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Financial Planning for Management of Radioactive Byproduct Material

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Financial Planning for Management of Radioactive Byproduct Material

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## General Comment

See attached file(s)

## Attachments

MK Response to 2015 NRC FRN FA-FP October 2015

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Template = ADM - 013  
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Add= *R. White (ARX2)*  
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October 16, 2015

Docket ID NRC-2015-0182  
U.S. Nuclear Regulatory Commission  
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**Re: Financial Planning for Management of Radioactive Byproduct Material**

Thank you for the opportunity to provide input to the U.S. Nuclear Regulatory Commission's Scoping Study on Financial Planning for Management of Radioactive Byproduct Material. These written comments are an expansion of, and in addition to, the oral comments I made at the October 7, 2015 public meeting held in Rockville, MD.

During my tenure with an Agreement State Program (Illinois Emergency Management Agency), I reviewed numerous submittals from licensees regarding decommissioning funding plans and financial assurance instruments. I was actively involved with the forced license termination for a radioactive waste broker that included seizing the posted financial assurance instrument and conducting the decommissioning activities. I am also a member of the Conference of Radiation Control Program Director's (CRCPD) Suggested State Regulations Committee for Surety (SR-S).

Financial assurance (FA) is an important safety net for the regulating agency (NRC or Agreement State Program) should a licensee fail to properly terminate their radioactive material license. FA provides no real benefit to the licensee. All FA instruments (surety bonds, letter of credit, cash set aside, etc.) are pledged to the regulating agency and are not an asset the licensee can access when needed for decommissioning. In determining who should have FA and how much is a balancing act between probability and risk:

- What is the probability that the licensee will fail to meet their obligation to properly terminate their radioactive material license?
- What is the financial risk to the regulating agency to decommission the licensee's facility and dispose of any waste/contaminated equipment and facilities?

These comments will focus on some general FA issues and provide responses to the specific questions posed in the Federal Register notice.

Thresholds for Requiring Financial Assurance

The current NRC regulations base whether or not a licensee is required to have FA on the quantity of radioactive material their license authorizes and the form the material is in (loose form vs. sealed source). For radioactive material with a half-life greater than 120 days, FA is required when the licensee possesses quantities in loose form exceeding  $10^5$  times or in sealed sources exceeding  $10^{10}$  times the quantity set forth in Appendix B to Part 30.

As it relates to sealed sources, the possession threshold for radioactive material requiring financial assurance is set too high. This will be discussed in additional detail in response to question 5 below. The NRC requires all Category 1 and 2 sources to be reported to the National Source Tracking System. Of these 20 radionuclides, 0 Category 1 sealed sources at the category threshold meets the requirement for a cost estimate based financial assurance ( $10^{12}$  time the Appendix B to Part 30 quantity). Fourteen of the twenty Category 1 sources at the category threshold meet the requirement for the fixed \$113,000 FA amount ( $10^{10}$  times the Appendix B to Part 30 quantity). Six of the Category 1 sealed sources at the category threshold have no required FA. None of the Category 2 sources at the category threshold require FA.

If a sealed source is risk significant enough to require tracking through the National Source Tracking System it is risk significant enough to require financial assurance.

An alternative way to establish the quantity threshold for requiring FA is a program similar to that established in the state of Florida. Florida has established a risk equation to calculate the appropriate amount of FA a licensee needs. This equation has factors that include the radionuclide, its half-life, its activity, facility size, radioactive materials use procedures and the physical form. Risk multipliers are established for each of these factors. The risk multipliers are then multiplied together with the resulting product being the dollar amount of financial assurance required. Florida requires their licensees to post a bond when the risk product exceeds 30,000.

In essence, the state of Florida has defined their level of risk tolerance at \$30,000 since all licensees whose risk product exceeds \$30,000 must post financial assurance. Some may see some arbitrariness to the risk multipliers assigned by the state of Florida. One way to avoid this is to require all radioactive material licensees to prepare a decommissioning cost estimate based on the possession limits in their radioactive material license. Any licensee whose estimate exceeds the financial risk threshold of the regulating agency must post FA.

Adopting a risk based approach allows each regulatory agency to establish their own financial risk tolerance level.

Financial Assurance Based on a Cost Estimate

Current NRC regulations have fixed FA dollar amounts for certain quantities of radioactive material. Utilizing a fixed dollar amount exposes the regulator to needless potential risk. All FA should be based on a cost estimate.

Fixed dollar amounts established in regulations rarely reflect the actual cost of decommissioning a facility or dispositioning radioactive material. These fixed amounts are frozen in time. The current fixed amounts in 10 CFR 30.35 have remained the same since 2003. In order for fixed amounts to stay current frequent rulemakings are required.

All cost estimates need to include a contingency factor to account for unseen conditions and account for cost escalation between cost estimate re-evaluations. Cost estimates must be re-evaluated regularly. The state of Colorado requires formal re-evaluation annually. A frequency not to exceed 3 years seems appropriate.

#### Financial Assurance Instruments

The financial assurance instruments break down into 2 basic categories: cash value or commitment. Instruments such as prepayment, surety bond or letter of credit all render cash to the regulating agency should the licensee fail to properly terminate their radioactive material license and the FA instrument is seized by the regulating agency. This is the most convenient and expeditious means to ensure that proper termination can occur. Commitment type FA instruments, such as self-guarantee and parent company guarantee, do not yield funds for the regulator. They only provide a potential legal battle for the regulatory agency to in order to compel the guarantor to perform the requisite action.

These commitment type instruments should be eliminated. All FA instruments should yield cash funds for the regulatory agency. Based on the recent experience in Illinois, if the regulator had to go to court to compel the licensee to perform the closure activities it would not have gotten done as quickly as it did.

#### Long Term Storage of Sealed Sources and Radioactive Material

Unused radioactive material, sealed sources or loose form, should not be allowed to be stored indefinitely without a demonstrated future use. It is easy to lose control of the material or the material can be lost or stolen.

A case in point is Riverside Hospital in Kankakee, IL. They ceased their brachytherapy program in late 2003. Their 14 Cs-137 sources were kept locked in a safe and regularly inventoried and leak checked. The sources were last inventoried in July 2009. When the licensee went to inventory the sources in July 2010 the safe containing the sources could not be located. It turns out the building the safe was stored in was remodeled in December 2009. The safe is presumed to be disposed in a landfill in Indiana.

The 14 sources had a decay corrected activity of 372 mCi. Based on the manufacturer's safety sheet the sources emit 3.6 mR/h per mCi at 1 foot. These 14 sources, which could easily fit in a film canister, would emit 1.34 R/h at 1 foot. This happened at an active licensee with an active radiation safety program. If it can happen at this facility, it can happen at any licensee. Had there been a limit on extended storage this may not have happened.

The NRC should institute a 2 year storage limit for all radioactive material. If the radioactive material has not been used in that time period, the licensee must demonstrate a need to continue to keep the

material or make plans to dispose of the material. This should be an item that inspectors in the field should verify.

**Response to questions posed by the NRC –**

The Federal Register notice asked 8 specific questions. The following is my response to the questions:

**Question 1: What disposition pathways are available to various licensee types beyond the traditional disposal pathway and should be considered in any potential new financial planning requirements?**

Since the NRC has established the financial assurance framework as a protection for the regulator should a licensee fail to properly terminate their radioactive material, it doesn't matter what disposition options are available to the licensee. What matters is what disposition options are available to the regulatory agency when they seize the financial assurance instrument and assume the responsibility for facility decommissioning and waste disposal.

The regulatory agency will likely go through their procurement process to secure the services of a contractor who will undertake the decommissioning activities. While return of radioactive material to the manufacturer or transfer to another licensee may be a potential disposition path for sealed sources it is not a certainty that it will be available at some time in the future. The safest disposition scenario for the regulator is to assume all radioactive material, loose form or sealed source, will require disposal. This will yield the most financially certain cost estimate. Cost estimates cannot rely on transfer to another licensee for reuse or recycle even when the radioactive material is commonly recycled.

**Question 2: What should be the primary considerations in establishing and imposing appropriate and equitable financial planning requirements on radioactive sealed sources?**

The primary focus of establishing an adequate financial assurance dollar amount is what it will take for a third party to lawfully disposition the radioactive material and decontaminate any associated facility. Financial assurance is not established to protect the licensee. Rather it is established to protect the regulator should the licensee not properly terminate their radioactive materials license. FA provides a source of funding so the failure of a licensee to properly terminate their radioactive material license does not present a financial burden on the state or federal government.

A majority of sealed sources have an available disposal pathway with 3 of the operating disposal facilities and the new Branch Technical Position on Concentration Averaging. Those sources without a commercial disposition pathway should be registered with the Department of Energy's Offsite Source Recovery Program (OSRP).

In calculating the financial assurance amount all cost components of the source disposition must be considered. These cost elements performed by an independent third party may include:

- Removal of the device from service
- Removal of the source from the device
- Leak testing

- Site modifications necessary to access source
- On-site security
- Source Packaging
- Shipping container rental or purchase
- Transportation
- Disposal charge

Each of the items listed above may have several subcomponents that need to be addressed. An example is building modifications necessary to bring in a shielded cask for the removal of sources from a gamma knife.

Since costs change over time, any cost estimate must include a suitable contingency factor to allow for any unforeseen expenses and to account for cost escalation. The cost estimate should be periodically reevaluated to ensure the cost estimate is current and timely. This reevaluation should be done at least every 3 years.

The licensee must consider all facets when developing the estimate. In addition, the regulatory agency license reviewer needs to have a basic understanding of the licensee's operations and the actions necessary to take sources out of service and properly disposition them. The license reviewer is the "last line of defense" so to speak and it is important that they have a basic knowledge to determine completeness of the cost estimate. This is an area that the NRC could add to their training program for the agreement states and/or develop a written guidance document.

**Question 3: Should licensees be required to specifically declare disused sources? If so, how long after a source is disused must a licensee declare it as disused?**

The following is language from NRC regulations regarding the requirement to notify NRC when a facility use or licensed activity has not occurred for a 2-year period:

10 CFR 30.36 Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas.

(d) Within 60 days of the occurrence of any of the following, consistent with the administrative directions in § 30.6, each licensee shall provide notification to the NRC in writing of such occurrence, and either begin decommissioning its site, or any separate building or outdoor area that contains residual radioactivity so that the building or outdoor area is suitable for release in accordance with NRC requirements, or submit within 12 months of notification a decommissioning plan, if required by paragraph (g)(1) of this section, and begin decommissioning upon approval of that plan if--

- (1) The license has expired pursuant to paragraph (a) or (b) of this section; or
- (2) The licensee has decided to permanently cease principal activities, as defined in this part, at the entire site or in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with NRC requirements; or

(3) No principal activities under the license have been conducted for a period of 24 months; or

(4) No principal activities have been conducted for a period of 24 months in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with NRC requirements.

In response to this question, logic would indicate that consistency should apply. If a licensee has not used a sealed source, or for that matter unsealed material, in a 2-year period it should be declared as disused and appropriate steps should be taken to lawfully disposition the sealed source or material. This regulation should not just apply to a site or contaminated facility.

Provisions should be provided where the licensee can justify continued storage. This will address the concern raised at the October 7, 2015 public meeting where an example was given for allowing extended storage (Jet Propulsion Laboratory).

The 2014 NRC RIS 2014-04 "National Source Tracking System Long-Term Storage Indicator" was essentially the result of a compromise during the 2014 Task Force process. It "encourage[s] licensees on a voluntary basis, to submit additional information pertaining to sources identified in Long Term Storage in the NSTS to include the 'use status' of their sealed sources (i.e., whether or not their sources are in use or have become disused)." The voluntary use of this indicator should be made mandatory.

**Question 4: How should source characteristics be factored into establishing equitable financial planning requirements for end-of-life management?**

The financial cost estimate to lawfully disposition a source must reflect the cost to disposition the source on day 1 following the approval of the estimate because under a worst case scenario that is when it is needed. The estimate must also reflect any potential increase in disposition cost for the period until the cost estimate is revisited or revised. Some regulatory programs require the licensee to informally revisit the estimate every year with a formal resubmittal every 3 years. The application of a contingency factor addresses the potential for increase in cost between re-evaluations.

Source characteristics may influence the disposal cost estimate and should be considered when the cost estimate is developed. When a source decays to a point of no longer being a concern, the licensee can resubmit a cost estimate that takes that source out of the calculation.

**Question 5: If NRC rulemaking is initiated as a result of this scoping study, how should NRC engage with and consider the impact on Agreement States? What would be the primary considerations in establishing compatibility levels for rule requirements?**

While it is important to consider the impact to the Agreement States programs and the regulated community, it is more important to establish a sound regulatory program. All regulators, federal and state, have the balancing act between protecting public health and safety and living within their respective budgets. Additional burdens on state programs without additional funding will place additional strain on an already strained program.

The current compatibility requirements for 10 CFR 30.35 are:

Section	Compatibility Level
30.35 a, b, e, g	H&S
30.35 c, d, f, h	D
30 Appendix A, C, D, E	D
30 Appendix B	B

In 51 of the 54 states, federal districts and territories, the financial assurance requirements for sealed sources is essentially the program established in 10 CFR 30.35. The state of Florida has established a risk multiplier calculation that yields the financial assurance dollar amount. The state of Illinois has FA requirements for sealed sources that start at 1 Ci. The state of Tennessee has no financial assurance requirements for sealed sources. With these few exceptions, the NRC requirements form the basis for most state FA requirements.

There are 2 sealed source activity thresholds in 30.35. Paragraph (a)(2) requires a decommissioning funding plan for persons who possess sealed sources or plated foils of half-life greater than 120 days with an activity greater than  $10^{12}$  times the Part 30 Appendix B value. For Agreement States, this paragraph has an H&S compatibility requirement. A simplistic paraphrasing of the H&S definition is "unless you have something better, you better have this".

The second threshold is in paragraph (d) which requires a fixed \$113,000 financial assurance instrument for persons possessing greater than  $10^{10}$  but less than or equal to  $10^{12}$  times the Appendix B value. This paragraph has an assigned compatibility level of "D" which is not required for purposes of compatibility. [As an aside, paragraph (b) with an H&S compatibility level establishes a requirement for those persons who possess sources identified in paragraph (d), a regulation with a "D" compatibility. This appears to be a conflict where a required programmatic element references and establishes a requirement on program element that is not required.] Paragraph (b) allows the licensee to prepare and submit a decommissioning funding plan in lieu of the fixed amount.

The following table identifies the two financial assurance threshold for the list of nationally tracked sealed sources and the Category 1 and 2 thresholds:



Nationally Tracked Sealed Sources	10 CFR 30 App. B	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	Cat 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	10	100,000	10,000,000	2,200	22
Plutonium-238	0.01	100	10,000	1,600	16
Plutonium-239/Be	0.01	100	10,000	1,600	16
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	10	100,000	10,000,000	5,400	54
Strontium-90	0.1	1,000	100,000	27,000	270
Thorium-228	0.01	100	10,000	540	5.4
Thorium-229	0.01	100	10,000	540	5.4
Thulium-170	10	100,000	10,000,000	540,000	5,400
Ytterbium-169	0.1	1,000	100,000	8,100	81

As can be seen on the table, none of the Category 1 sealed source at the threshold level require a cost estimate based FA. Fourteen Category 1 sealed sources at the threshold level have a fixed \$113,000 FA. Six Category 1 sealed sources at the threshold level require no FA. None of the Category 2 sealed source at the threshold level require any FA. If a licensee has more than one source then the sum of the fractions rule applies.

The  $10^{10}$  times the Appendix B threshold is set too high for most isotopes. A licensee can possess a Category 2 sealed source that has to be reported to the National Source Tracking System but yet not be subject to FA. The fixed \$113,000 FA amount has no direct relationship to the actual cost to disposition the source. This dollar amount has remained unchanged in NRC regulations since 2003.

As mentioned earlier, if a source is risk significant enough to require reporting to the National Source Tracking System it is risk significant enough to require FA.

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. This is similar to what the state of Florida did with their risk calculation.

As mentioned previously, FA is a mechanism to protect the regulating agency should a licensee fail to properly terminate their radioactive material license. The minimum amount of FA should be set at a level that the regulating agency is no longer willing or able to pay should a licensee fail to properly terminate their radioactive material license. The state of Florida has established this level at \$30,000.

Compatibility levels for these revised requirements should be C. This will form a new minimum national program that will better address the true cost to disposition sealed sources and loose form radioactive material. There should be no conflict where a paragraph with an H&S compatibility level requires something in a paragraph with a D compatibility.

**Question 6: When necessary, what mechanisms should be used to administer financial planning requirements on general licensees?**

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. These individuals should be specifically licensed. The revised quantity possession limit threshold for FA could be used as the new demarcation between general and specific licensees. Requiring a specific license for all persons who have to post FA provides the licensing agency with a revenue stream (license fee) that can support sealed source review and oversight activities.

**Question 7: What are the ideal characteristics and qualification for an entity that will act as the custodian for any funds earmarked for long-term management of disused sealed sources? For instance, what characteristics and qualifications 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 the event that there is a residual amount remaining in the fund following payment of disposition cost, what should be the fate of the residual funds?**

Any custodian who manages a cash deposit account for decommissioning funds should be a licensed financial institution where the deposits are insured. The licensee should have no direct access to the funds. Funds deposited in fulfillment of a FA obligation should be pledged to the licensing agency should the licensee fail to properly terminate their radioactive material license. Pending successful termination of the radioactive material license or disposition of the radioactive material that the instrument was posted for, the funds should be returned to the licensee.

Since the cash deposit FA fund is pledged to the licensing agency, there will be no direct payment towards a disposition cost. The funds will either be forfeited to the licensing agency based on the

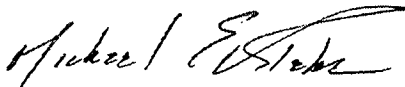
licensee's failure to properly terminate their radioactive material license or it will be released by the licensing agency and returned to the licensee upon the proper license termination. If the funds are forfeited to the licensing agency and that agency has funds remaining following the actions taken to disposition the radioactive material and decontaminate any contaminated facility, those funds should be returned to the entity who provided them. In the case of a cash set aside, the funds would be returned to the licensee. For funds that originated from a surety bond or a letter of credit, the remaining funds should be returned to the institution who issued the bond or letter of credit.

**Question 8: What are the key characteristics of a tracking system for byproduct material (sealed sources) subject to financial planning requirements? Which of these characteristics are not available as part of the NSTS?**

The main shortcoming of the NSTS is it needs to be expanded to include Category 3 sealed sources. Category 3 sources can be aggregated and pose a potential health, safety and security concern. A second shortcoming is the NSTS cannot be used by a licensing agency to monitor compliance with a licensee's possession limit. The License Verification System can be used by the licensing agency to determine if the receiving facility is authorized to receive the sealed source but it has no information regarding the receiving facility's inventory.

Thank you again for the opportunity to provide input to the NRC regarding Financial Planning for Byproduct Material. If you have any questions about these comments or need clarification you may contact me at [michael@michaelklebe.com](mailto:michael@michaelklebe.com) or 217-622-8807.

Sincerely,



Michael E. Klebe, P.E.