

## ATTACHMENT 6

Options Analysis Based on Deliberations of the JWG

# OPTIONS ANALYSIS BASED ON DELIBERATIONS OF THE JWG

## INTRODUCTION

In the staff requirements memorandum (SRM) for SECY-99-259, dated March 9, 2000, the staff was tasked to initiate interaction with the U.S. Environmental Protection Agency (EPA), the U.S. Occupational Safety and Health Administration (OSHA), the States, and other organizations to explore the best approach to delineate the responsibilities of the NRC and those agencies with regard to low-level source material or materials containing less than 0.05 percent by weight uranium and/or thorium. As part of this task, representatives from the participating organizations evaluated existing jurisdictional authority, regulations, practices, and data to determine what, if any, changes should be made to the regulatory jurisdiction of uranium and thorium to ensure protection of the public with the greatest efficiency across government agencies. The purpose of this attachment is to describe and evaluate the options, based largely on the deliberations of the Jurisdictional Working Group (JWG), for the best approach for regulating low-levels of uranium and thorium.

## BACKGROUND

### *Original Definition of Source Material*

The Atomic Energy Act (AEA) of 1946 defined source material as follows: "The term 'source material' means uranium, thorium, or any other material which is determined by the Commission, with the approval of the President, to be peculiarly essential to the production of fissionable materials; but includes ores only if they contain one or more of the foregoing materials in such concentration as the Commission may by regulation determine from time to time." Also, the 1946 Act, in Section 5(b)(2), stated that "...licenses shall not be required for quantities of source material which, in the opinion of the Commission, are unimportant." In implementing the 1946 Act, the Commission established in 10 CFR Part 40, § 40.2(a), the following definition of source material: "the term 'source material' means any material, except fissionable material, which contains by weight one-twentieth of one percent (0.05%) or more of (1) uranium, (2) thorium, or (3) any combination thereof." No distinction was made with respect to ores containing uranium or thorium. It appears that the Commission selected the 0.05% value primarily on the basis of that concentration of source material that was considered strategically important for the production of special nuclear material. It also appears that concentrations of natural uranium and thorium less than 0.05% were considered "unimportant." The legislative history of the Act indicates that Congress believed that uranium and thorium, as they exist in nature, were not a concern unless they were considered important to the production of special nuclear material. It should be noted, however, that the AEA of 1954, as amended, makes it clear in several places that the Commission is to regulate source material, to, among other things, protect the health and safety of the public (see, for example, Section 2 d. and e., Section 63 b., Section 69 and Section 161 b.).

### *Subsequent Definition Changes*

The AEA of 1954 changed the definition of source material to read as follows: "The term 'source material' means (1) uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of Section 61 to be source material; or (2) ores

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containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time.” There appears to be no explanation why the phrase "but includes ores only" was changed. The primary difference from the 1946 Act is the deletion of the phrase: “peculiarly essential to the production of fissionable material,” although the concept was embodied in Section 61 of the 1954 Act. Section 62 of the 1954 Act states, as did the 1946 Act, that “...licenses shall not be required for quantities of source material which, in the opinion of the Commission, are unimportant.” To conform with the 1954 Act, the Commission revised the definition of source material in 10 CFR Part 40 (§ 40.4) to read as follows: "Source Material means: (1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material" (26 FR 284, January 14, 1961). The change in the source material definition also added the phrase “any physical or chemical form” to the first part of the definition. As noted above, the Commission also provided in Part 40 an exemption from licensing for any chemical mixture, compound, solution, or alloy in which the source material content by weight is less than 0.05% (§ 40.13 (a)). Thus, the Commission carried forward the 0.05% value that was established earlier. The Commission noted in its Notice of Proposed Rulemaking on amending Part 40 (25 FR 8619, September 7, 1960) that as a result of this exemption, the change in the definition of source material was not expected to have any effect on the licensing program. An exemption from licensing was also provided for unrefined and unprocessed ore (§ 40.13(b)) without regard to source material concentration (note that ores containing less than the 0.05% concentration are not source material by definition). A definition for the word ore was not provided in the AEA of 1946, the AEA of 1954, as amended, or in 10 CFR Part 40. The above cited Notice of Proposed Rulemaking indicates that this exemption would eliminate the need for miners to have a license to transfer source material, as was required by existing regulations at that time. The Notice also states that the Act does not require a license for the mining of source material, nor do the implementing regulations. Finally, although NRC did include these exemptions, historically most uranium and thorium is considered to still be under the jurisdiction of AEA. As a result, any agency whose authorizing legislation specifically excludes AEA material cannot regulate AEA material under those authorizing statutes. In the case of EPA, certain statutes specifically exclude AEA material, while others do not.

## **DISCUSSION**

The JWG generally used the following process as it began its evaluation: (1) determine Agency responsibilities, (2) evaluate health and safety data and other applicable information, (3) determine if NRC responsibility should remain the same, increase, or decrease, and (4) determine best method to implement chosen outcome (results in approach). Throughout the process, the JWG evaluated available options against the considerations listed below:

- a. Impact to health and safety
- b. Consistency within NRC regulations
- c. Consistency in regulation of NORM
- d. Impact to existing treaties
- e. Impact on NRC resources

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- f. Impact on resources of States and other Federal agencies
- g. Impact on licensees and non-licensees
- h. Impact on public confidence

After assessing the current jurisdictional responsibilities of each agency, the JWG grouped the available options from SECY-99-259 on the basis of their basic outcomes. The general outcomes evaluated included (1) making no changes, (2) increasing NRC regulatory requirements, or (3) decreasing NRC regulatory jurisdiction. Based on the health and safety data and other available information, the JWG determined which outcome was preferable. The JWG then evaluated approaches within the outcome category to determine which would result in the most effective regulation of uranium and thorium.

### ***Determination of Preferred Outcome***

Through evaluation of the Options Paper attached to SECY-99-259, the JWG divided the options discussed in that paper into three general categories, as shown in Table 1. These categories became the basic outcomes that the JWG initially evaluated.

Table 1. Options to Change NRC Responsibility

No Change	Increase NRC Regulation	Decrease NRC Authority
Legislation, its interpretation, and regulations remain as is	Eliminate the exemption	Regulate uranium or thorium that is extracted for use of the uranium or thorium
	Lower the concentration level	Regulate uranium or thorium that is extracted for the use of the uranium or thorium <b>and</b> rare earth processing
	Keep the exemption, but specify the activities that can or cannot be conducted under the exemption - based on health and safety concern(s) or dose	Establish a concentration level below which NRC would not have jurisdiction, i.e., 0.05 percent or some other determined concentration
	Combination of revising concentration level and specifying which activities can or cannot be done under the exemption	

Tables 2(a) to 2(c) illustrate the pros and cons for each general outcome that the JWG discussed while determining its preferred approach. The pros and cons are meant to address the general outcome and not be specific to individual approaches for implementation of the outcome.

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Table 2(a). Pros and Cons for Making no Change to NRC Regulatory Oversight

<b>No Change</b>	
<b>Pros</b>	<b>Cons</b>
<ul style="list-style-type: none"> <li>- Save resources (States and Federal) in the near term; no further work related to coordination.</li> </ul>	<ul style="list-style-type: none"> <li>- Overall regulation is inconsistent since NRC may not be aware of all non-fuel-cycle activities that may inadvertently concentrate source material to levels greater than the concentration limit. Considerable additional NRC resources would be needed to find such situations, if the Agency decided it was necessary.</li> <li>- Inconsistent with how other agencies handle most other NORM.</li> <li>- Existing regulatory scheme may hinder the ability of States and EPA to regulate uranium and thorium covered under the exemption in § 40.13(a).</li> <li>- NRC may not be fully carrying out its responsibility to protect public health and safety.</li> <li>- Recurring issues related to definition of source material and § 40.13(a) and extensive resources expended to resolve.</li> </ul>

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Table 2(b). Pros and Cons for Increasing NRC Regulation

<b>Increase NRC Regulation</b>	
<b>Pros</b>	<b>Cons</b>
<ul style="list-style-type: none"> <li>- Provides justifiable basis for the regulations based on current radiation standards.</li> <li>- Provides more uniform regulation of uranium and thorium.</li> </ul>	<ul style="list-style-type: none"> <li>- Increases the regulatory workload of NRC.</li> <li>- May increase the impact, including fees, on those subject to regulation by requiring licenses for a wide variety of activities that were previously exempt from licensing.</li> <li>- Could cause NRC to regulate operations in the non-nuclear mineral extraction and other industries where hazards from materials other than uranium and thorium usually predominate, possibly resulting in Congressional reaction and/or additional tort liability concerns for newly regulated businesses.</li> <li>- Could cause interface problems between NRC and EPA (and possibly the States), since EPA is in the process of developing guidance for controlling diffuse sources of naturally occurring radioactive material.</li> <li>- Potential impact on FUSRAP sites.</li> <li>- Potential impact to waste sites as more material would be classified as low-level waste. This would result in increased costs and other burdens to holders of the material and possible capacity issues.</li> <li>- Could impact existing international treaties.</li> </ul>

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Table 2(c). Pros and Cons for Decreasing NRC Authority

<b>Decrease NRC Authority</b>	
<b>Pros</b>	<b>Cons</b>
<ul style="list-style-type: none"> <li>- Would allow the NRC to concentrate its resources on the regulation of processing activities directly related to uranium recovery and subsequent utilization of the recovered materials.</li> <li>- Would not change NRC authority to control uranium and thorium from a strategic standpoint.</li> <li>- Would potentially remove inconsistencies within NRC regulations.</li> <li>- Under the recommended approach, a single regulatory authority would be in a better position to evaluate the potential hazards of uranium and thorium, which would be considered NORM, with the potential hazards of the other materials with which they are associated, such as radium and hazardous chemicals.</li> <li>- Would allow EPA, OSHA, and the States to have a comprehensive control program over all aspects of activities involving low concentrations of naturally occurring radioactive material.</li> <li>- Reduces the number of agencies involved in regulating many materials containing low concentrations of uranium and thorium.</li> <li>- Conserves NRC resources in the long term.</li> </ul>	<ul style="list-style-type: none"> <li>- Would require expenditure of NRC resources in the near term to coordinate the proposed NRC action with EPA, OSHA, and the States.</li> <li>- Could impact existing international treaties.</li> <li>- If States and EPA choose to regulate this material, may need to modify existing regulations/standards or develop radiation protection standards if none are in place.</li> <li>- While the regulatory program within a State may be more consistent, there may be inconsistencies among the different States in how each regulates.</li> </ul>

Initially, the JWG's review of NUREG-1717 led to some concern for the potentially significant doses in certain areas. As a result, the JWG initially considered whether NRC should be increasing its regulatory oversight of low-level source material.

A more thorough review of the data supporting NUREG-1717, as well as input from industry representatives, led the JWG to conclude that most of these dose estimates were conservative and would be significantly lower when calculated using newer dose calculation methodology. The JWG found that using more realistic calculations resulted in calculated annual exposures significantly lower than those calculated in NUREG-1717, especially for evaluations for inhalation exposures. These more realistic calculations appeared to be more consistent with the CRCPD/OAS representative's informal conversations with state regulators from Florida who identified no significant occupational exposure concerns for zirconium processors within Florida.

As a result, the JWG concluded that, while the exemption in § 40.13(a) does not provide the level of protection of many other exemptions and release criteria in the Commission's regulations, there does not appear to be a significant health and safety concern such that

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urgent action is necessary. The JWG believed that it would seem appropriate for these materials to be handled by EPA, OSHA, and States under regulations governing NORM and TENORM. However, it should also be noted that the JWG has not evaluated all possible exposure scenarios and is basing its conclusion on the data available.

Additionally, the JWG discussed whether there were other concerns related to the current regulatory scheme for regulating materials containing low-levels of uranium and thorium. One of the concerns identified by the JWG was that the current exemption may not always grant enough flexibility for other agencies to regulate all constituents of the material due to their status as AEA material, other than through indirect means. Additionally, the JWG indicated that uranium and thorium that is incidental to a process should be treated similarly to NORM since they are similar in origin and proximity to NORM.

Based on the data available, the JWG concluded that the preferred outcome would be to decrease NRC regulatory authority for uranium and thorium. The programs of other agencies, which may already deal with material that is NORM (also containing uranium and thorium), will then be able to operate in an unimpeded manner while still providing appropriate levels of protection of health and safety for uranium and thorium incidentally present with NORM. This approach would clarify jurisdictional authorities, limit *de-facto* dual regulation, and provide for more consistent regulation of low-level uranium and thorium.

### ***Determination of Preferred Approach***

After a general agreement that the JWG's preferred outcome was to decrease NRC's authority for uranium and thorium, the JWG focused on two primary approaches to reach the desired outcome:

- 5) Limited-to-Extraction Approach: To limit NRC authority to uranium and thorium that is purposely extracted for the use of the uranium or thorium. To limit impacts to programs, ore would be defined as material which is planned to be processed primarily for its content of uranium or thorium.
- 6) Concentration Approach: To limit NRC authority to uranium and thorium at concentrations above 0.05 percent. NRC would retain authority over uranium and thorium below this threshold only if it resulted from an NRC-licensed process.

Table 3 shows a comparison between the two primary approaches considered by the JWG as feasible solutions. These two approaches are evaluated against a no change approach using the list of considerations discussed above.



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Table 3. Comparison of Approaches for Decreasing NRC Regulation versus No Change

Consideration	Only regulate extracted	Only regulate >0.05% by weight	No Change Option
1. <b>Consistency within NRC regulations</b>	By removing § 40.13(a), many of the potential conflicts within Part 40 versus other agency regulations are removed. Allows regulation of uranium and thorium to be more consistent with overall theme of AEA to regulate the discrete, beneficial use of radioactive material.	Maintains concentration based regulation versus health and safety based. Uranium and thorium continues to be the only naturally occurring radioactive materials that are regulated by NRC as a diffuse source.	Potential for inconsistency of handling source material vs. other AEA material continues or requires alternative resolution.
2. <b>Consistency in regulation of NORM</b>	Under the recommended approach, a single regulatory authority would be in a better position to evaluate the potential hazards of uranium and thorium, which would be considered NORM, with the potential hazards of the other materials with which they are associated, such as radium and hazardous chemicals, if they choose to regulate the material. Allows regulatory oversight to be more consistent with other ubiquitous NORM.	Under the recommended approach, a single regulatory authority would be in a better position to evaluate the potential hazards of uranium and thorium, which would be considered NORM, with the potential hazards of the other materials with which they are associated, such as radium and hazardous chemicals, if they choose to regulate the material. Allows regulatory oversight of concentrations under 0.05 percent to be more consistent with other ubiquitous NORM.	Inconsistency with handling of most other NORM remains. Potential jurisdictional questions could limit other agencies from regulating other hazards associated with materials containing source material.
3. <b>Impact to Health and Safety</b>	Would allow States/EPA to better regulate all hazards from materials that currently may have mixed jurisdiction over radioactive material, thus potentially reducing hazards. However, there is a possibility of increased exposures in certain situations if lesser standards are used by other agencies. Also, risk of increased exposures from more industries using higher concentration material because possible NRC-licensing is no longer a deterrent. On the other hand, industry should have a motivation to control exposures because of potential liability.	Would allow States/EPA to better regulate all hazards from materials <0.05 percent that currently may have mixed jurisdiction over radioactive material, thus potentially increasing public and worker health and safety. NRC will still have difficulty in identifying situations where concentrations in non-nuclear industries exceed 0.05 percent by weight of uranium or thorium.	Difficult for States/EPA to regulate § 40.13(a) exempted material if they see a need. Concern that presence of uranium and thorium may be used as an excuse to prohibit the State or EPA from regulating greater hazards combined in material, if material overall were defined as source material.

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Consideration	Only regulate extracted	Only regulate >0.05% by weight	No Change Option
<b>4. NRC Resource Usage</b>	Reduced long-term costs from fewer specific licensees and fewer recurring questions related to inconsistencies. If sites on the SDMP/complex sites list remain under NRC jurisdiction, there would be less cost savings. Easier to make determination if license is needed or not.	May be easier to implement because the changes are not as broad and the 0.05 percent concentration value remains as a limit. Does not reduce any long-term costs, as number of licensees would not change and it would likely not reduce number of recurring questions.	No extra initial costs. Continued costs of licensing certain entities and resolving potential conflicts resulting from § 40.13(a), determinations of what is source material, inconsistent use of the term “ore”, and other associated regulations/policies.
<b>5. Expected Costs to States and other Federal Agencies</b>	No legislative costs. Removal from AEA would allow most agencies/States to regulate. Some incremental costs setting up standards within existing frameworks. May be costs to develop radiation protection program, if a State does not have existing framework and chooses to regulate this material. Potential impacts on DOE have to be considered with any change in the AEA.	No legislative costs. Removal from AEA would allow most agencies/States to regulate. Some costs setting up standards within existing frameworks (likely no reduction from option to regulate all non-extracted uranium and thorium). There would be continued costs from dual regulation of material >0.05 percent by weight. Potential impacts on DOE have to be considered with any change in the AEA.	No additional costs. Continued costs related to difficult interpretations similar to NRC.
<b>6. Costs to Licensees</b>	No continued costs related to NRC requirements for current specific licensees that would no longer be required to have an NRC license. Costs will continue as subject to State regulations and the potential for inconsistent State regulation.	Continued costs to licensees that possess uranium or thorium incidental to the material.	Continued costs to licensees that possess uranium or thorium incidental to the material
<b>7. Costs to non-licensees</b>	Easier for non-licensees to determine if they require licensing. Could decrease revenue at disposal sites that accept exempt source material, but increase revenue at other disposal facilities. Increased costs if other agencies decide to regulate uranium and thorium that is now exempted by NRC.	Increased costs if other agencies decide to regulate uranium and thorium that is now exempted by NRC. Continued costs to determine what weight percentage is.	Continued costs to determine what weight percentage is.

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Consideration	Only regulate extracted	Only regulate >0.05% by weight	No Change Option
8. <b>Public Confidence</b>	Potential concern that general public may view NRC as abdicating its duty to protect public health and safety. Also, the expectation is that other Federal agencies/States already have or would implement programs to adequately protect the health and safety of the public and workers before transition. Segregation of regulated material versus non-regulated would be more clear. Greater consistency of treatment of all NORM might increase confidence.	Greater consistency of treatment of all NORM with uranium and thorium below 0.05 percent might increase confidence. May even increase confidence that other Federal agencies/States are looking at material that NRC currently exempts, if the other agencies/States choose to regulate the material.	No change. Confusion could continue as to when licenses are required and as to why we regulate uranium and thorium differently at similar risk levels and why it is treated differently than other NORM.
9. <b>Other Considerations</b>	May impact some international treaties.	None.	None.

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Based upon the information compiled in Table 3, the JWG primarily focused on the approach limiting NRC jurisdiction to extracted material. As a result, a number of issues were identified for further evaluation including the amenability of the other agencies to take over this material, potential industry behavioral changes, viability of methods of implementing approaches, resource costs and savings, impacts to treaties, and impacts to domestic safeguards and security. These issues are discussed in the following paragraphs.

Initially, discussion of the amenability of the other agencies for taking over jurisdictional authority of these approaches was addressed. EPA representatives believed that their agency would be amenable to pursuing either approach, while the OSHA representative stated his agreement that the approach was reasonable. The CRCPD/OAS representative presented three priorities that were of concern to the States: (1) adequate protection of public health and safety, (2) emphasis on a consistent Federal framework across the spectrum of radioactive issues, and (3) enhancing, not interfering with the States regulatory programs – the States do not want NRC to institute a program that will keep the States from doing what they are already doing or feel they should do to protect public health and safety. As both of the proposed approaches reduce NRC authority, there would not appear to be a conflict with these State priorities.

The JWG also evaluated potential industry behavioral changes resulting from decreased NRC authority. For the approach limiting NRC authority to only extracted uranium and thorium, the JWG believed that concern is warranted that some industries may attempt to either import or process bulk ores containing higher concentrations of uranium and thorium than they now use in order to avoid NRC licensing; this could lead to higher exposures to workers. There is; however, some motivation on the part of industry to minimize exposures to the workers because of potential liability concerns. The JWG concluded that the existing regulatory schemes at other agencies can limit the amount of imported material (to restrict the use, as necessary, of ores containing high concentrations of uranium and thorium) and limit the exposures to workers and others, similar to how they would handle higher concentrations of other NORM (such as radium-bearing materials). Further, there is an expectation that these types of materials would only be used if they provided other economic benefits (e.g., higher concentrations of the minerals to be extracted). Disposals of associated wastes would be completed under existing frameworks of the States and EPA. The approach which limits NRC authority to only over 0.05 percent by weight would likely not change industry behavior.

Current NRC resource expenditures would be expected to be reduced only under the approach based on regulating extracted uranium and thorium, regardless of the concentration level. There would be expected to be minimal direct-cost savings from this approach because only a handful of licensees may be removed from NRC jurisdiction. If the sites on the SDMP/complex sites list remain in NRC jurisdiction, there would be less cost savings. There should be; however, cost savings resulting from the clarification of Part 40 regulations and the reduction of staff resources used to repetitively address the applicability of § 40.13(a) to licensees and questions related to jurisdiction. There would be some similar benefit to the Agreement States with regard to this aspect. If the sites on the SDMP/complex sites list are transferred to the States, there will be an increase in cost to those States in which the sites are located. As no further legislative or interpretive changes would be necessary to allow other agencies to regulate these materials, it is expected that the costs would be relatively small for them to

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incorporate uranium and thorium into existing regulatory programs, standards, and/or guidance. For States that do not have radiation control programs in place, and decide to regulate this material, there will be some costs to those States to develop regulations or standards. With the approach based on concentration limits, these cost savings would not exist because § 40.13(a) would still remain in some form and there would not be a change in the number of licensees.

Revising the definition of source material or changing the concentration limit in § 40.13(a) may have an impact on international treaties or Agreements of Cooperation that exist or are in the process of being developed or ratified. This is discussed further in Attachment 5. There might be proliferation concerns if the recommended approach is implemented. Also, the staff will have to discuss any impacts on international treaties with the State Department. Further evaluation of this issue is not being pursued until the Commission directs the staff to pursue the recommended approach to limit NRC authority to extracted uranium and thorium.

The JWG also discussed concerns related to safeguards. These concerns included ensuring an adequate supply of uranium and thorium for domestic use, as well as preventing proliferation. The staff belief is that the original purpose for inclusion of uranium and thorium in the AEA was to ensure an adequate supply of this material at the time the AEA was implemented. Since that time, there has been found to be an abundant supply of source material for domestic security. As to proliferation, there is already a large supply of extracted uranium and thorium (which would continue to be regulated under either approach), which would be easier for persons to obtain for illicit uses than by attempting to extract uranium and thorium from the materials containing uranium and thorium that are proposed to be released from NRC authority. Therefore, it is expected that decreasing NRC authority, to include only extracted uranium and thorium, would not result in any significant safeguards issues.

As a result of these discussions, overall, the JWG believes that the consistency, safety, and economic benefits to industry and the public sufficiently offset these other concerns to favor limiting NRC's authority to only regulating extracted uranium and thorium.

## **CONCLUSION**

After reviewing the information in Table 3, the general consensus of the JWG was that limiting NRC authority to only extracted (or purposely concentrated) uranium and thorium was the preferred approach. Although the JWG put a primary emphasis on ensuring public and worker health and safety, it also considered many other factors. Based upon the review of the data supporting NUREG-1717 and data submitted by industry, the JWG believed that agencies other than NRC (i.e., OSHA, many States, and EPA) generally already have methods of regulation in place to either regulate NORM or other properties of the material (e.g., respiratory particle size requirements, etc.) or processes to ensure such safety. By allowing these agencies to have full jurisdiction over the uranium and thorium in these situations, the JWG believes that regulatory burden and duplication would be reduced. The staff shares these views.