NSTS to track Category 3 sources.

In its FRN, the NRC staff asked stakeholders to identify the key characteristics of a tracking system for byproduct material subject to financial planning requirements, and to specify which of these characteristics are not available as part of the NSTS.

In response, some stakeholders recommended that the NSTS be expanded to include Category 3 sources. Comments from the DSWG suggested that “[...]general licensees] in possession of large sources or a large number of sources should be converted to [specific licensees] so that they may be tracked more effectively.” Some stakeholders felt that the NSTS should be used to track compliance with financial planning requirements, while other felt that a separate tracking system should be used. For example, OAS noted that, “[k]ey characteristics would be the model and serial number, current activity, and an indicator of disuse.... This information should be in a separate system, not the NSTS.”

CRCPD’s Committee for Suggested Regulations for Bonding and Surety noted in its comments that “...if [financial] surety shifts from flat fees after exceeding a threshold to an amount based upon a decommissioning funding plan [DFP], NSTS will not need anything further. These DFP’s would be available for review at IMPEP.”

### **3.11 Applicability to General Licensees**

The requirements for an NRC general license for certain byproduct material are provided in 10 CFR Part 31, *General Domestic Licenses for Byproduct Material*. For example, 10 CFR 31.5 issues a general license to certain users to acquire, receive, possess, use or transfer, in accordance with other applicable NRC provisions, byproduct material contained in devices such as gas chromatograph units, fixed gauging devices, static eliminators, tritium exit signs, and many other devices. Distributors of generally-licensed devices must have a specific license from the NRC or an Agreement State. The NRC’s general license requirements require the registration of devices containing certain radionuclides above threshold limits that are specified in 10 CFR 31.5(c)(13)(i) (e.g., 10 millicuries of Cs-137, 1 millicurie of Co-60, etc.). In addition, GLs may not hold devices that are not in use for longer than 2 years. Devices kept in standby for future use are excluded from the 2-year time limit if the general licensee performs quarterly physical inventories of these devices while they are in standby. Additional information regarding general licenses can be found in NUREG-1556, Volume 16, *Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Licenses Authorizing Distribution to General Licensees - Final Report*.

In SECY-10-0105, the NRC proposed a final rule to limit the quantity of byproduct material in a generally licensed device to below one-tenth of the IAEA Category 3 thresholds. Individuals possessing devices with byproduct material at or above this threshold would have been required to obtain a Specific License. The basis for the staff’s proposed final rule was, in part, due to concerns that had been raised by Congress, the GAO, and Agreement States regarding the safety and security of generally licensed devices, including the potential for aggregation of lower activity sources to higher activity levels. In SRM-SECY-10-0105 (issued December 2, 2010),

the Commission disapproved the publication of this final rule. In its SRM, the Commission approved revising the compatibility categories of 10 CFR 31.5 and 31.6 from B to C, which permitted Agreement States to impose more stringent requirements on GLs at their discretion. The Commission also required the staff in SRM-SECY-10-0105 to "...leverage the General License Tracking System to monitor for aggregation of sources of concern and take action as appropriate to increase source security by the issuance of orders to the GLs that possess IAEA Category 1 and 2 quantities."

In its FRN, the staff asked stakeholders to consider the applicability of financial planning requirements to GLs and requested feedback regarding what mechanism should be used, if such requirements were needed.

A number of stakeholders suggested that, if financial planning requirements were based on radionuclide quantity limits (e.g., as in 10 CFR 30.35, which references quantities in Appendix B to Part 30), then the requirements should apply regardless of whether a source is specifically or generally licensed.

Some Agreement States have imposed additional requirements on GLs. For example, as noted in comments provided by the DSWG, Colorado has a comprehensive general license registration and annual self-certification program, and a requirement for specific licenses for some Category 3 sources that may be generally licensed per NRC regulations.

In his comments on this topic, Mr. Michael Klebe suggested that:

The NRC should eliminate the general license. Radioactive material should either be exempt or specifically licensed...Absent that, the NRC should reconsider the general license quantity limits. It doesn't seem appropriate that persons can possess quantity of concern radioactive material under a general license.

In its response, the DSWG noted:

Financial planning requirements need to be applied to persons who are currently generally licensed. Since financial planning is not consistent with the GL concept, general licensees who possess sources that require financial planning should be required to be specifically licensed.

At a minimum all Category 3 GL devices should be specifically licensed, but to adequately address financial planning the Commission should consider a lower activity threshold such as 10 percent of Category 3, Category 4, or the current activities that require registration. Alternatively generally licensed devices should be done away with altogether.

Similar comments were received from CRCPD's Committee for Suggested Regulations for Bonding and Surety, which noted that, "...[a]ll material should either be specifically licensed or exempt from regulation! Given the current regulatory environment, any GL sources or devices meeting the basic criteria should at least be under license or registration by an Agreement State

or NRC in order to determine and oversee adequate financial surety.” Similar comments were also received from the OAS and the Wisconsin Department of Health Services, which further noted that, “...the general license program is not set up to handle additional requirements. In addition, sources requiring financial planning should be subject to routine inspections to ensure said planning is still required and satisfactory.”

### **3.12 Compatibility with Agreement State Requirements**

An expansion of financial assurance requirements for RSSs would likely have significant impacts on the NRC and Agreement State regulatory programs and resources. If the NRC amends its financial assurance regulations for byproduct material, effective engagement with the NRC’s Agreement State partners would be important from the early stages of rulemaking to ensure that these impacts, including the effects of compatibility requirements, are well understood.

Compatibility categories for NRC regulations are established in the Office of Nuclear Material Safety and Safeguards Procedure SA-200, “Compatibility Categories and Health and Safety Identification for NRC Regulations and Other Program Elements.” As a reference, a Compatibility Category “A” or “B” designation means the Agreement State program element should be essentially identical to that of the NRC. A Compatibility Category “C” designation means the Agreement State should adopt the essential objectives of the requirement to avoid conflicts, duplications or gaps, but the manner in which the essential objectives are addressed need not be the same as the NRC. A Compatibility Category “D” designation means the requirement does not need to be adopted by an Agreement State for purposes of compatibility. The Compatibility Category “Health and Safety” (H&S) identifies requirements that are not required for compatibility, but which have particular health and safety significance. Agreement States should adopt the essential objectives of such H&S requirements in order to maintain an adequate program.

The current compatibility categories associated with various provisions of 10 CFR 30.35 are Category “D” and Category H&S. These compatibility levels have afforded Agreement States the flexibility to implement financial planning requirements that go beyond those in 10 CFR 30.35.

The 2014 Task Force report noted that, should the NRC pursue rulemaking to implement Task Force Recommendation 2 regarding source disposition/disposal financial planning, “...the rulemaking process should carefully consider the compatibility category assigned to the rule, recognizing the importance of Agreement States maintaining flexibility in developing a compatible requirement that meets or exceeds the NRC standard.”

In its FRN, the NRC staff asked stakeholders to comment on how the NRC should engage with and consider the impact on Agreement States of any rulemaking initiated subsequent to this scoping study. The staff also asked for comments regarding what factors it should consider in establishing compatibility levels for any rule requirements.

In response, stakeholders noted that the NRC should involve all affected parties in any potential rulemaking, including Agreement States and the regulated community. Respondents from

Agreement State regulatory agencies, as well as the OAS, particularly stressed the need for the NRC to engage Agreement States in the decision-making process related to any rulemaking to understand the impacts on state regulatory programs. For example, OAS noted in its comments that:

1. As with other rulemakings, NRC should consider forming a working group to work with Agreement States in the development of proposed rule requirements.
2. The Board recommends that the NRC maintain compatibility C for financial assurance requirements. Financial planning is an area that States need to have the ability to innovate. There are existing 'financial planning' programs in States (i.e., Illinois), and States need to maintain the ability to be more restrictive than the NRC on this issue.
3. In determining compatibility, the NRC should consider the impact to states in terms of review of financial assurance documents on an ongoing basis for a greatly increased number of licensees and the number of additional full time equivalents that it may require.
4. If the NRC sets hard dollar values based on isotopes and activities and expects the states to be compatible with those values at an A, B, or C level the NRC should commit within regulation to updating those values on a regular basis to account for inflation as well as changing conditions (availability of disposal sites, transportation packages, etc.).

CRCPD's Committee for Suggested Regulations for Bonding and Surety, as well as a respondent on behalf of the Wisconsin Department of Health Services, recommended Compatibility Category C for any proposed rulemaking on financial assurance, with comments similar to those noted above from the OAS. The CRCPD Committee stated in its comments that, "...it is important that all states meet basic criteria, however, the wording may differ and States could be more conservative and impose additional requirements, but not less."

In its comments, the DSWG also recommended that any new rulemaking on financial assurance be assigned Compatibility Category C and noted that "...some proposed financial planning solutions may be too labor-intensive for smaller state programs, so in that case these states may need to opt into a federal program rather than have their own."

In its comments on this issue, EnergySolutions noted that:

In this case, we believe that the issues of transboundary impacts should carry significant weight. Sealed sources are manufactured and stored in many states, and used in all states. It does not seem rational that the standards for financial assurance should vary from state to state when the risk does not. As such, the compatibility requirement should be B.

## **4 Other Issues**

### **4.1 Security Considerations**

Since September 11, 2001, there has been increased emphasis on security considerations regarding the possession and use of radioactive material. The NRC issued a series of orders followed by a regulation, 10 CFR Part 37, *Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material*, to ensure continued security of RSSs and to prevent malevolent activities that may result from their loss, theft, or sabotage. The Radiation Source Protection and Security Task Force (Task Force) is chartered to evaluate issues regarding the security of Category 1 and 2 radioactive sources. The issue of financial planning for disposition of Category 1 and 2 sources has been covered in each of the three Task Force reports that have been issued to date. As noted in Section 2.3, the 2014 Task Force report contained a specific recommendation, Recommendation 2, related to financial planning. While there are requirements in 10 CFR Part 37 that facilitate continuous security (background checks, physical protection, etc.), the Task Force noted in their 2014 report that financial planning for end-of-life management would “encourage timely disposal of disused and unwanted sealed sources and improved sealed source management and disposal practices.”

### **4.2 Relevant National Activities**

This section provides a brief overview of a number of domestic issues and activities that may be relevant to decision-making regarding financial planning requirements for RSSs. The landscape regarding management and disposal of radioactive materials in the U.S. is dynamic, and many of these areas will likely continue to experience significant changes.

#### **4.2.1 Disposal Access**

At the end of their useful life, many RSSs will be classified as Class B, C or Greater-Than-Class-C (GTCC) radioactive waste per the classification criteria in 10 CFR 61.55. The DOE has statutory responsibility for development of disposal capacity for GTCC waste, which cannot be disposed of in currently-licensed commercial LLW disposal facilities. In its 2016 final Environmental Impact Statement (EIS), the DOE evaluated several GTCC disposal methods including deep geologic disposal at the Waste Isolation Pilot Plant (WIPP), enhanced near-surface disposal, intermediate depth disposal, and use of above-grade vault facilities. As described in the final EIS, DOE’s preferred alternative for disposal of GTCC waste is the WIPP geologic repository and/or land disposal at commercial facilities. Prior to making a final decision on which disposal alternative to implement, DOE will submit a Report to Congress to fulfill the requirement of Section 631(b)(1)(B)(i) of the Energy Policy Act of 2005 and await action by Congress.

Until 2012, commercial disposal of RSSs was limited to LLW Compact Facilities near Barnwell, South Carolina, and Richland, Washington, which precluded LLW generators in 37 States from disposing of disused RSSs. Further, disposal at these facilities was subject to Waste Acceptance Criteria (WAC) that excluded some higher activity sources. The opening of the Waste Control Specialists LLC (WCS) site in Andrews County, Texas, in 2012 allowed generators in all States (not just members of the Texas Compact) the option for disposal of

some Class B and C RSSs (such as some cesium-137 sources, which are particularly important from a risk-reduction perspective). Disposal of out-of-compact waste at the WCS site is subject to certain Texas Low Level Radioactive Waste Disposal Compact Commission restrictions and site WAC. In addition, in 2011 the Texas Commission adopted administrative procedures to ensure that disused sealed sources from small generators (such as hospitals, universities, and industrial licensees) are allocated disposal capacity within the annual non-party volume and curie limits set by Texas legislation. In its initial year of operations, the Texas Commission was able to accommodate all the requests for non-party sealed source disposal that were deemed eligible.

Disposal at the Barnwell facility continues to be subject to the constraints of the Atlantic Compact, while disposal at the Richland facility is subject to the constraints of the Northwest Compact. These facilities may accept RSSs from within their respective compacts that meet the facility WAC. The Richland facility can accept naturally occurring radioactive material from sources outside the compact. This includes discrete radium sources notwithstanding its redefinition as byproduct material. Disposal at the EnergySolutions facility in Clive, Utah, is limited to Class A LLW.

To the extent disposal of RSSs is available at the facilities discussed above, this helps significantly in preparing end-of-life financial planning estimates. However, disposal access may not be available due to a variety of factors such as transportation container availability, waste form, activity level, and other characteristics. For example, a gap exists between the upper limit of Class C RSSs that meet commercial disposal site WAC and the lower threshold of GTCC sources eligible for management by the DOE. Therefore, a licensee may have the financial resources to dispose of a RSS only to have the source be unsuitable for commercial disposal and not be considered GTCC waste. As noted in the IWG Report, "The lack of disposal access poses a significant challenge in determining adequate levels of financial assurance, as financial assurance should be based on expected decommissioning costs, and without disposal capacity, it is difficult, if not impossible, to determine reasonable future decommissioning costs." Any imposition of financial planning requirements for sources for which there is no current disposal pathway would have to accommodate this unknown.

Publication of the NRC's *Revised Concentration Averaging and Encapsulation Branch Technical Position* (ML12254B065), which increased the recommended activity limit for Cs-137 disposal from 30 curies to 130 curies, should help facilitate disposal of additional Cs-137 sources. Application of this Branch Technical Position should also facilitate disposal of a greater number of other types of Class B and C RSSs at commercial LLW disposal facilities, assuming these sources can meet the site-specific WAC.

#### **4.2.2 DOE/NNSA Source Recovery and Disposal Programs**

The OSRP is sponsored by the DOE/NNSA and is managed at Los Alamos National Laboratory (LANL) through the Nuclear Engineering & Nonproliferation Division. The OSRP's mission is to remove excess, unwanted, abandoned, or orphan RSSs that pose a potential risk to health, safety, and national security. The initial scope of the Project included any sealed sources comprising GTCC radioactive waste. However, the mission was later expanded to address broader public safety and national security requirements. In addition to transuranic sources, the

expanded OSRP mission now includes recovery of beta/gamma emitting sources. In total, the OSRP has been able to recover more than 35,700 sources from more than 1250 sites, resulting in more than 1.57 Million Curies of radioactive material being removed and secured.<sup>5</sup>

The costs borne by DOE/NNSA's OSRP to perform source recovery can be significant. The IWG Report noted that, at the time, the average cost per OSRP recovery was about \$60,000. The range of recovery costs for irradiator devices with greater than 1800 Ci of Cobalt-60 was \$54,000-\$140,000, with an average of about \$82,000. Cesium-137 irradiator recovery costs averaged about \$42,000 for smaller devices (for approximately 250 Ci of material).

DOE/NNSA also provides funding for the SCATR program, which is administered by CRCPD. The SCATR program is an initiative to reduce the amount of unused radioactive material stored by licensees by providing assistance or advice regarding disposition of disused or unwanted sources. The SCATR program's goal is to collect sources being stored and not used that pose a threat to public health and safety and could possibly be used for malicious intent. The SCATR program provides cost-shared support for the packaging, transport, and disposal of Class A, B, and C sources with access to a commercial disposal facility. The program is targeting a 45 percent cost-share amount for 2014-2015 program participants. Licensees in all 50 States and U.S. territories are potentially eligible for program participation. The CRCPD works with LANL and the DOE/NNSA to arrange for disposition of these radiation sources.<sup>6</sup>

In responding to the NRC staff's FRN, the DOE/NNSA noted that additional financial planning requirements could help reduce the future resources required to operate the OSRP and SCATR programs, as follows:

National security concerns after September 11, 2001, as well as the significant constraints on commercial LLRW disposal options, resulted in an increase in government involvement in efforts to address commercial sealed source management and disposal challenges; however, increased government assistance is not sustainable. Financial planning could help ensure licensees are prepared to utilize available commercial disposal options, thereby helping to transition the full lifecycle management costs for sealed sources to licensees and limiting the need for government involvement.

Other stakeholders generally agreed that, while the OSRP and SCATR programs are valuable and necessary at this time, they can create unintended consequences in terms of proper financial planning for and prompt disposition of RSSs by licensees. Some of these considerations were summarized in the March 2014 DSWG report, as follows:

...an unintended consequence of both the GTRI/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 through the SCATR and GTRI/OSRP programs they may not bear the full cost of disposal as these programs may subsidize the

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<sup>5</sup> Information obtained from <http://osrp.lanl.gov>.

<sup>6</sup> Information obtained from <http://www.crcpd.org/StateServices/SCATR.aspx>.

packaging, transport, and disposal of sources. This may result in several adverse consequences.

First, since the life-cycle cost of using sealed sources is being artificially lowered through government subsidies, licensees may be obtaining more sources than they otherwise would. Second, these programs provide an economic incentive for the licensee to store sources waiting for the next “roundup” program to avoid having to pay the full cost of packaging, transport and disposal of their disused sources.

Several stakeholders noted that upfront financial planning should help to ensure that the entity receiving the benefits from the use of RSSs is also responsible for the costs related to safe and secure disposition of those RSSs.

#### **4.2.3 Transportation**

While there have been recent positive developments related to the transportation of some disused RSSs that may improve the reliability of cost estimates, significant challenges and uncertainties remain. Many RSSs are “Type B” quantities of radioactive material that require Type B packaging for transportation per 10 CFR Part 71, *Packaging and Transportation of Radioactive Material*. Type B packages must undergo a rigorous DOE and/or NRC certification process, which is both costly and time consuming. In recent years, there have been challenges in maintaining and expanding the fleet of Type B packages. The 2010 Task Force Report, Recommendation 8, addressed this issue as follows: “The Task Force recommends that the U.S. Government enhance support of short-term and long-term research and development of certified Type B containers for use in domestic and international source recovery efforts.”

New sealed source transportation containers were available for use beginning in 2014. However, the 2014 Task Force Report noted that a shortage remained of Type B shipping containers required to transport Category 1 and 2 radioactive sources. The 2014 Task Force Report acknowledged efforts by DOE/NNSA to facilitate the design, development, testing, and certification of two Type B packages to support the recovery and transportation of RSSs commonly used in irradiators and cancer treatment devices. The report also noted that development and production of new transportation packages is a multi-year project, with the regulatory approval process alone taking up to 18 months.

In response to the staff’s FRN, a number of commenters cited continuing challenges regarding the availability and expense of Type B packages for transfer of certain radioactive sources. Some commenters noted the sun setting of some reliable packages without suitable replacements being made available. For example, as part of comments provided by the DSWG, JL Shepherd & Associates noted that:

If ...the source is a Type B shipment, transportation container options are extremely limited, due to wattage or Curie limitations for Cs-137 & Co-60. With the current Summer 2015 suspension of 2 Models of Type B packages, transportation options are even scarcer. Of even more importance, is the scarcity of Type B packages that can ship sealed sources direct to a commercial



waste disposal site, without an on-site source transfer into a burial container (LANL/OSRP shipments excepted from this statement).

Uncertainty regarding the availability and cost of transportation, particularly for RSSs requiring Type B transportation containers, can complicate the financial planning process for RSS disposition. Additionally, in some cases a RSS may require transfer from a transportation package to a disposal package, and LLW site operators may not be licensed to affect such a transfer.

#### **4.3 Agreement State Requirements for Financial Assurance**

Some Agreement States have instituted more stringent requirements than those contained in 10 CFR 30.35 to address the cost of disused and orphan RSS packaging, transport, and disposal unrelated to facility decommissioning. As noted below, Texas, Illinois, and Florida are among those states with more robust provisions for RSS disposition, although these provisions vary in terms of their purpose, mechanisms, and thresholds for requiring financial assurance. These initiatives at the State level demonstrate the potential feasibility of developing expanded financial assurance requirements for RSS disposition and could help to inform future NRC actions in this area. The following are examples of State financial assurance provisions:

1. The State of Texas has promulgated financial assurance regulations that adopt the major requirements in 10 CFR 30.35.<sup>7</sup> In addition, as noted in the IWG Report, Texas assesses a surcharge to licensees to support the Texas Radiation and Perpetual Care Fund. Monies for the Fund are from an additional fee assessed on the State's radioactive materials licensees and administrative penalties collected by the enforcement program. There is no cap on the amount of penalties accrued in the Fund. Texas utilizes the monies in the Fund to pay for unexpected disposition costs that fall outside of costs covered by a licensee's primary financial assurance. These monies may also be used to pay for the disposal of abandoned sources and to cover sites that have inadequate financial assurance.
2. The State of Illinois has established financial assurance requirements for general and specific licensees possessing sealed sources in quantities greater than one Curie.<sup>8</sup> For small licensees there is a fixed financial assurance requirement. For larger licensees, the amount is based on a reclamation plan with a cost estimate and financial surety estimate. As noted in the IWG report, Illinois also assesses a Radioactive Material Recovery and Remediation Fee on most licensees. The purpose of collecting these fees is to pay for recovery and remediation if the licensee, and/or their surety, is unable to provide funds for recovery and remediation in a timely manner.
3. The State of Florida has adopted a risk-based system to establish financial assurance requirements for radioactive material. Risk factors for purposes of bonding include the radioisotope, activity, physical form, half-life, and type of licensee facility. Multipliers that

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<sup>7</sup> Texas Health and Safety Code, Subtitle D, Nuclear and Radioactive Materials: Chapter 401, Radioactive Materials and other Sources of Radiation: Subchapter H, Financial Provisions.

<sup>8</sup> Illinois Title 32, Energy Chapter ii, Emergency Management Agency Subchapter B: Radiation Protection, Part 326.

reflect relative risk are used to establish the level of a performance bond. Additional information can be found in the IWG Report, Enclosure 2, where Florida's program is discussed in detail. Florida also has a Radiation Protection Trust Fund that is funded with a percentage of annual licensing and inspection fees to cover costs associated with licensee bankruptcy and orphaned sources.

#### **4.4 Relevant International Activities**

The issue of financial planning for RSS disposition has been the subject of efforts by the international community. IAEA Nuclear Energy Series No. NW-T-1.3, *Management of Disused Sealed Radioactive Sources*, was released in November 2014 and summarizes the information distributed in previous IAEA publications. This document also provides an up-to-date, overall picture of the management of disused RSSs based upon the current status and trends in this field. Section 5.5 of the document addresses aspects of financing including cost distribution, cost uncertainty, and financial implications of the lack of availability of an ownership transfer path.

The NRC staff has also been involved in efforts to develop the IAEA document *Guidance on the Management of Disused Radioactive Sources* as part of an effort to implement related recommendations of the *Code of Conduct on the Safety and Security of Radioactive Sources*. Paragraph 22(b) of the *Code of Conduct* notes that every State should ensure that its 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." Staff has participated in multiple meetings with other international technical experts to prepare this draft IAEA guidance document, which will be circulated for Member State review in 2016. Financial planning for disposition of disused radioactive sources is addressed in the draft guidance document, which includes suggested roles and responsibilities for a Member State's regulatory body to ensure that adequate financial provisions are in place to support safe and secure management of such sources.

Further, the *Joint Convention on the Safety of Spent Nuclear Fuel and on the Safety of Radioactive Waste Management* requires that Contracting Parties (CP) address aspects of end-of-life RSS management. Article 28 requires CPs to ensure that the possession, remanufacturing, or disposal of disused sealed sources takes place in a safe manner. Further, a CP is required to allow for reentry of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess them. The U.S. is a CP to the Joint Convention and hosts several international source manufacturers and distributors.

Both IAEA guidance and Joint Convention requirements stress the importance of source return to manufacturers and suppliers as a disposition option, as manufacturers and suppliers are typically well-equipped to manage radioactive sources and evaluate options for further reuse or recycling. This option may involve the repatriation of sources that were manufactured in one country and exported for use by a licensee in another country. Close coordination is required in such situations to adhere to potentially differing statutory and regulatory requirements of each country, including requirements for import/export of radioactive materials.

The IWG Report noted the following regarding international financial assurance practices:

The financial assurance strategies used varies across Member States, especially with respect to disused sealed sources. However, the common method is returning the source back to the manufacturer and having the licensee pay. In many cases, the licensee may be another governmental entity, in which case there is a transfer of funds or else the cost is absorbed by the Government as a whole. Additionally, many countries assess a fee on all licensees (not just those using RSSs) to create a Decommissioning and Dispositioning Fund that is utilized for the dispositioning of sources held by private firms. The Republic of Korea utilizes this type of fund to cover financial liability. In some instances, the licensee and the licensee's Government each contribute monies to such a fund to cover dispositioning costs (e.g., Brazil). Switzerland's Government shares storage costs with the owner or licensee, and the Government pays the costs associated with orphaned sources.

A 2007 report by GAO (GAO-07-221, *Low-Level Radioactive Waste Management: Approaches Used by Foreign Countries May Provide Useful Lessons for Managing U.S. Radioactive Waste*) noted that 9 of 18 countries surveyed indicated that their nuclear regulatory authorities require all non-utility LLW generators to set aside sufficient financial reserves to cover waste disposition costs. The GAO report further noted that, as a means to reimburse the government for orphan source recovery costs, 5 countries indicated that RSS users have established common funds to pay the LLW disposition costs. Two countries indicated that recovery funds have been established by RSS suppliers to cover disposition costs. For example, in France, the association of source suppliers and manufacturers contribute to a common fund to reimburse the Government for recovering RSSs from any supplier or manufacturer that is unable to disposition them. In cases where the supplier cannot be identified, the Government is reimbursed by an insurance system implemented by the source manufacturers.

## **5 Implementation Considerations**

### **5.1 Benefits of Radioactive Sealed Source Financial Planning**

RSSs are widely used in diagnostic and therapeutic medicine, research, agriculture, industry, and government. Financial planning by licensees for end-of-life management and disposition of RSSs helps ensure that timely disposition will occur, particularly if resources for such management are in place and earmarked for that use. In addition, upfront financial planning helps ensure that costs related to the use of RSSs are borne by those who receive the associated economic benefits.

On this topic, the DOE/NNSA noted in their response to the staff's FRN:

Financial planning could help to address several significant commercial sealed source management challenges that have long been a concern from a national security, public health, and safety perspective, including timely disposal of disused sources and sealed source lifecycle cost transparency. Sealed source-specific financial planning and financial assurance requirements have the potential to both encourage and facilitate the timely disposal of these and other common Category 1, 2, and 3 sealed sources...In addition, financial planning mechanisms that require licensees to be financially prepared and able to appropriately disposition disused and unwanted sources would help ensure that responsibility for commercial sealed source management rests with those who benefit economically from the use of the material.

Similarly, the 2014 Task Force report noted that financial planning for RSS disposition is likely to have several beneficial impacts, although these impacts may vary according to the financial assurance mechanism adopted. The report stated that financial assurance requirements are likely to decrease the time that commercial sealed sources remain in storage because the funds necessary for source disposal will be immediately or quickly available. Further, the report noted that requiring licensees to assess and account for expected RSS disposition costs will facilitate broader awareness regarding the financial and logistical factors associated with the packaging, transport, and disposition of Category 1 and 2 RSSs. Finally, the report stated that financial planning requirements will help to ensure that costs related to the use of RSSs are borne by those who receive the associated benefits.

In responding to the staff's FRN, numerous commenters noted the positive effect that upfront financial planning could have on ensuring timely, safe disposition of RSSs. In addition, the Nevada Division of Environmental Protection noted in its comments that:

Requiring the user community to bear the cost of financial assurance for packaging, transport, and disposal is likely to both reduce the generation of disused sealed sources and make the cost of sealed sources more comparable to non-radioisotopic alternative technologies. Additionally, financial assurance requirements will increase the availability of commercial disposal options, thereby reducing the need for use of the NNSS in Nevada as a default location for disposal of sealed sources containing cobalt-60 and cesium-137.

As noted in Nevada's comments, for some applications there are alternative technologies that can be used to substitute for the use of radioactive sources. Some stakeholders have suggested that the lack of financial planning requirements for some RSSs has essentially subsidized the use of radioactive material for certain applications, and has negatively affected the economic viability of nascent alternative technologies. These stakeholders have argued that additional financial planning requirements would ensure the full cost of using radioactive material is considered when comparing RSS applications with non-radioactive alternative technologies.

## **5.2 Potential Impacts of Additional Financial Planning Requirements**

Off-setting the potential benefits of additional financial planning requirements on RSS licensees are the possible negative effects on the beneficial uses of radioactive material due to increased regulatory costs. If the NRC pursues rulemaking in this area, such costs and benefits would be evaluated in detail as part of the rulemaking process. However, it is reasonable to assume that any new requirements could shift the financial burden of planning for RSS disposition to earlier in the source's lifecycle than planned for at least some licensees. In addition, the cost of additional regulatory oversight by the NRC or Agreement States would be passed on to the regulated community.

Information provided in the IWG Report, as well as anecdotal discussions with state and Federal partners and industry, indicates that the cost of disposition of unwanted RSSs, if a pathway is available, can range from hundreds of dollars to hundreds of thousands of dollars per source. Disposition costs for some licensees may be daunting and, at worst, prohibitive. For new sources, licensees/applicants would be able to evaluate these costs when making business decisions regarding whether or not to acquire a source. However, implementation of any new requirements for existing sources would need to carefully consider potential adverse impacts to the regulated community and to those who receive the benefits of radioactive material use. New requirements could potentially increase the number of disused sources if some existing licensees determine that the costs associated with implementing these requirements outweigh the associated benefits.

While a majority of stakeholders responding to the staff's FRN were in favor of additional financial planning requirements, a few stakeholders noted the potential for adverse impacts. For example, one commenter from industry stated:

...applying the fixed cost, let alone any financial assurance for the sealed sources below the current financial assurance quantities has little merit relative to the complexity and costs incurred by the regulator and licensees. We believe increasing the cost of owning materials will only introduce new complexities and higher regulatory costs.

Another commenter from industry noted:

We fully acknowledge that there are some problem licensees and manufacturers...however we believe that there can be unintended consequences for the majority of the responsible licensees, whether they are governmental, private or commercial.... We believe that there should be some way to approach the problem in a phased, important to safety type and safety culture type approach that would be fair to the responsible licensees.

## **5.3 Potential Impacts on Regulators**

Administration by the NRC and Agreement State regulatory agencies of any additional financial planning requirements for a new subset of licensees may significantly increase resource requirements. Regulators would need to develop or amend regulatory guidance associated with

new or modified requirements. In addition, regulatory agencies would need to acquire expertise or provide training to supplement existing professional expertise in the area of financial planning and financial assurance. Inspection procedures would have to be developed or supplemented in order to verify licensee compliance with new or updated financial assurance requirements. Resource impacts for regulatory agencies will largely depend on the nature of any new requirements, how many licensees are affected, and the level of expertise required to evaluate licensee compliance with the new requirements. Such impacts will be evaluated in detail should the NRC elect to pursue rulemaking in this area.

## **6 Summary**

The issue of financial planning for disposition of RSSs is complex and multi-faceted. This enclosure provides an overview of many of the important parameters that may be considered in future decision-making on this issue. Discussions of these parameters have been informed by a number of reports and studies as well as feedback from a variety of stakeholders collected as part of the NRC staff's scoping process.

The NRC has regulatory requirements in place to ensure the safe and secure management of RSSs. While long-term storage of RSSs in accordance with applicable NRC requirements is an acceptable practice, the staff recognizes that early financial planning is a best management practice and should facilitate timely, safe and secure disposition when RSSs become disused.

In reviewing reports on this topic and the positions stated by various state and Federal agencies and international safety organizations, there is general agreement that financial planning for end-of-life RSS management supports safety and security goals, facilitates timely disposition, and ensures that the full cost of acquiring and using RSSs is appropriately considered. However, the implementation of new requirements would impose additional regulatory costs and has the potential to adversely affect beneficial uses of radioactive material. Careful planning would be needed as part of any future regulatory actions in this area to consider, as appropriate, the numerous complex issues discussed in this enclosure.

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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 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."

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