

RESULTS OF EVALUATIONS FOR APPROPRIATENESS OF DEVELOPING A SEPARATE UNRESTRICTED RELEASE STANDARD FOR URANIUM AND THORIUM

1.0 BACKGROUND

Source material (uranium and thorium) is found ubiquitously in nature. As a result, a number of facilities become NRC licensees because the ores (or materials) they use to produce other materials (e.g. rare earths) are naturally found combined with high concentrations of uranium and thorium or the uranium and thorium is inadvertently concentrated to above 0.05 percent by weight of source material during their process. These licensees, over the decades, have often accumulated large volumes of wastes that contain source material. These wastes eventually require decommissioning under NRC's regulations and have become some of the more problematic sites on the Site Decommissioning Management Plan (SDMP)/complex site list. Under the Licensing Termination Rule (LTR), NRC requires source material licensees to cleanup to levels, particularly for unrestricted release under 10 CFR 20.1402, that are potentially below the concentration levels that uranium and thorium are sometimes found elsewhere in nature and that persons not licensed (and sometimes general licensees) are free to use and dispose of under exemptions.

Compounding the difficulty of decommissioning these sites is the long half-life of uranium and thorium. Because the source material is expected to be present for much longer periods than most other radionuclides that NRC regulates, it is difficult to implement restricted release criteria under 10 CFR 20.1403 or alternate criteria under 10 CFR 20.1404 to ensure that any institutional controls will be maintained while the source material remains a risk. As a result, most source material sites have historically chosen to meet the unrestricted release criteria in 10 CFR 20.1402.

2.0 ISSUE DESCRIPTION AND DESIRED OUTCOMES

2.1 Issue:

The appropriateness of developing a separate unrestricted release standard for uranium and thorium at levels higher than those in 10 CFR 20.1402 is being considered given that :

- 1) source material specific licensees are currently required to cleanup sites where source material was used under license to levels that are potentially below concentration levels that uranium and thorium exist elsewhere in nature;
- 2) some of these sites have gathered large volumes of source material, making the cleanups both complex and costly - and, in some cases, threatening to bring the owners to bankruptcy;
- and 3) the unrestricted release standard in the LTR is, in many cases, lower than other NRC regulations dealing with remediation and unrestricted use of uranium and thorium, State and Federal regulations for technologically enhanced naturally occurring radioactive material (TENORM), and recommendations of the International Commission on Radiological Protection (ICRP).

2.2 Eventual Desired Outcome:

Decide whether it is appropriate to develop a separate (from existing 10 CFR 20.1402) unrestricted release standard (either concentration or dose-based) for uranium and thorium and describe a clear relationship to other standards.

3.0 EVALUATIONS/CONSIDERATIONS

The staff examined a large number of existing regulations and policies to determine the relationship and consistency between the release criteria in the LTR and other regulations pertaining to the unrestricted use of the this material. The evaluation included regulations and policies from NRC, other domestic sources, and from international activities related to uranium and thorium. Finally, the staff identified other issues that they believed should be considered in the evaluation.

3.1 Criteria in 10 CFR Part 20

The criteria found in 10 CFR Part 20 generally apply to the decommissioning of most NRC licensed material except as specifically noted in individual parts of the 10 CFR. This section focuses on the criteria in 10 CFR 20.1402, 20.1403, and 20.1404. The criteria in 10 CFR 20.1402 applies specifically to unrestricted use. 10 CFR 20.1403 provides criteria for restricted release and 10 CFR 20.1404 provides criteria for alternate criteria for license termination. These latter two sections are discussed because they can be used to potentially reduce licensee costs for cleanup, which is in part, one of the reasons to consider developing an separate unrestricted release criteria.

3.1.1 10 CFR 20.1402

10 CFR 20.1402 provides that a site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent (TEDE) to an average member of the critical group that does not exceed 25 mrem per year and is as low as reasonably achievable (ALARA). This criteria was selected because it is considered a fraction of the 100 mrem per year public dose limit and takes into consideration the potential for members of the public to be exposed to additional sources of radiation not directly related to the decommissioned site.

3.1.2 10 CFR 20.1403

10 CFR 20.1403 provides that a licensee may terminate its license under restricted use if it can be shown that: (1) further reductions in residual radioactivity would result in a net harm to public or environment and levels are ALARA; (2) any institutional controls are found to be legally enforceable and will provide reasonable assurance that the TEDE to the average member of the critical group will not exceed 25 mrem per year; (3) sufficient funding is provided by the licensee to enable a third party to carry out responsibilities for any necessary control and maintenance of the site; (4) the licensee has received input and advice from persons who may be affected; and (5) residual radioactivity at the site has been reduced such that if institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual radioactivity to the average member of the critical group does not exceed

100 mrem per year. A limit of 500 mrem per year for failed controls would be acceptable provided that additional reductions are either not technically achievable, prohibitively expensive, or would result in net public or environmental harm, and durable institutional controls are used.

3.1.3 10 CFR 20.1404

10 CFR 20.1404 provides that the Commission may terminate a license using alternate criteria greater than the dose criterion in 10 CFR 20.1402, 20.1403(b), and 20.1403(d)(1)(i)(A), if the licensee: (1) provides assurance that public health and safety would continue to be protected and it is unlikely that the dose from all man-made sources combined would be more than 100 mrem per year; (2) has employed to the extent practical restrictions on site use to minimize exposures; (3) has reduced doses to ALARA levels; and (4) has sought input and advice from persons who may be affected by the decommissioning. The use of this option requires approval of the Commission after consideration of the NRC staff's recommendations that must address any comments provided by EPA and any public comments submitted pursuant to 10 CFR 20.1405.

10 CFR 20.1404 was implemented due to a realization that a small number of sites may not be able to reasonably terminate their licenses under either 10 CFR 20.1402 or 20.1403. Rather than seeking an exemption for such situations, this section was codified to provide licensing efficiency and consistency of application of requirements to account for the few difficult sites that were expected to present unique decommissioning problems. The staff, however, believed that the vast majority of cleanups should be able to be completed under 10 CFR 20.1402 or 20.1403.

3.2 Criteria in 10 CFR Part 40

NRC regulates source material under 10 CFR Part 40. The staff identified five sections that provide for the use of source material in a potentially unrestricted manner that may result in exposures that are potentially higher than what the LTR permits for unrestricted use under 10 CFR 20.1402. These sections and a description of each can be found below.

3.2.1 10 CFR Part 40, Appendix A

10 CFR Part 40, Appendix A provides unrestricted release criteria for 11e.(2) byproduct material (i.e., mill tailings) only. In criterion 6(6), the unrestricted release limit for residual radionuclides, other than radium, is based on the site-specific dose for radium (using sum of fractions in any 100 m²), e.g., 5 pCi/g Ra-226 +ALARA averaged over the first 15 centimeters (cm) below the surface or 15 pCi/g Ra-226 +ALARA when averaged in 15 cm layers below the first 15 cm, and if it exceeds 100 mrem/yr, it will require Commission approval. It should be noted that equivalency approach in criterion 6(6) is based on the idea that uranium and thorium would contribute only a small component of the overall dose since most source material had been previously extracted and thorium-230 would generally be removed with the radium-226. Additionally, the 1999 rulemaking that added criterion 6 (6) expected that the areas contaminated with U and Th alone or remaining elevated after remediation for Ra-226 would be small areas at a limited number of relatively isolated sites where these licensees are generally found.

3.2.2 10 CFR 40.13(a)

10 CFR 40.13(a) provides an exemption to allow any person to receive, possess, use, transfer or deliver source material at levels below 0.05 percent by weight. However, at this limit, some calculated scenarios have indicated that doses could potentially exceed the unrestricted use criterion in 10 CFR 20.1402. As a result, this exemption allows a person to process large quantities of materials containing concentrations of uranium and thorium just under this limit without a license and freely dispose of the wastes at higher concentration levels than a licensee would be permitted to keep onsite for an unrestricted release under 10 CFR 20.1402. This results in the inconsistency that a licensee may have to clean up to considerably lower levels than its non-licensed "neighbors" for what is essentially the same material. Finally, the staff is hesitant to lower the concentration in this exemption because it could bring under NRC's regulation, a large number of industries that Congress may not have intended NRC to regulate (e.g., petroleum industry, water treatment facilities, etc.).

3.2.3 10 CFR 40.13(b)

10 CFR 40.13(b) is an exemption that allows any person to receive, possess, use, transfer or deliver unrefined and unprocessed source material, provided that they do not process or refine such ore without a specific license. For example, a person could move high concentrations of natural uranium and thorium from place to place (including use as backfill) and still be exempt from the requirements of 10 CFR Part 40. As a result, this exemption could result in exposures above the unrestricted use criterion in 10 CFR 20.1402 for any high concentrations of uranium and thorium that may sometimes be found in nature.

3.2.4 10 CFR 40.22

10 CFR 40.22 provides institutions and firms a general license to hold or transfer up to 15 pounds of source material at any one time (this would be equal to 30,000 pounds of material at 0.05 percent level) and receive up to 150 pounds per year. Persons operating under this general license are exempted from the regulations in 10 CFR Parts 19, 20, and 21, including the requirements in the LTR. Thus, the source material could conceivably result in exposures that exceed the unrestricted use criteria in 10 CFR 20.1402. It should be noted, however, that the State of Colorado petitioned to have this changed in 1999 due to finding a site severely contaminated after a general licensee abandoned it. Doses were calculated by the State to potentially exceed 100 mrem per year. In April 2001, the staff submitted a rulemaking plan to the Commission (SECY-01-0072) which would, in part, have the staff address that State of Colorado's petition by reexamining the exemptions to 10 CFR Parts 19, 20, and 21, as currently stated in 10 CFR 40.22. As a result, some of these general licensees may eventually have the LTR apply to them or may become specific licensees. The staff is currently awaiting Commission direction on the rulemaking plan.

3.2.5 10 CFR 40.51

10 CFR 40.51 allows a source material licensee to transfer material to a person exempt under the regulations. The current language in the regulations can be interpreted to allow licensees to move source material under 0.05 percent off site without restriction or notification to NRC, including for purposes of disposal on a neighboring unlicensed site. However, NRC is not

aware of this occurring in the past and has released stated positions, despite the wording in the regulation, that would indicate this practice is not permitted. To better clarify this position, the SRM to SECY-00-0201 directed staff to implement a rule to require approval from NRC prior to any such transfer. The SRM also gave staff permission to authorize transfers for disposal in appropriate facilities (i.e., RCRA or State permitted sites) up to 25 mrem per year, keep the Commission informed of approvals given for disposals up to 100 mrem per year, and even kept open the possibility of higher exposures in unique circumstances with appropriate Commission review. However, because these appropriate facilities are expected to have some type of long-term government oversight, they might be viewed similar to sites falling under 10 CFR 20.1403 or 10 CFR Part 61.

3.2.6 Conclusion

Based upon the review of existing NRC regulations, it appears that there are large discrepancies between each regulation as to when and at what level NRC regulates source material. Each regulation above may result in calculated doses that exceed the unrestricted use criteria in 10 CFR 20.1402 for equivalent scenarios. Some inconsistencies are a result of constraints in the Atomic Energy Act and the belief that Congress did not intend NRC to regulate a large number of industries not related to the nuclear fuel cycle. However, the staff is currently reevaluating many of these regulations to determine if any adjustment is necessary.

3.3 Other Domestic Regulations/Guidance Related to TENORM or Uranium and Thorium

Other domestic federal and state agencies, as well as industry groups have also developed or proposed regulations or guidance related to unrestricted release criteria for naturally occurring radioactive material (NORM) and TENORM. These regulations were considered because uranium and thorium in nature is considered NORM although often radionuclides other than uranium and thorium are the more significant hazard. This section summarizes the proposed or existing criteria that were identified.

3.3.1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA is a risk based standard that covers radionuclides and was issued by EPA. Cleanup of radionuclides are governed by the risk range (generally 10^{-4} to 10^{-6}) for all carcinogens established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) when applicable or relevant and appropriate requirements (ARARs) are not available or are not sufficiently protective. An August 22, 1997, memorandum from EPA (OSWER No. 9200.4-18) includes a determination that dose limits in NRC decommissioning rule (e.g., 25/100 mrem/yr) should generally not be used to establish cleanup levels under CERCLA. However, EPA has provided exceptions, by using ARARs, that might permit resulting doses to exceed 25 mrem per year. Additionally, doses associated with any material covered by an ARAR are not recalculated nor added to other materials present to compare with the EPA risk range.

3.3.2 EPA Use of ARARs

Section 121(d) of the CERCLA requires attainment of federal and state applicable or relevant and appropriate requirements. The NCP describes the process for attaining these ARAR requirements. In evaluating the relevance and appropriateness of a requirement, eight

comparison factors in 40 CFR 300.400(g)(2) are considered. Once a requirement is determined to be relevant and appropriate, it must be complied with as if it were applicable. EPA has issued some ARARs related to the cleanup of sites containing uranium and thorium using 40 CFR 192 and Appendix A of 10 CFR Part 40 (see OSWER Directives 9200.4-25 and 9200.4-35P, respectively), both of which would allow exposures comparable to those resulting from 5 pCi/g radium-226. However, these ARARs are based on Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) and clearly state that they are meant for sites which have soil contamination that is very similar to sites covered by UMTRCA (meaning not having significant concentrations of uranium and thorium that result in a equivalent dose of radium-226 contamination in the range of 5 to 30 pCi/g). Criterion 6(6) of Appendix A of 10 CFR Part 40 was to only be used infrequently and benchmarking was to be incorporated by only using EPA methodology in conjunction with the 5 pCi/g limit (and then it was acceptable only if it resulted in doses generally below 15 mrem per year).

3.3.3 NRC/EPA Memorandum of Understanding Concentrations

On October 9, 2002, the U.S. Nuclear Regulatory Commission (NRC) signed a Memorandum of Understanding (MOU) with the U.S. Environmental Protection Agency (EPA) on the radiological decommissioning and decontamination of NRC-licensed sites. Since 1983, EPA has generally deferred listing NRC licensed sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This deferral policy, however, did not extend to previously licensed NRC sites, leaving the possibility of dual regulation (i.e., an NRC licensee could potentially remediate to NRC's license termination criteria, and then have to perform subsequent cleanup to separately comply with EPA's CERCLA requirements). The MOU was developed in response to this general concern.

The MOU reaffirms EPA's 1983 policy and expands EPA's deferral to sites for which the NRC license is terminated and certain criteria are met. The MOU provides that unless an NRC licensed site exceeds any of three "trigger" criteria at the time of license termination, EPA does not expect to exercise its CERCLA authority before or after termination of the NRC license. The three criteria provided in the MOU are: (1) radioactive ground-water contamination above EPA's Maximum Contaminant Levels; (2) radioactive soil concentrations exceeding the values provided in Table 1 of the MOU; and, (3) license termination under either restricted release or alternate criteria. According to the MOU, if NRC determines during the license termination process, that any NRC licensed sites meet/exceed any of the trigger criteria, NRC will consult with EPA.

Note that the soil concentration values provided in the MOU are not "cleanup" levels for either NRC or EPA; rather they are just trigger values for consultation between the two agencies. The soil concentrations in the MOU for radium-226 and thorium-232 (5 pCi/g) are based on soil standards developed under UMTRCA and EPA's implementing standard in 40 CFR 192. The soil concentrations (mg/kg) for total uranium were calculated by EPA and are based on a noncarcinogenic hazard index quotient of 1. The remainder of the soil concentrations were calculated by EPA based on a 1×10^{-4} cancer risk.

3.3.4 CRCPD Subpart N

The Conference of Radiation Control Program Director, Inc. (CRCPD) has proposed regulations related to the regulation of TENORM in Subpart N of their regulations. Under

Subpart N, the unrestricted release criteria for radium on land, averaged over 100 square meters, is to not exceed 5 pCi/g above the background concentration, averaged over any 15 cm layer of soil. Exposures from other TENORM nuclides are proposed to be limited to 25 mrem per year. This criteria for other TENORM nuclides is consistent with the unrestricted use criteria found in 10 CFR 20.1402. However, Subpart N does propose to exempt some TENORM (such as fertilizers).

3.3.5 ANSI N13.53

ANSI has proposed guidance related to TENORM and source material under ANSI N13.53. For disposals, 25 mrem per year is proposed for residual radioactivity (excluding radon and progeny which are 20 Bq/m³ outdoors and 150 Bq/m³ indoors). This is consistent with the unrestricted use criteria found in 10 CFR 20.1402. However, the guidance also provides exemptions for fertilizers, natural construction materials, and fossil fuels.

3.3.6 States

Some individual States have developed TENORM regulations related to disposal. These regulations include criteria based upon concentrations of Ra-226 (ranging from 5 pCi/g [most] to 30 pCi/g Ra-226 [New Mexico]). Some have implemented annual exposure limits that range from 15 mrem to 100 mrem per year (although higher levels are often allowed for low-radon emanation materials). The State of Arkansas limits soil disposals for uranium and thorium up to 0.05 percent by weight. However, many of these regulations exempt one or more specific industries or products.

3.3.7 Summary

Although these regulations and guidance are similar to the unrestricted use criteria found in 10 CFR 20.1402, many of these agencies and groups have provided exemptions or exceptions for certain industries which could lead to higher exposures. The rationale for these higher exposures may be based on a cost-benefit approach that the societal benefit of limiting regulation on the material may outweigh the radiation associated risks and the practicality to control the materials.

3.4 International Activities Using Separate Criteria for U/Th

Although not directly related to disposal criteria, it should be noted that the International Atomic Energy Agency (IAEA) has developed a draft safety guide entitled, "Draft Safety Proposed Specification of Radionuclide Content not Requiring Regulation for Purposes of Radiation Protection (DS-161)." The IAEA draft safety guide uses different approaches to set limits for "artificial radionuclides" (i.e., produced by reactor or accelerator) versus naturally occurring radionuclides. The IAEA draft safety guide could also be considered for the control of solid materials. The draft document argues that if criteria for NORM is derived on the basis of radiological criteria for other isotopes, the values will, in many cases, be lower than concentrations that occur in many natural materials. Thus many activities previously unregulated from a radiological standpoint, such as construction of houses from natural building materials or even the use of land in many areas, could be subject to regulation. The IAEA

proposes that a level needs to be set where the number of materials involved should not be so great as to make regulation unmanageable or unlikely to improve protection.

This approach is different from the one limit for all radionuclides used in NRC's LTR.

3.5 Other Considerations

The staff also considered a number of other items that could influence both the viability and necessity to develop a separate unrestricted release standard for source material. These items include the number of licensees that would be impacted, ongoing activities that may affect the future number of source material licensees, the use of existing regulations to reach the goal of allowing licensees to cleanup at reasonable cost, differences between source material and other radioactive materials, and the possible impacts from having a separate standard. These items are discussed below.

3.5.1 Number of Licensees Impacted

The number of licensees that are finding it unacceptably difficult to decommission to the levels required under 10 CFR 20.1402 are relatively few. Although many licensees may benefit from the cost savings resulting from the implementation of a separate unrestricted release criteria for source material at a higher level than allowed in 10 CFR 20.1402, most source material licensees use source material in solid forms (as metals or as shielding) and as thus would see little or no benefit to higher unrestricted release criteria. Currently, the staff has identified eighteen SDMP or complex source material sites that are contaminated with uranium and/or thorium. Of these sites, fourteen have submitted decommissioning plans for unrestricted release, while four sites are contemplating pursuing restricted release (two already have plans under review). Of these eighteen sites, only four sites are currently not scheduled to be decommissioned by January 2007. As a result, by the time a rulemaking to create a separate unrestricted release standard could be implemented, many of these sites could be completed with decommissioning. Additionally, the staff has some concerns that many of these sites currently undergoing decommissioning may push to slow down their processes if any rule is pondered in the public forum in order to achieve potential cost savings that higher decommissioning criteria may allow. Finally, the staff does not foresee there being more than a few additional operating or proposed operations that may also be considered as complex sites in the near future. Although rule changes proposed in SECY-01-0072 could increase the number of source material specific licensees in the future, these new licensees would not be expected to create new complex decommissioning sites.

3.5.2 10 CFR Part 40 Interagency Jurisdictional Working Group

In a March 9, 2000, SRM to SECY-99-259, the Commission directed the staff to initiate interactions and work with specified Federal agencies and the States to "explore the best approach to delineate the responsibilities of the NRC and these agencies with regard to low-level source material (as defined in 10 CFR Part 40) or materials containing less than 0.05 percent uranium and/or thorium." The staff established an interagency Jurisdictional Working Group (JWG) composed of representatives from the specified Federal agencies and the States. As noted in an August 13, 2002, memorandum to the Commission, as a result of the JWG efforts, the staff is considering an approach to limit NRC authority to uranium and thorium that

are purposely extracted or used. The memorandum described the further evaluations that needed to be completed before the staff could make a recommendation to the Commission.

In a separate paper entitled, "Interagency Jurisdictional Working Group Evaluating the Regulation of Low-Level Source Material or Materials Containing Less Than 0.05 Percent by Weight Concentration Uranium and/or Thorium," the staff will provide additional findings to the Commission. As part of this paper the staff will recommend that the Commission continue consideration of limiting NRC authority to uranium and thorium that are purposely extracted. The staff proposes to formally request responses from other Agencies regarding the approach, as well as contacting other agencies regarding other related issues (such as impact on international treaties, etc.). The staff believes that in order to make the recommendation more acceptable to the States and to not interrupt ongoing cleanup activities, source material SDMP sites, and potentially other complex existing source material sites, would likely remain under NRC's jurisdiction despite whether they originally purposely extracted or used uranium and thorium or not.

If the NRC jurisdiction of non-purposefully-used uranium and thorium is transferred to other agencies, the number of existing NRC and Agreement State sites licensed under the AEA, and potential future licensees, would be reduced. However, because the staff believes that it may be necessary to retain the SDMP sites and possibly other complex sites under NRC jurisdiction, the recommendation of the JWG will have little or no reduction in the number of sites that would benefit from a separate unrestricted standard from what was discussed in the previous section (Section 3.5.1).

3.5.3 Use of Existing Regulations to Allow Source Material Licensees to Reduce Cleanup Costs (through greater use of 10 CFR 20.1403 and 20.1404, as well as exemptions)

10 CFR 20.1403 or 10 CFR 20.1404 have not been significantly used by licensees as cleanup criteria to date. These sections, however, are available for use by licensees and the staff believes they provide regulatory flexibility and the potential for cost reductions while maintaining public health and safety. These sections effectively rely on a graded approach based on risk. As such, the licensee has a choice of cleaning up to unrestricted use (under 10 CFR 20.1402) or pursuing a restricted use (under 10 CFR 20.1403) if an unrestricted release is not feasible. Furthermore, in the rare circumstances that the criteria under 10 CFR 20.1402 or 20.1403 could not be met, the licensee could pursue alternative criteria, possibly resulting in higher exposure limits, through the use of 10 CFR 20.1404. Evaluations completed under 10 CFR 20.1403 or 20.1404 would be more involved and rely on risk evaluations to determine appropriate dose constraints and restrictions. Finally, if none of the above criteria fit a unique condition of the site, an exemption could be sought under 10 CFR 20.2301. The staff is considering development of guidance that would make these regulations more practical for both the staff and licensees to use (see Attachment 1 of "Results of the License Termination Rule Analysis").

The benefit of pursuing the use of existing regulations is that it would take into account the specific circumstances associated with each licensee's site and conditions. In contrast to development of a separate unrestricted release criteria, which would allow all source material licensees to likely exceed the criteria in 10 CFR 20.1402, the use of existing regulations allows the staff to use cost/benefit and risk evaluation to establish criteria and restrictions, as necessary, that may exceed the criteria in 10 CFR 20.1402; those licensees who can readily

meet the criterion in 10 CFR 20.1402 will continue to be required to do so. The use of the existing regulations would not require the resources necessary to develop a separate unrestricted release criteria for source material, nor place additional burden on Agreement States to potentially change their regulations to maintain appropriate compatibility levels.

3.5.4 Properties of Uranium and Thorium

Uranium and thorium are found ubiquitously in nature, whereas the origination of any byproduct material is the result of a man-made intervention (i.e., produced by reactor or accelerator). Therefore, for uranium or thorium, generally considered as part of background in its place of origin, there is always a risk associated with the material whether or not the material is used; however, the movement and use of the source material can change the risk of exposure to specific populations. This is in contrast to 11e.(1) byproduct material, which increases the risk of exposure to all populations because it creates a new source of radiation upon its creation. As a result, although difficult to quantify, one can argue that setting an equal level for decommissioning criteria does not reduce risk equally between uranium and thorium versus other radionuclides.

Another consideration is the half-life of uranium and thorium. Source material has a half-life that is considerably longer than most other radionuclides. This, however, is countered by the relatively low specific activities associated with the uranium and thorium when compared to 11e.(1) byproduct material. The longer half-life makes it more difficult to model alternative disposals, because of the longer period that must be considered during which exposure conditions may change. If institutional controls are found necessary for some sites, evaluating the effectiveness of such controls in perpetuity may be difficult. Although allowing a higher unrestricted release criteria than currently exists would certainly be of benefit to persons using source material, consideration will need to be given to the fact that the disposition of the material will effectively result in a permanent potential exposure hazard while the material remains there (however, any such exposure level would still be considered protective of the environment and human health and safety).

3.5.5 Consistency in Dose Levels and Public Confidence

One of the most difficult areas that requires consideration is the impact on public confidence resulting from having more than one cleanup level. Many members of the public may become concerned about any regulation that appears to reduce their perceived safety and, as a result, developing a separate unrestricted release standard for source material will be difficult from the start. The public may be confused how NRC can consider exposures from uranium and thorium to be safe, while, at the same time, ensuring safety at a likely lower exposure level for other radionuclides. However, as shown in Section 3.1, there are already a number of potential “unrestricted use” levels that NRC (and the public to an extent) already accept as protective of safety; thus, any impact on public confidence from the development of separate criteria might be minimal. Additionally, although it may appear to the public that it is appropriate to provide consistency in dose limits for different practices (and maybe same practice/different radionuclides), it can be considered to be inconsistent in cost/benefit evaluation and risk-informing (e.g. there may be more societal benefit to allow a certain practice to provide public exposures at a higher level versus another, including for disposal). As a result, it is important to make it clear to the public that exceeding a practice-specific limit does not necessarily create an

unsafe condition (although any cost-benefit evaluation would need to incorporate NRC's current policy to protect against the possibility of receiving multiple exposures over time).

3.6 Summary

Based on the evaluation of the information above, it can be concluded that the LTR has important differences from other Part 40 regulations that make a simple comparison of the criteria complicated. The basis assumed for each regulation, such as the amount of material, licensing status of material, impact on other industries, etc., needs to be considered when making the comparison. Additionally, it is important to realize that some of the NRC regulations (e.g., 10 CFR 40.22 and 10 CFR 40.51) are currently being reevaluated to determine if they should include requirements that are more in line with the criteria in the LTR. In regards to regulations developed by other domestic sources, most are relatively equivalent to the criteria found in 10 CFR 20.1402; however, many also provide exemptions or exceptions for classes of material or industries which would possibly create scenarios that result in exposures at levels higher than the constraints found in 10 CFR 20.1402. Notwithstanding existing regulations, there are a number of other considerations the staff believes impact the need for separate criteria. There are differences in properties of uranium and thorium versus other radionuclides that NRC regulates, which can be used as a basis to support separate criteria. However, without a detailed cost/benefit analysis, it is unclear that the limited number of licensees that may need criteria beyond the criteria in 10 CFR 20.1402 warrants the development of a separate unrestricted release criteria for source material.

4.0 EVALUATION OF OPTIONS

Two primary options were considered: (1) establish a separate unrestricted release standard for source material, or (2) do not establish a separate unrestricted release standard for uranium and thorium.

4.1 Establish a Separate Unrestricted Release Standard for Source Material

Under this option, the staff would establish, through rulemaking, a separate unrestricted release standard for source material at a level that could result in exposures higher than currently allowed under 10 CFR 20.1402. As a result, all source material licensees would have the opportunity to cleanup to this higher constraint, although ALARA would still be expected to apply. This would require the development of rulemaking language, a regulatory analysis, and either an environmental assessment (EA) or environmental impact statement (EIS), as well as established processes for public participation. The criteria could be based on numerous existing standards for NORM, criterion 6(6) in Appendix A, or some other basis.

4.1.1 Pros

This option provides a separate unrestricted release standard for source material, which, although still considered protective of health and safety, may be higher than the unrestricted release criteria in 10 CFR 20.1402 and should, therefore, reduce the burden for cleanup for all source material licensees. Further, by cleaning up to an unrestricted release, it would allow greater flexibility in the future use of the site. In contrast to the use of restrictions, the use of a defined higher unrestricted release standard for source material would presumably allow for a

straight forward review process for both licensees and staff to allow some of the more complex sites to cleanup. Additionally, compared to restricted releases, no additional burden would be necessary to ensure any restrictions are maintained.

4.1.2 Cons

This option would potentially allow exposures at higher levels than permitted in 10 CFR 20.1402 while not providing any of the possible reductions in exposure that restrictions may allow; thus the public may view this as a reduction of safety over current practice. Because a generic standard may need to be set as high as a criterion instituted under a case-by-case review of unique circumstance, because it needs to account for a broader range of conditions, some of the more complex sites may still find it more cost effective to use 10 CFR 20.1403 or 10 CFR 20.1404 as provisions for cleanup. Additionally, a new separate unrestricted release standard would permit licensees who would have had no problem cleaning up under 10 CFR 20.1402 to cleanup to the higher unrestricted release standard (after considerations of ALARA); this would result in the potential for higher exposures at more sites than just the complex/SDMP sites of concern. The implementation of this option would require additional rulemaking and guidance to be developed by NRC and Agreement States resulting in costs to both groups. Finally, because of the duration of the rulemaking process, many of the SDMP/complex sites may already be on a schedule to complete decommissioning prior to implementation of a final rule reducing the rule's usefulness; however, because some sites may opt to defer further decommissioning until the rule is completed in the hopes of reducing decommissioning costs overall, timeliness in cleanup of existing sites could also be impacted.

4.2 Do Not Establish a Separate Unrestricted Release Standard for Uranium and Thorium

Under this option, all source material licensees would continue to be required to decommission their sites to meet the criteria in 10 CFR 20.1402, 20.1403, and 20.1404. The use of 10 CFR 20.1403 and 20.1404 would require case-by-case review of both restrictions and criteria proposed by the licensee and development of associated EAs or EISs.

4.2.1 Pros

The current level of protection of the environment and public health and safety would not change. Source material licensees who can meet the current unrestricted release criterion would continue to be required to meet 10 CFR 20.1402 instead of a higher generic level that might be instituted under a separate unrestricted release criterion. Because continued use of the LTR would provide a consistent basis for all specific licensees independent of the type of material, it should not create any public confusion about release criteria. The benefit of pursuing the use of existing regulations is that it would take into account the specific circumstances of each licensee's site-specific conditions to tailor what appropriate criteria was necessary and what restrictions, if necessary, were appropriate. No additional rulemaking would be necessary by NRC and only guidance would need to be revised or developed. Finally, the continued use of the LTR would not require the resources necessary to develop a separate unrestricted release criterion for source material, nor place additional burden on Agreement States to potentially change their regulations to maintain compatibility levels.

4.2.2 Cons

This option would continue to require licensees to dispose of source material at levels that may be lower than what “neighboring processes” might use under exemption or general license; this may be confusing to the public to a certain extent as to why NRC regulations do not provide exactly the same restrictions throughout. It would not reduce current levels of burden on all source material licensees that a separate criteria may. Because the staff may rely more on restricted releases to allow a reduction in cleanup costs, NRC resources (or other independent party resources) may need to continue to be spent into the foreseeable future to ensure that any restrictions remain in place. In addition, although the licensee is required to provide adequate funding for maintaining those restrictions, it may be difficult for staff to estimate what those future costs may be. Finally, the staff will need a separate Commission review for each cleanup completed under 10 CFR 20.1404 which may not be as efficient as could be completed under an Commission approved separate standard.

5.0 RECOMMENDATIONS

The staff acknowledges that there are some significant inconsistencies in the potential exposures allowed between 10 CFR 20.1402 and other regulations in 10 CFR Part 40. Although the staff is reevaluating some of these 10 CFR Part 40 regulations, the staff does not believe that they are applicable as unrestricted release criteria for source material specific licensees.

The staff has also found that there are only a limited number of existing source material sites that have not already sought unrestricted release that may find it necessary to cleanup to requirements other than those in 10 CFR 20.1402. If NRC jurisdiction of non-purposefully-used uranium and thorium is transferred to other agencies, as discussed in the JWG’s paper, the number of existing NRC and Agreement State source material sites licensed under the AEA, and potential future licensees, would be further reduced. However, because the staff believes that it may be necessary to retain the SDMP/complex decommissioning sites under NRC jurisdiction, the recommendation of the JWG will not result in a significant reduction in the number of overall sites that would benefit from a separate unrestricted standard.

In summary, the staff believes that the opportunity provided by the existing LTR allows complex source material sites the flexibility to reduce burden through a graded approach (unrestricted use to restricted use to alternate criteria) that can be based on risk. Continued use of the LTR would also maintain 10 CFR 20.1402 as an unrestricted release standard for source material sites that are not so complex so that public confidence is not impacted. As a result, the staff believes that given the flexibility in the existing regulations in 10 CFR 20.1402, 20.1403, and 20.1404, and in conjunction with the limited number of sites that may require cleanup to criteria other than those in 10 CFR 20.1402, it is not appropriate at this time to develop a separate unrestricted release standard for source material licensees. This issue should be discussed in a RIS.