UNIQUE WASTE STREAMS WORKSHOPS (INCLUDING DEPLETED URANIUM)
September 2009

Key messages

- The Commission decision to direct the staff to move forward with a rulemaking to require a site-specific analysis for unique waste streams will result in improved regulatory oversight to more adequately protect public health and safety from potential impacts resulting from the disposal of unique wastes including significant quantities of DU.

- This rulemaking will not alter the waste classification of depleted uranium.

- The technical parameters for the site-specific analysis will be specified in the rule language and will be developed based on information gathered at the public workshops and through the public rulemaking process. Initial parameters staff identified in SECY-08-0147 include:

    - the type of individuals receiving the dose who are receptors used to assess protection of the general population from releases of radioactivity;
    - the exposure scenarios evaluated to protect individuals who inadvertently enter the disposal cell; and
    - the period of performance evaluated.

- Specifying the technical parameters for the site-specific analysis in the rule language will provide uniformity in the technical approach used by the Agreement States and their disposal facility licensees and allow more alignment across the disposal sites. The NRC will also publish regulatory guidance on implementation to help ensure more uniformity.

- Given the possibility that large quantities of depleted uranium will be disposed before NRC completes its rulemaking, it would be prudent for the site operator and state regulator to review the existing site-specific performance assessment. The performance assessment should minimally be reviewed against the initial parameters staff identified in SECY-08-0147 (see above).

- The Commission has directed the staff, as a longer-term action, to budget for a comprehensive revision to risk-inform the 10 CFR Part 61 waste classification framework using updated assumptions and referencing the latest International Committee on Radiation Protection methodology to explicitly address the waste classification for DU. The NRC will also consider the need to propose changes to the Low-Level Radioactive Waste Policy Amendments Act of 1985 as part of this comprehensive revision.

QUESTIONS AND ANSWERS

1. What is low-level radioactive waste?

Answer: Low-level radioactive waste is not defined by physical characteristics (e.g., half-life or decay rate). It is legally defined by its origin, and the definition depends on what the waste is "not." The definition in 10 CFR 61.2 for waste states:

Waste means those low-level radioactive wastes containing source, special nuclear, or byproduct material that are acceptable for disposal in a land disposal facility. For the purpose of this definition, low-level waste has the same meaning as in the Low-Level Waste Policy Act, that is, radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste).

2. What is depleted uranium? Why is it considered low-level radioactive waste?

Answer: Depleted uranium is created when natural uranium is enriched to increase the concentration of Uranium-235. Uranium slightly enriched in Uranium-235 is used as fuel in nuclear reactors in the United States. The waste-product from this enrichment process is depleted uranium. Depleted uranium can be fed back through the process multiple times until it is uneconomical to extract any more Uranium-235. There are many uses for depleted uranium because of its physical characteristics and its relatively low radiological hazard. Stockpiles of depleted uranium have been maintained for a variety of reasons, including the potential for new enrichment processes that would allow more Uranium-235 to be retrieved from the depleted uranium. However, at some point, the depleted uranium may be declared, by the entity possessing it, to have no foreseeable use. At that point, the depleted uranium, whether it was stockpiled material or had been used in some product such as ballast or military ammunition, becomes waste and must be categorized using the definition quoted in the answer to question 9 above.

Depleted uranium is defined as source material (10 CFR 40.2 "*Source Material* means: (1) Uranium or thorium, or any combination thereof, in any physical or chemical form...") and, according to the staff's generic screening analysis, may be able to be disposed in a near-surface facility, even in large volumes, depending on the facility design and site performance.

Depleted uranium is not high-level radioactive waste or spent nuclear fuel as defined in 10 CFR 60.2:

High-level radioactive waste or HLW means: (1) Irradiated reactor fuel, (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel, and (3) solids into which such liquid wastes have been converted.

Depleted uranium is not transuranic waste as defined in Section 11.ee of the Atomic Energy Act (as amended):

The term “transuranic waste” means material contaminated with elements that have an atomic number greater than that of uranium (92), including neptunium, plutonium, americium, and curium, and that are in concentrations greater than 10 nano-curies per gram, or in such other concentrations as the Nuclear Regulatory Commission may prescribe to protect the public health and safety. By definition depleted uranium cannot be transuranic waste.

Depleted uranium is not byproduct material as defined in section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste) which states, “the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.”

Depleted uranium is considered source material, which can be disposed of near-surface, and is radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste). Therefore, consistent with the Low-Level Waste Policy Amendments Act and the 10 CFR disposal requirements for radwaste (Part 61) and radiation protection standards (Part 20), DU is defined as low-level waste.

3. Where will the workshops be held? Why did NRC choose these locations?

Answer: The public workshops will be held in Bethesda, Maryland on September 2-3, 2009, and in Salt Lake City, Utah on September 23-24, 2009. NRC chose the Maryland location so that senior managers within the NRC could participate. NRC chose the Salt Lake City, Utah location to coincide with the Low-Level Waste Forum in Park City, Utah where many stakeholders will be gathered. The Salt Lake City location is also convenient for many stakeholders that have indicated a desire to participate in the workshop.

4. What is the timing of the rulemaking compared to the U.S. Department of Energy’s and commercial enrichment facilities’ plan for disposal of DU?

Answer: Staff plans to complete the technical basis document for this rulemaking by September 30, 2010; the proposed rule and draft guidance document by September 30, 2011; and the final rule by September 30, 2012. Based on current information, the Department of Energy may have shipments of DU from its deconversion facilities that require disposal in mid-2010, depending on the construction progress. Commercial enrichment facilities may have significant quantities of DU to be disposed of by 2012.

5. What is NRC’s position regarding disposal of significant amounts of depleted uranium before the rulemaking is complete?

Answer: Because all of the low level waste disposal facilities are located in Agreement States and because no specific NRC regulations exist to impose additional requirements on the disposal of DU, the states in which the disposal facilities are located have the authority to determine the suitability of disposal during the rulemaking. Part of the decision-making process to allow disposal of any waste at a low-level radioactive waste disposal facility is to assess whether the site will continue to meet the performance objectives of 10 CFR Part 61, or the State equivalent. If a site wishes to dispose of significant amounts of depleted uranium, it would be prudent for the site operator and State regulator to review the existing performance assessment supporting the site and determine whether the issues that were raised in the technical analyses supporting the Commission decision to initiate this potential rulemaking and in the *Federal Register* Notice for the NRC public workshops are adequately addressed. If not,

it would be prudent to revise the performance assessment to adequately address these issues on a site-specific basis before disposal of significant quantities of depleted uranium.

For example, the technical analysis supporting the Commission decision to initiate this potential rulemaking used a framework similar to the analysis performed for the impacts analysis described in the Environmental Impact Statement for 10 CFR Part 61. Although computational tools and methods have improved, NRC staff continue to believe the framework used in the development of 10 CFR Part 61 remains appropriate today. Specifically, the technical analysis evaluated receptors to protect the general population from releases of radioactivity and exposure scenarios to protect individuals from inadvertent intrusion that were consistent with the impact analysis performed for the development of 10 CFR Part 61. The technical analysis also evaluated a time period of performance up to one million years. These criteria can guide a review of the current performance assessment.

6. Could any other materials be classified as Class A under the action taken by the Commission?

Answer: The Commission action does not change the existing definition of Class A waste as applied to DU or any other material. Nor would this action or any other NRC action affect the types of low-level waste for which the states and the federal government are assigned responsibility under the LLRWPAA. The Commission action directs staff to 1) proceed with a rulemaking to amend 10 CFR Part 61 to specify a requirement for a site-specific analysis for the disposal of unique waste streams; and 2) to develop a guidance document for public comment that outlines the parameters and assumptions to be used in conducting such site-specific analyses. This direction does not impact waste classifications currently applied to materials. However, the Commission also directed staff to perform a comprehensive revision to risk-inform the 10 CFR Part 61 waste classification framework. After this revision is performed, there is potential that other materials could be reclassified if the current tiered classification scheme continues, or it is possible an entirely different disposal system framework would be developed that might not use these classifications. The Commission cannot speculate on the results of this comprehensive revision to the waste classification framework.

7. How should previously disposed of depleted uranium be addressed by the disposal facility sites?

Answer: Previously disposed of volumes of DU should be addressed through each site's performance assessment. The performance assessment is meant to be a living tool for both the licensee and regulator to be able to assess future compliance of the disposal facility with the performance objectives in 10 CFR regulations protecting workers and the public and ensuring long-term stability of the disposal site after it is closed (Part 61.41-61.44). During the licensing of a disposal site, assumptions must be made about the possible final inventory of a site or a specific disposal unit within a site based on expected waste volumes and streams. As operations occur, the uncertainty in the inventory decreases as actual waste volumes, constituents, and concentrations are known. The performance assessment should be regularly updated with these actual values and any revised information of future waste to be received. The results of the performance assessment can then be used to evaluate whether there is reasonable assurance that the disposal unit or site will remain in compliance with the performance objectives.

If the result of the performance assessment is that compliance with performance objectives is uncertain or unlikely, then several options may be used depending on the specifics of the

situation. Additional data collection and modeling may be performed to reduce the uncertainties in those factors driving the results. Another option is modification of the facility, such as the final cover design. A third option is to reduce future waste volumes, or specific radionuclide quantities or concentrations. The decisions on what actions to take should involve both the site operator and the appropriate regulator(s).

8. Exposure to depleted uranium poses both radioactive and chemical risks. How is the chemical risk integrated into the risk assessment to demonstrate compliance with 10 CFR Part 61?

Answer: The chemical risks are not integrated directly into the compliance assessment for a Part 61 license. The regulatory criteria, including concentration values and limits, in 10 CFR Part 61 have been established based on radiation risk alone. As part of requesting a license for a radioactive waste disposal facility, the applicant would also have to obtain all other required permits or licenses. These will include licenses or permits from other Federal or State agencies that have authority over the elements or compounds, in this case depleted uranium, which may pose a chemical risk. Examples of other regulatory authorities might include a general authority to protect underground sources of drinking water in the general environment or through a site's National Pollutant Elimination Discharge System permit(s).

9. How does the NRC ensure Agreement States provide proper oversight?

Answer: NRC is required by the Atomic Energy Act to periodically review Agreement States' regulatory programs to ensure that they are adequate to protect public health and safety and are compatible with NRC regulations. These periodic reviews of the Agreement States' radiation protection programs are performed as part of NRC's Integrated Materials Performance Evaluation Program (IMPEP). Agreement States' regulatory programs are reviewed every four years. If performance issues are identified with an Agreement State program, more frequent reviews or formal interactions are performed. In some circumstances, the State will prepare and implement a Program Improvement Program, which is reviewed by the NRC. In addition to IMPEP reviews, NRC conducts management meetings with the Agreement States between the reviews. NRC also performs detailed technical and legal reviews of all Agreement State regulations to ensure compatibility with NRC regulations. For most NRC amendments to the regulations, the Agreement States are required to adopt compatible regulations within three years. In addition to overall programmatic guidance provided by FSME, NRC Regional-based State-Agreement Officers also provide direction and guidance to the Agreement States within their Region.

10. Will I get a response to my comments?

Answer: Not at this time; comments submitted at this stage in the process will not receive a response from the NRC. However, the NRC will consider any comments in the development of the technical basis for the rulemaking. Written comments will be recorded in ADAMS and included into the docket, the formal public record, for the proposed rulemaking. Subsequent to the workshops, NRC will develop a technical basis document, a proposed rule, and a final rule. Comments submitted in association with the workshops will inform the technical basis document for the proposed rule, but no formal response will be provided. The public will also be invited to provide comments on the proposed rule as part of the notice-and-comment rulemaking process. These comments will be considered by the NRC in the development of the final rule, and, if a final rule is adopted, the NRC will respond to the proposed rule comments in the FRN announcing the final rule.

11. How can depleted uranium be stored safely in a near-surface disposal facility?

Answer: The safe disposal of depleted uranium is the responsibility of licensed waste disposal facilities. Demonstration of compliance with 10 CFR Part 61 criteria will ensure safe disposal of DU in a near-surface environment. NRC staff performed a screening analysis to evaluate whether significant quantities of DU can be disposed of in the near-surface. The results of the screening analysis suggest that disposal facility performance is strongly dependent upon site-specific conditions. For instance, suitable covers and robust radon barriers may effectively limit exposures to radon gas at arid sites, while humid sites with viable water pathways are probably not appropriate for significant quantities of DU. Therefore, near-surface disposal of significant quantities of DU may be appropriate, but not under all site conditions. The analysis to assess performance of disposal of significant quantities of DU at a particular site should be supported by as much site-specific data as appropriate to demonstrate compliance with the performance objectives in 10 CFR Part 61.

12. How can the performance assessment account for long time periods, such as one million years, the estimated peak dose timeframe?

Answer: The performance assessment is a systematic analysis that identifies the features, events, and processes (i.e., specific conditions or attributes of the geology, biosphere (including climate), degradation, deterioration, or alteration processes of engineered barriers, and interactions between the natural and engineered barriers) that may affect the performance of the disposal facility. The applicable features, events, and processes that need to be considered for evaluation depend on the time period of analysis. Different features, events and processes may need to be included for a performance assessment for 1,000; 10,000, and 1,000,000 years. As the period of analysis is extended through time, the uncertainty in the analysis grows. At longer time periods, analyses may need to rely on stylized scenarios, based on current scientific knowledge and assumptions about features, events and processes, such as major global climatic cycles including warming cycles and ice ages, rather than discrete modeling of the evolution of the disposal site, due to the large degree of uncertainty. Arguments can be presented both for and against extended performance analysis of near-surface facilities (both for DU and any other long-lived waste constituent such as technicium-99 or chlorine-36) due to these uncertainties. This is the reason that public views on what appropriate period(s) of performance should be considered in the depleted uranium limited rulemaking was requested in NRC's recent *Federal Register* Notice.